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ANNUAL REPORT 2025

ICAR-Indian Institute of Water Management, Bhubaneswar

वार्षिक प्रतिवेदन
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2025

भाकृअनुप–भारतीय जल प्रबंधन संस्थान
भुवनेश्वर, ओड़िशा–751023

ICAR-Indian Institute of Water Management
Bhubaneswar, Odisha-751023

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भाकृअनुप
ICAR

ICAR-INDIAN INSTITUTE OF WATER MANAGEMENT
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
Bhubaneswar-751 023, Odisha, India
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ICAR-IIWM Annual Report 2025

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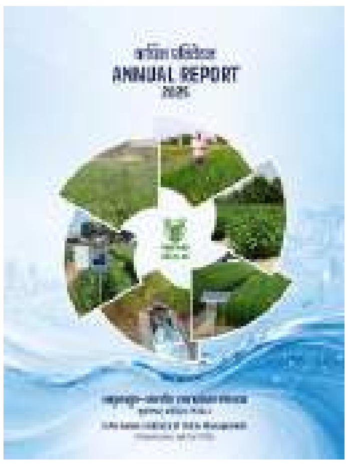

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PREFACE

Food, Land and Water are three important building blocks for development of a nation in which judicious agricultural water management plays a vital role to ensure agricultural sustainability. Technologies for conservation, conveyance and consumption of water at field scale are very much essential to ensure attaining not only sustainability in agriculture but also enhancing the water productivity. Globally, the agricultural water management sector witnessed significant transformation driven by implementation of precision irrigation technologies with use of integrated sensing systems and the automation using IoT enabled protocols for enhancing agricultural water productivity. Such developments include robust digital devices for irrigation scheduling besides testing of robots and drones to detect crop stress and apply water in these regions as part of AI-connected agricultural systems; advanced sensors to monitor soil moisture dynamics and its availability in real time for deciding on precise and optimal drip fertigation for different crops; use of agri-photovoltaic and wind energy for irrigating crops and providing energy for operation of desalinization plants for use of treated saline water in agriculture; isotope techniques for assessment of water resources *viz.* specifically using oxygen-18 and hydrogen-2 to measure evapotranspiration and assist in optimization of crop water consumption; controlled drainage to manage the water table to ensure both adequate supply and drainage, mitigating water logging; micro catchment and rainwater harvesting techniques to collect, store, and utilize rainfall within the farm to boost water availability in rainfed systems besides improvements in irrigation methods with up scaling of central pivot systems, sub-surface drip irrigation systems, drip tapes and low cost micro sprinkler systems. Moreover, use of unmanned aerial vehicle (UAV)-based soil moisture mapping, model fusion techniques for identification of small water bodies, use of geospatial tools for irrigation planning besides safe wastewater reuse are emerging as sustainable innovations to improve agricultural water productivity leading to attainment of SDGs.

Keeping in view of developments in the field of agricultural water management in global perspective, it gives me immense pleasure to present the Annual Report of the ICAR-Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar, for the year 2025. The report synthesizes significant achievements and initiatives of the Institute, reflecting unwavering commitment to advancing agricultural water management through innovative research, technology dissemination and stakeholder oriented interventions. Significant accomplishments include implementation and successful operation of canal automation system in the minor Irrigation project in Odisha, groundwater resource augmentation and de-siltation of defunct water harvesting structures under climate resilient initiatives, installation of ground water recharge structures in different parts of the Country, AI-driven evapotranspiration estimator, development of operational protocols of subsurface drip irrigation system, hydroponics, aquaponics and use of soilless media for leafy vegetables, development of protocols for estimation of water footprint and water productivity at regional scales, model fusion techniques using the process based models and AI techniques for delineation of small water bodies in Google earth engine platform, testing and piloting of IoT enabled soil moisture sensor, water measuring device and AWD based irrigation scheduler. Innovations like low-cost groundwater recharge structures under different hydro-geological settings, water productivity estimations under natural and organic farming, piloting of automated irrigation systems, automation of ICAR flexi check dam, development of mobile applications related to agricultural water management, polymer-linked slow-release fertilizers for enhancing WUE and NUE are being developed to improve water and nutrient use efficiency besides undertaking the *vikasit krishi sankalp Abhiyan* (VKSA) and imparting training and covering about 487 events and 91,000 different stakeholders last year. During the year 2025, the 6th QRT report was submitted to the Council, EFC (2026-2031) was prepared and the third party evaluation of previous 5 year progress was undertaken for the Institute.

Besides these, ICAR-IIWM also served as the nodal institute for All India Coordinated Research Project on Irrigation Water Management (AICRP-IWM), steering collaborative research across 26 centers nationwide covering 14 agro ecological regions of the Country to address diverse agro-climatic challenges in agricultural water management. The Institute also leads the Agri-Consortia Research Platform (Agri-CRP) on Water (Phase-II) with research focused on the application of geospatial tools and models for surface water management, Automation of felxi check dam and canal irrigation systems, and enhancing groundwater sustainability through IoT-enabled technologies and analysis of the water-energy nexus. In addition, notable advancements have been achieved under externally funded projects such as the World Bank-supported REWARD initiative, *Rashtriya Krishi Vikas Yojana* (RKVY), consultancy projects of CWC, GoI & IMAGE, GoO besides competitive grant projects of National Agricultural Science Fund (NASF) and Department of Science and Technology (DST)-SERB with impactful interventions spanning various critical dimensions of agricultural water management.

In continuation of Institute's outreach initiatives, this year, under SCSP and STC projects that supported over a total of 2050 Scheduled Caste and Tribe families in Puri, Cuttack, Rayagada, and Gajapati districts of Odisha. The Farmer FIRST project was executed in three villages of Khordha district, Odisha involving integrated modules in agriculture, livestock, fisheries, enterprise development and natural resource management. Capacity-building initiatives such as farmer training, demonstration programs, and on-field guidance benefitted about 6500 farmers and farm women. The "*Mera Gaon Mera Gaurav*" initiative covered 33 villages across four districts, where over 500 farmers were trained in water-saving technologies and vegetable nursery management. The Institute also actively participated in national campaigns such as the *Swachh Bharat Abhiyan*, conducting cleanliness drives, awareness programs, and educational activities for youth and local communities. Institute's efforts are closely aligned with GoI missions such as the National Water Mission (NWM), *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY), *Atal Bhujal Yojana* (ABY), *Amrit Sarovar Mission*, *Jal Shakti Abhiyan*- CTR (Catch the Rain), *Jal Jeevan Mission* (JJM), *SahiFasal*, PMKUSUM, MGNREGS, *Namami Gange*, National Hydrology Project, etc.

I sincerely acknowledge the valuable guidance and support extended by Dr Mangi Lal Jat, Secretary DARE and Director General ICAR; Dr. A.K. Nayak, Deputy Director General (NRM); Dr. A. Velmurugan, ADG (Soil and Water Management) and ADG (Agronomy, Agroforestry and Climate Change), besides the staff of NRM division in particular and other staff of the Council in general. I express my deep appreciation to the Chairman and Members of the QRT, RAC and IMC for their constructive inputs and oversight. My gratitude extends to all members of the IRC, program leaders, various Institute committees, administrative and finance staff for their dedication and cooperation in the smooth conduction of the Institute activities. With continued collaboration, scientific rigor besides stakeholder engagement, I am confident that ICAR-IIWM will further strengthen its role as a national and global leader in agricultural water management.

April 20, 2026
Bhubaneswar

(Arjamadutta Sarangi)
Director, ICAR-IIWM

कार्यकारी सारांश

वर्षा जल प्रबंधन

ओड़िशा राज्य में दलहन फसलों का वॉटर फुटप्रिंट

ओड़िशा राज्य में दलहन फसलों के 'वॉटर फ़ुटप्रिंट' में जगह और समय के हिसाब से काफ़ी अंतर देखा गया। कुल वॉटर फ़ुटप्रिंट (TWF) में ब्लू, ग्रीन और ग्रे फ़ुटप्रिंट के घटक शामिल हैं, लेकिन इसमें ज़्यादातर घटक ब्लू वॉटर फ़ुटप्रिंट (BWF) का है, जो यह बताता है कि कई जिले अभी भी सिंचाई जल पर ही ज्यादा निर्भर है। भद्रक, बालासोर, केंदुझर और नबरंगपुर जिलों में वर्षा में उतार-चढ़ाव के कारण ग्रीन वॉटर फ़ुटप्रिंट में भी काफी बदलाव देखने को मिला है। पुरी, केंदुझर और कंधमाल ज़िलों में ब्लू वॉटर फ़ुटप्रिंट की वैल्यू ज्यादा पाई गई। हालाँकि, वर्ष 2013–14 में इसमें कुछ कमी आई थी, लेकिन, वर्ष 2021–22 में यह फिर से बढ़ गया। ग्रे वॉटर फ़ुटप्रिंट (GWF) आम तौर पर कम था, लेकिन, नबरंगपुर और संबलपुर जैसे ज़िलों में यह फुटप्रिंट प्रदूषण के हॉटस्पॉट को उजागर करता है।

महानदी नदी बेसिन में तापमान और वर्षा के ट्रेंड

ओड़िशा राज्य के बलांगिर, कालाहांडी और आंध्र प्रदेश राज्य के भद्राद्री एवं कोठागुडेम में दीर्घकालिक जलवायु के ट्रेंड्स के विश्लेषण से काफी मौसमी परिवर्तनशीलता के साथ थोड़ी बढ़ती हुई गर्मी का पता चला। ओड़िशा राज्य के जिलों में सितंबर और दिसंबर के महीनों में न्यूनतम तापमान में वृद्धि देखी गई जबकि, भद्राद्री एवं कोठागुडेम में सर्दी के महीनों में तापमान में वृद्धि दर्ज की गई। कालाहांडी में अधिकतम तापमान में अधिक वृद्धि का ट्रेंड प्राप्त हुआ और आंध्रप्रदेश में वर्षा के महीनों के बाद अधिकतम तापमान में काफी अधिक वृद्धि का ट्रेंड प्राप्त हुआ। वर्षा के ट्रेंड काफी हद तक गैर-महत्वपूर्ण प्राप्त हुए। ओड़िशा में मामूली गिरावट और भद्राद्री एवं कोठागुडेम में मानसून का बढ़ा हुआ ट्रेंड प्राप्त हुआ। यह परिणाम अधिकतम वर्षा की परिवर्तनशीलता के साथ वार्मिंग का संकेत देते हैं, जो जलवायु-अनुकूल कृषि की योजना और नमी-आधारित फसल प्रबंधन उपायों की आवश्यकता पर जोर देते हैं।

जल उत्पादकता में वृद्धि के लिए पेरीफाइटोन-आधारित कार्प सिस पॉलीकल्चर

जीरो जल विनिमय कार्प सिस पॉलीकल्चर में सब्सट्रेट प्रेरित (10% सब्सट्रेट) पेरीफाइटोन ने जल की गुणवत्ता, मछली की उपज (4.99 टन/हेक्टेयर तक) और जल की उत्पादकता में सुधार किया। सिस पॉलीकल्चर प्रणाली ने उपज में 10.4% की वृद्धि की और वाटर फुटप्रिंट (2906 घनमीटर/टन) को कम किया। इस प्रणाली के तहत जल उपयोग की दक्षता और आर्थिक रिटर्न भी अधिक प्राप्त हुआ। पेरीफाइटोन ने 21-23.6% तक मछलियों की खाद्य आवश्यकता को कम कर दिया और जल की अनुकूल गुणवत्ता (WQSI: 7.5 9.0) को बनाए रखा। कुल मिलाकर, पेरीफाइटन-आधारित प्रणाली को जोड़ने से मछली पालन में उत्पादकता, संसाधन दक्षता और टिकाऊपन में काफी वृद्धि हुई।

रोपित धान में आईओटी-सक्षम एकांतर नम सुखी सिंचाई विधि (AWD) का खेतों में परीक्षण

ओड़िशा राज्य में आईओटी-सक्षम एकांतर नम सुखी सिंचाई विधि के खेत में मूल्यांकन ने सिंचाई जल की बचत करने के लिए आशाजनक क्षमता दिखाई। जबकि, एकांतर नम सुखी सिंचाई विधि का खरीफ के मौसम में पर्याप्त वर्षा के कारण परीक्षण नहीं किया जा सका, वहीं रबी के मौसम में परीक्षणों ने नियंत्रित जल की कमी (4-5.3 सेमी/दिन) को बताया। प्रारंभिक परिणाम वास्तविक समय में निगरानी प्रणाली की प्रभावशीलता को उजागर करते हैं, हालांकि, व्यवहार संबंधी समस्याएँ अभी भी पाई गई हैं। निरंतर प्रदर्शन और जागरूकता के साथ, एकांतर नम सुखी सिंचाई विधि को आंशिक से पूर्ण रूप से अपनाने की उम्मीद की गई है, जिससे सिंचाई जल के उपयोग की दक्षता में वृद्धि होगी और टिकाऊ धान की खेती संभव हो पाएगी।

रिवार्ड परियोजना – हाइड्रोलोजिकल निगरानी और जल की डाइनेमिक्स

वर्ष 2025 के दौरान मृदा और जल संरक्षण, जल संचयन और भूजल पुनर्भरण और जल निकासी लाइन उपचार योजना सहित प्रमुख प्राकृतिक संसाधन प्रबंधन नवाचारों की व्यापक योजना तैयार की गई और कार्यान्वित की गई। नयागढ़ जिले के ओडागांव एवं दसपल्ला ब्लॉकों के दोनों माइक्रो वाटरशेड (MWS) समूहों में साप्ताहिक भूजल स्तर की निगरानी, भूजल और सतही जल की गुणवत्ता का विश्लेषण, प्रोफाइल और सतही मृदा की नमी का अध्ययन किया गया और साथ ही चार माइक्रो वाटरशेड्स के निकास बिंदुओं (आउटलेट्स) पर जल के डिस्चार्ज का मापन भी किया गया। माइक्रो वाटरशेड के स्तर पर घरेलू और पशुधन के लिए जल की मांग का अनुमान लगाने के लिए एक वेब-आधारित निर्णय समर्थन प्रणाली (DSS) के साथ-साथ एक जल मांग निर्णय समर्थन प्रणाली (DSS) के लिए रूपरेखा विकसित की गई।

भारत में कृषि आपदा जोखिम प्रबंधन रणनीति के माध्यम से एकीकृत कृषि के अनुकूलन में वृद्धि

इंटीग्रेट प्रोजेक्ट के तहत उपग्रह डाटा और क्षेत्रीय अवलोकन का उपयोग करके वर्ष 2025 में पूरे भारत में बाढ़ के प्रभावों, भूजल की गतिशीलता और प्रतिक्रिया रणनीतियों का आकलन किया गया। गंभीर बाढ़ ने असम, ओड़िशा और उत्तर प्रदेश राज्यों को प्रभावित किया, जबकि, चक्रवात मोन्था ने आंध्र प्रदेश में 1.38 लाख हेक्टेयर कृषि की भूमि और 1.74 लाख किसानों को प्रभावित किया। उपग्रह-आधारित मानचित्रण ने उच्च जोखिम क्षेत्रों की पहचान में सहायता प्रदान की, जिसके आधार पर बाढ़ बीमा, कृषि निवेश सहायता एवं अन्य लक्षित नवाचरों का प्रभावी क्रियान्वयन सुनिश्चित किया गया। प्रशिक्षण एवं जलवायु संबंधी कार्यक्रमों सहित क्षमता-विकास के प्रयासों ने किसानों और कृषि पद्धतियों की अनुकूलन क्षमता को सुदृढ़ किया। समग्र रूप से यह अध्ययन कृषि की जलवायु के प्रति अनुकूलता की क्षमता तथा किसानों की पुनर्प्राप्ति की क्षमता में वृद्धि के लिए एकीकृत एवं प्रौद्योगिकी-संचालित आपदा प्रबंधन उपायों की आवश्यकता को रेखांकित करता है।

नहरी जल प्रबंधन

मक्का आधारित फसल क्रम में उप-सतही ड्रिप सिंचाई का मूल्यांकन

मक्का-आधारित फसल क्रम (मक्का–टमाटर–बेबी कॉर्न) में 1.2 मीटर की लेटरल दूरी के साथ मक्का एवं बेबी कॉर्न के लिए पूरी फसल अवधि के दौरान 75% ETc तथा टमाटर के लिए फसल विकास अवस्था में 75% ETc + मध्य अवस्था में 100% ETc + अंतिम अवस्था में 50% ETc पर आधारित उप-सतही ड्रिप सिंचाई का सर्वोत्तम संयोजन पाया गया। इस पद्धति से मक्का आधारित फसल पद्धति (मक्का-टमाटर-बेबी कॉर्न) में सतही ड्रिप सिंचाई की तुलना में 32-44% तक सिंचाई जल की बचत हुई और जल की उत्पादकता में 22-71% तक की वृद्धि हुई।

संरक्षित कृषि के तहत सेंसर-आधारित सिंचाई

धान की सीधी बुवाई (DSR) विधि के अंतर्गत धान की उपज तथा जल की उत्पादकता रोपाई एवं पडलिंग आधारित विधि (PTR)की अपेक्षा काफी अधिक प्राप्त हुई व साथ ही नाइट्रोजन की बढ़ती हुई मात्राओं के साथ उपज एवं जल उत्पादकता में भी महत्वपूर्ण वृद्धि हुई। हालांकि, धान की उपज और जल की उत्पादकता के संबंध में नाइट्रोजन (RDN) की 100% और 125% अनुशंसित मात्रा के बीच कोई महत्वपूर्ण अंतर प्राप्त नहीं हुआ। रबी के मौसम में पारंपरिक जुताई की तुलना में बिना जुताई के मूंगफली की पैदावार और जल की उत्पादकता में अधिक वृद्धि हुई, लेकिन, मूंगफली की दाना उपज और जल की उत्पादकता पर सिंचाई और नाइट्रोजन के स्तरों का प्रभाव सांख्यिकीय रूप से महत्वपूर्ण प्राप्त नहीं हुआ।

उन्नत उपकरणों का प्रयोग करके जल उत्पादकता के अनुकूलन में सुधार हेतु सिंचाई प्रणालियों का कुशल प्रबंधन

धान की अधिकतम उपज धान गहनता पद्धति के तहत प्राप्त हुई, जो सांख्यिकीय रूप से पडल्ड ट्रांसप्लांटेड धान और निरंतर जलभराव विधि के समान थी। लेकिन, पडल्ड ट्रांसप्लांटेड धान में एकांतर नम एवं सुखी सिंचाई विधि और सीधे बुवाई वाली धान की विधि की स्थापना से काफी अधिक थी। हालाँकि, धान की जल उत्पादकता धान गहनता प्रणाली के तहत सबसे अधिक प्राप्त हुई जो सीधे बुवाई वाले धान की विधि के समान थी। लेकिन, फसल स्थापना की पडल्ड ट्रांसप्लांटेड धान और एकांतर नम एवं सुखी सिंचाई विधि से काफी अधिक थी।

नहर के कमांड क्षेत्रों की कृषि जल उत्पादकता में वृद्धि हेतु डिजिटल जल मापक उपकरण और मृदा नमी सेंसर प्रणालियों का पायलट क्षेत्र प्रदर्शन

सिंचाई शेड्यूलिंग की एकांतर नम एवं सुखी सिंचाई विधि के तहत खरीफ के मौसम में धान की खेती की पारंपरिक निरंतर जलभराव (CF) विधि की तुलना में सिंचाई जाल के उपयोग में 17.5% की कमी के अलावा न्यूनतम उपज में 10.7% की कमी हुई। हालाँकि, एकांतर नम एवं सुखी सिंचाई विधि के तहत धान की जल उत्पादकता पारंपरिक निरंतर जलभराव विधि की तुलना में 6% अधिक थी। इसी प्रकार, रबी मौसम में 50% उपलब्ध मृदा नमी में नमी की कमी पर आधारित मृदा नमी सेंसर-संचालित सिंचाई प्रणाली ने पारंपरिक किसानों द्वारा अपनाई जाने वाली महत्वपूर्ण फसल वृद्धि अवस्था पर आधारित सिंचाई पद्धति की तुलना में तिल की दाना उपज में नगण्य हानि (5%) के साथ सिंचाई जल की उत्पादकता में 42% तथा समग्र जल उत्पादकता में 18% की वृद्धि हुई।

सूक्ष्म सिंचाई प्रणालियों के माध्यम से सिंचित फसलों में ग्रीन हाउस गैसों के उत्सर्जन को कम करना

भाकृअनुप – भारतीय जल प्रबंधन संस्थान, भुवनेश्वर के अधीन सिंचाई जल प्रबंधन पर अखिल भारतीय समन्वित परियोजना के भारत के विभिन्न क्षेत्रों में स्थित छह भागीदार केंद्रों (1. कोयंबटूर, 2. राहुरी, 3. नवसारी, 4. पालमपुर, 5. जबलपुर, 6. रायपुर) के सहयोग से यह प्रोजेक्ट संचालित

किया जा रहा है। आंकड़ों के संग्रहण के लिए प्रोफार्मा इन चिन्हित केंद्रों को स्प्रेडशीट के रूप में प्रेषित किया गया है और इन आंकड़ों के संग्रहण का कार्य प्रगति पर है, जिसका उपयोग अप्रत्यक्ष विधि द्वारा ग्रीनहाउस गैसों के उत्सर्जन के आकलन के लिए किया जाएगा।

धान गहन आधारित फसल पद्धति में संरक्षित कृषि के तहत जल प्रबंधन

धान-मक्का-मूंग फसल पद्धति में सटीक सिंचाई (PI) से पारंपरिक सिंचाई (CI) की तुलना में फसल की उत्पादकता और जल उपयोग दक्षता में काफी अधिक वृद्धि हुई। सटीक सिंचाई के साथ मक्का की उपज में 17-19% तक की वृद्धि हुई, जिसमें से T_2 में सबसे अधिक उपज और जल की उत्पादकता प्राप्त हुई। सटीक सिंचाई (T_4) के साथ जीरो टिलेज के तहत मूंग की फसल ने सबसे अच्छा प्रदर्शन दिखाया, जिससे दाना उपज और सिंचाई जल की उत्पादकता दोनों अधिक पाई गईं। रोपित धान में सटीक सिंचाई स्तर (T_2) के साथ सबसे अधिक दाना उपज का उत्पादन प्राप्त हुआ, जबकि, जीरो टिलेज के तहत धान की सीधी बुवाई से थोड़ी कम उपज के बावजूद जल की उत्पादकता में वृद्धि हुई।

धान में जल उत्पादकता और पोषक तत्त्व उपयोग दक्षता पर जल प्रबंधन और नैनो-उर्वरक का प्रभाव

रोपाई एवं पडलिंग आधारित विधि (PTR), धान गहनता पद्धति (SRI) और धान की सीधी बुवाई (DSR) पद्धतियों के तहत खरीफ के मौसम में धान में जल प्रबंधन तकनीकों (एकांतर नम एवं सुखी सिंचाई विधि) और खेत में निरंतर जलभराव (CF) विधि) और नैनो-यूरिया-आधारित नाइट्रोजन उर्वरक की प्रयोग विधियों पर अनुसंधान किया गया। इनके परिणाम से पता चला ह कि फसल स्थापना सभी विधियों में सिंचाई और नाइट्रोजन के प्रयोग के तहत दाना और भूसे की उपज और; जल की उत्पादकता समान प्राप्त हुई। धान गहनता पद्धति के तहत नाइट्रोजन के उपचारों के बीच जल उत्पादकता में काफी भिन्नता पाई गई, जिसमें पूर्ण अनुशंसित नाइट्रोजन, फास्फोरस, और पोटेशियम की मात्रा के प्रयोग के साथ अधिकतम प्राप्त हुई, इसके बाद नैनो-यूरिया के साथ नाइट्रोजन में कमी से प्राप्त हुई।

प्राकृतिक खेती: विभिन्न सिंचाई विधियों के तहत फसल और जल की उत्पादकता पर प्रभाव

धान की फसल की जैविक खेती (OF) और प्राकृतिक खेती (NF) की तुलना में पारंपरिक खेती (CF) से अधिक उपज (4.29 टन/हेक्टेयर) प्राप्त हुई। जैविक खेती और प्राकृतिक खेती में पारंपरिक खेती की तुलना में धान की उपज में 11-12% की कमी प्राप्त हुई। इसी प्रकार पारंपरिक खेती, जैविक खेती और प्राकृतिक खेती में टमाटर और मूंग की पैदावार धान जैसी ही थी। सभी फसलों में ड्रिप सिंचाई के कारण अधिकतम जल उत्पादकता प्राप्त हुई जबकि, फ्लैट-बेड सिंचाई के तहत सबसे कम जल उत्पादकता प्राप्त हुई। धान में जल उत्पादकता 0.35 से 0.39 किग्रा/घनमीटर, टमाटर में 4.83 से 5.54 किग्रा/घनमीटर और मूंग में 0.18 से 0.21 किग्रा/घनमीटर तक प्राप्त हुई।

आईओटी सक्षम मिनी पैन वाष्पीकरण मीटर का विकास

फसलों में सटीक सिंचाई शेड्यूलिंग को प्रोत्साहित करने के लिए सिंचाई के वास्तविक समय के अनुमान हेतु एक आईओटी-सक्षम मिनी पैन वाष्पीकरण मीटर विकासाधीन है। यह प्रणाली अल्ट्रासोनिक सेंसर और क्लाउड कनेक्टिविटी के साथ अर्डुइनो मेगा-आधारित डाटा अधिग्रहण का उपयोग करती है। यह स्वचालित प्रणाली फसल वाष्पोत्सर्जन (Etc) का अनुमान, दूरस्थ निगरानी और सिंचाई के लिए बेहतर निर्णय लेने में सक्षम बनाती है।

आईओटी सक्षम सेंसर-आधारित स्मार्ट सिंचाई प्रबंधन प्रणाली

खेत में प्रयोग से पता चला कि केला (किस्म - ग्रैंड नैन) की फसल में आईओटी-आधारित ड्रिप फर्टिगेशन प्रणाली से पारंपरिक बेसिन सिंचाई (52.4 टन/हेक्टेयर) की तुलना में 21% सिंचाई जल की बचत और अधिकतम फल उपज (59.3 टन/हेक्टेयर) प्राप्त हुई। इस स्वचालित ड्रिप फर्टिगेशन प्रणाली (95% एकरूपता) ने अधिक टीएसएस (15.5 ब्रिक्स) और कम टाइट्रेटेबल अम्लता (0.15) के साथ सिंचाई जल की उत्पादकता में वृद्धि कर फलों की गुणवत्ता में सुधार किया।

कृषि की प्रमुख फसलों के लिए सिंचाई शेड्यूलिंग सूचना प्रणाली का विकास

एफएओ-पेनमान-मोंटिथ विधि का उपयोग करके सिंचाई शेड्यूलिंग को इष्टतम करने के लिए एक पायथन-आधारित वेब प्रोग्राम विकासाधीन है। भुवनेश्वर स्थित ओबजरवेट्री के आंकड़ों की तुलना नासा के पावर के आंकड़ों से करके इस अध्ययन ने एक सटीक ET_0 अनुमान उपकरण (R^2= 0.81 - 0.91) को मान्य किया एवं मई के महीने में अधिकतम जल की आवश्यकता का पता लगाया। यह विभिन्न फसलों और क्षेत्रों के लिए जल-कुशल इष्टतम सिंचाई शेड्यूलिंग को प्रोत्साहित करता है।

भूजल प्रबंधन

पूर्वी भारत की तटीय जलवाहियों के स्तर के लिए प्रबंधन रणनीति

ओड़िशा राज्य के तटीय क्षेत्र वाले पुरी जिले के लिए मानसून पूर्व, मानसून, सर्दियों और मानसून के बाद के मौसम के लिए जल गुणवत्ता सूचकांक के मानचित्र तैयार किए गए । जल गुणवत्ता सूचकांक के विश्लेषण से पता चला कि हाइड्रोलोजिकल स्ट्रेस और मानवीय प्रभावों के कारण मानसून से पहले और मानसून की अवधि के दौरान भूजल की गुणवत्ता खराब हो जाती है, जबकि, सर्दियों और मानसून के बाद की मौसम की स्थितियों में आम तौर पर यह बेहतर हो जाती है। मानसून और मानसून के बाद के मौसम में केलीज अनुपात के मूल्यों के विश्लेषण ने अनुकूल परिस्थितियों को बताया, जबकि, सभी मौसमों में सोडियम अवशोषण अनुपात के मूल्यों ने लगातार जल को उत्कृष्ट श्रेणी के अंतर्गत वर्गीकृत किया।

जल उत्पादकता और पोषक तत्वों के उपयोग की दक्षता में वृद्धि के लिए पॉलिमर से जुड़े स्लो रिलीज उर्वरक का विकास

पॉलीएक्रिलामाइड हाइड्रोजेल को वेट ग्रेनुलेशन प्रक्रिया के माध्यम से स्लो रिलीज उर्वरक मैग्नीशियम डोप्ड यूरिया हाइड्रॉक्सीएपेटाइट के साथ एकीकृत किया गया। इन परिणामों से पता चला कि अनुशंसित नाइट्रोजन की मात्रा (RND) के 70 और 80% की दर पर पीएल-एसआरएनएफ प्रयोग ने नीम लेपित यूरिया (NCU) के 100% प्रयोग की तुलना में रोपण के बाद 60 और 180 दिनों में काफी अधिक मृदा की नमी को समान बनाए रखा। आरएनडी की 70–80% मात्रा पर पीएल-एसआरएनएफ के प्रयोग से मृदा के एंजाइमों की गतिविधियों जैसे कि यूरीएज और डीहाइड्रोजनेज तथा माइक्रोबियल बायोमास-नाइट्रोजन की मात्रा में अधिक वृद्धि हुई। इसके साथ ही पौधों की वृद्धि संबंधी मानकों तथा जड़ बायोमास में भी महत्वपूर्ण वृद्धि हुई। इसके अलावा, 80% ETc के स्तर पर सिंचाई व्यवस्था के साथ आरएनडी के 70% के साथ पीएल-एसआरएनएफ के प्रयोग से सबसे ज़्यादा पैदावार प्राप्त हुई। इस उपचार संयोजन से नाइट्रोजन उपयोग दक्षता और जल उपयोग दक्षता में भी वृद्धि हुई।

जल और पोषक तत्वों के उपयोग की दक्षता और पर्यावरणीय स्थिरता में सुधार के लिए पॉलीमर बायो मिनरल कम्पोजीट का विकास

सेलुलोसिक बायोमास (मक्का डंठल) से प्राकृतिक हाइड्रोजेल विकसित करने हेतु विभिन्न प्रोटोकॉल का प्रयास किया गया। अल्ट्रासाउंड की सहायता से प्राप्त क्षारीयकरण की प्रक्रिया के बाद मक्का डंठल से प्राप्त किए गए पाउडर से कच्चा सेलूलोज़ निकाला गया। कार्बोक्सी मिथाइल सेलुलोज (CMC) को ब्लीच किए गए सेलुलोज के साथ सोडियम मोनोक्लोरो एसीटेट के साथ क्रिया करवाकर तैयार किया गया। कार्बोक्सी मिथाइल सेलुलोज का सोलवेसन, क्रॉसलिंकर CMC का अनुपात, क्रॉसलिंकिंग तापमान और समय को डिस्टिल्ड वाटर में 420 ग्राम/ग्राम की जल अवशोषण क्षमता वाले प्राकृतिक हाइड्रोजेल को संश्लेषित करने के लिए मानकीकृत किया गया। क्रॉसलिंकर के रूप में एपिक्लोरोहाइड्रिन का उपयोग किया गया। टैल्क-आधारित फंगल स्पोर्स तथा रॉक फॉस्फेट एवं पोटैशियम फेल्डस्पार से युक्त अघुलनशील खनिज मिश्रण के इष्टतम मिश्रण अनुपात का निर्धारण अंधकारमय परिस्थितियों में रूम के तापमान पर 10 माह के भंडारण के पश्चात प्राप्त वाइबल सेल काउंट के आधार पर किया गया। पॉलिमर–बायोमिनरल कंपोजिट के निर्माण के लिए कई परीक्षण किए गए। विभिन्न प्रोटोकॉल्स में से प्रोटोकॉल–III ने अंधकारमय परिवेशीय भंडारण परिस्थितियों में भंडारण के बाद सूक्ष्मजीवों की वाइबल सेल काउंट के संरक्षण में अन्य प्रोटोकॉलों की तुलना में श्रेष्ठ प्रदर्शन किया।

भूजल–ऊर्जा–उत्सर्जन सूचकांक (GEEI) दृष्टिकोण का उपयोग करके नयागढ़ जिले में सिंचाई-प्रेरित ऊर्जा उपयोग एवं उत्सर्जन से ब्लॉक-स्तरीय हॉट स्पॉट की पहचान

हाइड्रोजियोलॉजिकल स्ट्रेस, पम्पिंग ऊर्जा की मांग और संबंधित कार्बन उत्सर्जन का संयुक्त रूप से आकलन करने के लिए नयागढ़ जिले हेतु एक ब्लॉक-स्तरीय भूजल-ऊर्जा-उत्सर्जन सूचकांक विकसित किया गया। इस सूचकांक में ऊर्जा की तीव्रता (किलो वाट घंटा/घनमीटर), उत्सर्जन तीव्रता (किलोग्राम कार्बन डाइऑक्साइड/घनमीटर) तथा मानसून के पूर्व भूजल की गहराई को एक भारित और सामान्यीकृत पद्धति के माध्यम से एकीकृत किया गया, जिसमें ऊर्जा और उत्सर्जन को अधिक महत्व दिया गया। इसके परिणाम पूरे जिले में स्पष्ट स्थानिक भिन्नताएँ दिखाते हैं। गहरे भूजल स्तर, अधिक पंपिंग घंटों, डीजल पंपों का प्रभुत्व और कई कुएं और ट्यूबवेल के कारण रानापुर और ओडागांव में बहुत अधिक स्ट्रेस (GEEI > 0.75) दर्ज किया गया। इसके विपरीत, गनिया और भापुर ब्लॉक कम स्ट्रेस (GEEI< 0.25) के अंतर्गत आते हैं, जहां , उथला भूजल स्तर है और ऊर्जा की मांग कम होती है।

नयागढ़ जिले में भूजल पुनर्भरण शाफ्ट की तकनीक का विकास

ओड़िशा सरकार की राष्ट्रीय कृषि विकास योजना के तहत प्राप्त की गई सहायता से नयागढ़ जिले के नयागढ़ और खंडपड़ा ब्लॉकों में भूजल पुनर्भरण की परियोजना को क्रियान्वित किया गया। इस जिले के कुल 15 गांवों में अनुपयोगी पड़े कुओं और मौजूदा जल संचयन संरचनाओं में कुल 200 रिचार्ज शाफ्ट्स (औसत गहराई 6 मीटर और व्यास 6 इंच) की स्थापना की गई। ये शाफ्ट्स छिद्र युक्त थे और निस्पंदन इकाइयों के रूप में कार्य करने के लिए रेत और बजरी से भरे हुए थे। भूजल की निगरानी से पता चला कि इन उपचारित कुओं के भूजल स्तर में 15-30 सेमी तक की वृद्धि हुई है। वर्षा के आंकड़ों के विश्लेषण से यह स्पष्ट हुआ कि कुल वर्षा का अधिकांश भाग मानसून ऋतु में प्राप्त होता है। सेंटिनेल-2 आधारित स्पेक्ट्रल सूचकांकों (एनडीवीआई, एनडीडब्ल्यूआई, एमएनडीडब्ल्यूआई, एलएसडब्ल्यूआई) ने मानसून के पूर्व-की अवधि में मृदा नमी और वनस्पति की बेहतर स्थिति की पुष्टि की, जिससे भूजल पुनर्भरण की प्रभावशीलता प्रमाणित हुई।

नेशनल मिशन ऑन नेचुरल फ़ार्मिंग के अंतर्गत प्राकृतिक खेती मॉडल फार्म

खरीफ के मौसम में ओड़िशा राज्य के मेंढ़ासल में स्थित भाकृअनुप-भाजप्रसं, भुवनेश्वर के अनुसंधान फार्म और खोर्धा जिले के तीन किसानों के खेतों में प्राकृतिक खेती मॉडल फार्म की स्थापना शुरू की गई। खरीफ से पहले के मौसम के दौरान प्राकृतिक खेती मॉडल फार्म में धान - मूँग - ढेंचा फसल पद्धति की खेती की गई जिसमें हरी खाद की फसल के रूप में ढेंचा को शामिल किया गया। यह देखा गया कि विभिन्न प्राकृतिक खेती मॉडल फार्म में धान की फसल में प्रति वर्ग मीटर हिल्स की संख्या 26.8 से 30.2, प्रति हिल्स पैनिकल्स की संख्या 9.6 और 10.8 के बीच, पैनिकल लंबाई 23 से 25 सेमी तक पाई गई और पैनिकल्स का वजन 3.3 से 4.4 ग्राम के बीच प्राप्त हुआ और प्रति पैनिकल दानों की संख्या 136 और 172 के बीच प्राप्त हुई। धान और भूसे की उपज क्रमशः 4.72-4.97 और 5.28-6.42 टन/हेक्टेयर पाई गई।

ऑन फार्म जल जल प्रबंधन एवं तकनीकों का प्रचार-प्रसार

पूर्वी भारत में सौर ऊर्जा चालित सिंचाई का सामाजिक-आर्थिक मूल्यांकन और किसानों की आजीविका पर इसका प्रभाव

इस अध्ययन में ओड़िशा, छत्तीसगढ़ और आंध्र प्रदेश के कुछ हिस्सों में पीएम-कुसुम योजना के तहत सौर ऊर्जा चालित सिंचाई का मूल्यांकन किया गया, जिसमें कुल 230 किसानों का सर्वेक्षण किया गया। यह सौर ऊर्जा के माध्यम से ऊर्जा की स्वतंत्रता को बढ़ावा देता है। नतीजों से पता चला कि कृषि विज्ञान केन्द्रों और साथी किसान उनके लिए इस योजना की जानकारी के मुख्य सोर्स हैं और इसमें ओड़िशा लिफ्ट इरिगेशन कॉर्पोरेशन की बड़ी भूमिका है। यह भी पाया गया कि पीएम-कुसुम योजना के क्रियान्वयन के बाद किसानों के खेतों पर फसल तीव्रता और इनके क्षेत्रफल में वृद्धि हुई है, और डीजल पंप को सौर ऊर्जा चालित पंप के रूप में बदलने से कृषि की लागत में काफी बचत हुई है।

उपचारित वाटर शेड क्षेत्र के कमांड का चित्रिकरण और वर्षा जल संचयन संरचनाओं का मूल्यांकन

उपचारित वाटर शेड क्षेत्र के कमांड के चित्रिकरण के लिए उन्नाकोटिश्वर दक्षिणकाली माइक्रो वाटरशेड में वर्षा जल संचयन की पांच संरचनाओं का मूल्यांकन किया गया। इन सभी संरचनाओं का जलग्रहण क्षेत्र 9.9 से 23.7 हेक्टेयर के बीच था, जिनमें 3.66 - 6.5% का ढ़लान था। अपवाह का अनुमान 22.5-34.9% वर्षा के रूप में लगाया गया । भंडारण, इंफ्लो, आउट फ्लो बवाह और सिंचाई की क्षमता का विश्लेषण किया गया, जिससे जीवन रक्षक सिंचाई के लिए 3.14:1 से 9.43:1 तक जलग्रहण क्षेत्र-कमांड अनुपात उपयुक्त पाया गया।

मिल्लेट्स आधारित उत्पादन पद्धति की जल उत्पादकता में वृद्धि के लिए जल प्रबंधन के उपाय

इस अध्ययन में शुष्क मौसम के दौरान धान-मिल्लेट्स फसल पद्धति में नमी, स्थापना के तरीकों और किस्मों का आकलन किया गया, जो दर्शाता है कि 2 सप्ताह पुरानी रागी की पौध को 20×20 सेमी की दूरी पर रोपित करने से उपज, आर्थिक लाभ और जल की उत्पादकता में वृद्धि हुई। स्माल मिलेट की किस्म ओएलएम 217 ने ओएलएम 218 की तुलना में बेहतर प्रदर्शन किया। 50% मृदा में नमी की कमी पर सिंचाई और 40% से मृदा में नमी की कमी पर सिंचाई लगभग समान पाई गई, जबकि, 60% पर उत्पादकता में कमी हो गई।

संरक्षित खेती के तहत ड्रैगन फल की जल प्रबंधन और उत्पादन विधि

कोकोपीट और उसके विभिन्न मिश्रणों, विशेष रूप से कोकोपीट + पर्लाइट, ने जड़-क्षेत्र में वायु मिश्रण को उल्लेखनीय रूप से बेहतर बनाया, जबकि, सिंचाई जल की खपत को भी काफी हद तक कम किया (मिट्टी में की जाने वाली खेती के 624 लीटर की तुलना में केवल 168 लीटर)। मृदा में उगाए गए पौधों (152 ग्राम) की तुलना में कोकोपीट (404 ग्राम) और कोको फाइबर (368 ग्राम) में उगाए गए

पौधों के औसत फल का वजन अधिक था। कोकोपीट + पर्लाइट ने सर्वाधिक उपज (30.4 किग्रा/गमला) प्रदान की, इसके बाद क्रमशः कोकोपीट (21.6 किग्रा/गमला), कोको फाइबर (14 किग्रा/गमला) और मृदा (12.5 किग्रा/गमला) का स्थान रहा। यह परिणाम ड्रैगन फ्रूट उत्पादन में मृदा-रहित (सोइल लेस) आधारित उपचारों के श्रेष्ठ प्रदर्शन की पुष्टि करता है।

कृषि जल प्रबंधन की प्रचार-प्रसार की गतिविधियाँ

एकीकृत कृषि पद्धति के माध्यम से भूमि और जल उत्पादकता में वृद्धि (जनजातीय उप योजना परियोजना-अब एसटीसी)

ओड़िशा राज्य के रायगड़ा, गजपति और कोरापुट जिलों के चार आदिवासी आकांक्षी गांवों में आदिवासी किसानों के बीच कृषि की गतिविधियों को मजबूत करने के लिए क्षेत्र-आधारित विस्तार और क्षमता-निर्माण गतिविधियों की एक श्रृंखला शुरू की गई। भारत सरकार के जनजातीय मामलों के मंत्रालय के निर्देशों के अनुसार, भगवान बिरसा मुंडा की 150 वीं जयंती के उपलक्ष्य में ओडिशा राज्य के जनजातीय गांवों में पंद्रह दिन का जनजातीय गौरव वर्ष पखवाड़ा (01-15 नवंबर, 2025) मनाया गया।

कृषि उत्पादकता और आय बढ़ाने के लिए जल प्रबंधन तकनीकों का परीक्षण (SCSP)

एससीएसपी कार्यक्रम में ओडिशा के क्रमश: पुरी, खोर्धा, कटक, ढेंकनाल और कालाहांडी जिलों के निमापड़ा, बालिपटना, सालिपुर, गोंदिया और भवानी पटना ब्लॉकों को कवर करते हुए कुल 15 गांवों में कृषि जल प्रबंधन की गतिविधियों को लागू किया गया। फसल विविधीकरण को अपनाने और किसानों की आय में सुधार लाने के लिए 30 क्विंटल से अधिक नकदी फसलों का बीज और 40 क्विंटल धान का बीज तथा 12 प्रकार की सब्जियों के बीज, किचन गार्डन सब्जी बीज किट कुल 450 महिलाओं को वितरित किए गए। अन्य महत्वपूर्ण कृषि के आदानों जैसे जल में घुलनशील उर्वरक, नीम का तेल आदि और 1.5 एचपी क्षमता के दो पावर मिनी वीडर, 7.0 एचपी क्षमता के दो पावर वीडर, एक पावर टिलर, एचडीपीई स्प्रिंकलर पाइप आदि वितरित किए गए। एससीएसपी गांवों के तहत कुल 13 एक दिवसीय ओरिएंटेशन कार्यशाला सह प्रशिक्षण, 33 संवाद बैठक कार्यक्रम और विभिन्न पहलुओं पर 9 इंटरफेस बैठकें आयोजित की गई।

फार्मर फर्स्ट परियोजना

ओड़िशा के वर्षा-आधारित कृषि पारिस्थितिकी तंत्र में जल और आजीविका सुरक्षा में वृद्धि और आदिवासी बहुल धान की परती भूमि में जल उत्पादकता में वृद्धि के उपाय।

फार्मर फर्स्ट कार्यक्रम ने ओड़िशा राज्य के आदिवासी किसानों ले लिए वर्षा-आधारित धान पारिस्थितिकी तंत्र में तकनीकी नवाचरों और जलवायु-अनुकूलन और जैव-संवर्धित धान की किस्मों, सब्जियों के संकर बीज की खेती, सूक्ष्म सिंचाई, एकीकृत कृषि प्रणालियों, मशरूम की खेती, वर्मी-कम्पोस्टिंग, दोहरे उद्देश्य वाली मुर्गी पालन, उन्नत बकरी पालन और तालाब आधारित जलीय कृषि को बढ़ावा देने के माध्यम से खेती करने वाले परिवारों की जल उत्पादकता और आजीविका की सुरक्षा को मजबूत किया। धान के प्रदर्शन ने स्थानीय किस्मों की तुलना में 8-28% अधिक उपज लाभ दिया**,** ,जिससे आय, जलवायु अनुकूलन और टिकाऊ संसाधन प्रबंधन में वृद्धि हुई।

मेरा गाँव-मेरा गौरव कार्यक्रम की गतिविधियाँ

वर्ष 2025 के दौरान भारत सरकार द्वारा क्रियान्वित *मेरा गांव- मेरा गौरव (MG-MG)* फ्लेगशिप कार्यक्रम को ओड़िशा राज्य के खोर्धा, पुरी, नयागढ़ और कटक और अन्य जिलों के कुल 33 गांवों में लागू किया गया। इस संस्थान के वैज्ञानिकों की विभिन्न टीमों ने ओड़िशा राज्य के किसानों के लिए सब्जी की खेती, ऊंची क्यारियों पर नर्सरी और आम के पौधे लगाने सहित फसल और कृषि जल प्रबंधन पर सक्रिय रूप से प्रशिक्षण कार्यक्रम आयोजित किए। इन नवीन पहलों से कुल 500 से अधिक किसानों को लाभ हुआ। इसके अलावा, *हरित अभियान* पहल (ग्रीन ड्राइव इनिशिएटिव) और *स्वच्छ भारत अभियान* के तहत, 650 कलमी कृत आम के पौधे और 500 न्यूट्री-गार्डन बीज किट वितरित किए गए। इस कार्यक्रम ने सफलतापूर्वक किसानों की खेती की क्षमता को बढ़ाया, उनके खेतों में टिकाऊ कृषि को बढ़ावा दिया और एक पेड़ मां के नाम और मेरी लाइफ मिशन के माध्यम से पर्यावरण संरक्षण में भी बहुमूल्य योगदान दिया। इस कार्यक्रम के तहत महिला किसानों के सशक्तिकरण को भी बढ़ावा दिया गया है।

स्वच्छ भारत अभियान

भाकृअनुप-भारतीय जल प्रबंधन संस्थान, भुवनेश्वर ने *स्वच्छता ही सेवा*, 2025 के अभियान के दौरान कई गतिविधियों को आयोजित किया, जो दिनांक 17 सितंबर

से 2 अक्टूबर, 2025 के दौरान चलाया गया। इस कार्यक्रम के पहले दिन, अर्थात 17 सितंबर, 2025 को निदेशक डॉ. अर्जमादत्त षड़ंगी ने संस्थान के सभी कर्मचारियों और छात्रों को स्वच्छता शपथ दिलाई और अभियान के मुख्य विषय'स्वच्छोत्सव' पर मंथन किया। संस्थान के मुख्य द्वार, कार्यालय भवन के प्रवेश द्वार और बैठक कक्षों में बैनर लगाए गए ।उद्घाटन समारोह की बैठक के पश्चात एक वृक्षारोपण कार्यक्रम 'एक पेड़ माँ के नाम' में संस्थान के निदेशक और अन्य वैज्ञानिकों ने परिसर में पौधा रोपण किया। दिनांक 19.9.2025 को स्कूली बच्चों के लिए एक स्वच्छता की पाठशाला का आयोजन किया गया, जिसमें स्वच्छता, सफाई और स्वच्छता की विधियों, प्लास्टिक प्रदूषण, घरेलू और सामुदायिक स्तर पर पर्यावरण के अनुकूल अपशिष्ट प्रबंधन, जल संरक्षण और पर्यावरण के लिए वृक्षारोपण के विभिन्न पहलुओं पर चर्चा की गई। स्वच्छता संवेदीकरण और जागरूकता कार्यक्रम में कक्षा-8 के 100 से अधिक उत्साही छात्रों ने भाग लिया। दिनांक 20.9.2025 को, सरकारी हाई स्कूल के छात्रों के बीच *'स्वच्छ भारत मिशन* और स्वास्थ्य, पर्यावरण और समाज पर इसका प्रभाव' विषय पर निबंध और चित्रकला प्रतियोगिताएं आयोजित की गईं।इस कार्यक्रम में कुल 40 विद्यार्थियों ने भाग लिया।

सिंचाई जल प्रबंधन पर अखिल भारतीय समन्वित अनुसंधान परियोजना

भाकृअनुप-भाजप्रसं, भुवनेश्वर मृदा-जल-पौधा और उनके बीच का परस्पर संबंध और जल उपलब्धता के आकलन के क्षेत्र में विस्तार कार्य, अधिक वर्षा वाले क्षेत्रों में वर्षा जल प्रबंधन, जल के बहु उपयोगों द्वारा उत्पादकता बढ़ाने, क्षेत्रीय स्तर पर भूजल उपयोग, भूजल आकलन और पुनर्भरण, दबावयुक्त सिंचाई प्रणाली का मूल्यांकन, बागवानी और अधिक मूल्य वाली फसलों में जल प्रबंधन, नहर और भूजल का संयुक्त उपयोग, और जल उत्पादकता को बढ़ाने के लिए जल निकासी पर बुनियादी अध्ययन करने के लिए सिंचाई जल प्रबंधन पर अखिल भारतीय समन्वित अनुसंधान परियोजना. के छब्बीस केंद्रों के समन्वयक केंद्र के रूप में कार्य करता है।

जल पर कृषि-भागीदार अनुसंधान मंच (Agri-CRP on Water)

भाकृअनुप-भारतीय जल प्रबंधन संस्थान, भुवनेश्वर, एग्री कन्सोर्टीया रिसर्च प्लेटफार्म ऑन वॉटर (Agri-CRP on Water, फेज-2, वर्ष 2021-2026)) हेतु अनुसंधान कार्य के समन्वय इकाई के रूप में कार्य किया है, और इसके अंतर्गत चार विभिन्न विषयों के तहत अनुसंधान कार्य किया गया है। भारत के विभिन्न कृषि-पारिस्थितिक क्षेत्रों में भू-सूचना विज्ञान और नैनो तकनीक का उपयोग करके सतही जल संसाधनों और मृदा की नमी का आकलन और प्रबंधन, कुशल और स्मार्ट सिंचाई जल प्रबंधन के लिए स्वचालित नहर सिंचाई प्रणाली, भूजल-ऊर्जा संबंध का विश्लेषण करके भूजल स्थिरता में सुधार, आईओटी सक्षम सेंसर आधारित स्मार्ट सिंचाई प्रबंधन प्रणाली इत्यादि।

प्रकाशन, पुरस्कार और मान्यताएँ

वर्ष 2025 में भाकृअनुप-भारतीय जल प्रबंधन संस्थान, भुवनेश्वर के वैज्ञानिकों ने 49 शोध पत्र, 5 नीति दस्तावेज, 8 तकनीकी बुलेटिन, 12 लोकप्रिय लेख और 8 पुस्तक अध्याय प्रकाशित किए। इस संस्थान के बहुत से वैज्ञानिकों को कई सम्मान और मान्यता के साथ कई पुरस्कार मिले हैं।

अनुसंधान परियोजनाएँ

भाकृअनुप-भारतीय जल प्रबंधन संस्थान, भुवनेश्वर के वैज्ञानिक वर्ष 2025 के दौरान 15 आंतरिक, 19 बाह्य वित्त पोषित और 3 परामर्श अनुसंधान परियोजनाओं पर काम कर रहे हैं।

मानव संसाधन विकास, प्रशिक्षण और क्षमता निर्माण

हमारे संस्थान के अधिकारियों/कर्मचारियों को विभिन्न संगठनों द्वारा आयोजित कार्यक्रमों के माध्यम से विभिन्न विषयों पर प्रशिक्षण प्राप्त हुआ है। भाकृअनुप-भारतीय जल प्रबंधन संस्थान, भुवनेश्वर ने कई वर्चुअल बैठकें, प्रशिक्षण सत्र और किसान संपर्क कार्यक्रम आयोजित किए हैं। रिवार्ड परियोजना के तहत, वैज्ञानिकों, परियोजना कर्मचारियों, जल उपयोगकर्ता संघों के सदस्यों और प्रगतिशील किसानों के लिए कुल 29 क्षमता निर्माण कार्यक्रम आयोजित किए गए। इसके अलावा, अन्तराष्ट्रीय जल प्रबंधन संस्थान, कोलंबो, श्रीलंका द्वारा वित्त पोषित इंटीग्रेट परियोजना ने एक प्रशिक्षण-सह-वैज्ञानिक-हितधारक बातचीत कार्यक्रम और दो विचार-मंथन कार्यशालाओं का आयोजन किया है। इसके अलावा, ओड़िशा में बागवानी अधिकारियों और प्रगतिशील बागवानी किसानों के लिए तीन प्रशिक्षण और क्षमता निर्माण कार्यक्रम आयोजित किए गए हैं। इसके अलावा, हमारे संस्थान के द्वारा विभिन्न कार्यक्रमों के माध्यम से कृषि जल प्रबंधन की गतिविधियों में महिला किसानों के सशक्तिकरण, उनकी आजीविका में वृद्धि एवं समृद्धि के लिए भी महत्त्वपूर्ण योगदान दिया गया है।

EXECUTIVE SUMMARY

Rainwater Management

Water footprint of pulse crops in Odisha

The water footprint of pulse crops across Odisha showed a significant spatial and temporal variation. The total water footprint (TWF), comprising blue, green, and grey components, is largely dominated by blue water footprint (BWF), indicating higher irrigation dependence in many districts. Green water footprint exhibits strong fluctuations due to rainfall variability in Bhadrak, Balasore, Keonjhar, and Nabarangpur districts. The higher BWF values were observed in Puri, Keonjhar, and Kandhamal districts, though some decline occurred in 2013–14 before rising again in 2021–22. Grey water footprint was generally low but highlights pollution hotspots in districts like Nabarangpur and Sambalpur.

Temperature and rainfall trends in Mahanadi River basin

Analysis of long-term climate trends across Balangir, Kalahandi, and Bhadradri Kothagudem reveals gradual warming with notable seasonal variability. Minimum temperatures show significant increases in September and December in districts of Odisha, while Bhadradri Kothagudem exhibits winter warming. Maximum temperatures indicate rising trends, significant in Kalahandi and strongly increasing in post-monsoon months in BhadradriKothagudem. Rainfall trends remain largely non-significant, with slight declines in Odisha and increasing monsoon tendencies in BhadradriKothagudem. The results indicate warming with high rainfall variability, emphasizing the need for climate-resilient agricultural planning and moisture-based crop management strategies.

Periphyton-based Carp–SIS polyculture for water productivity enhancement

The substrate-induced (10% substrate) periphyton in zero-water exchange carp–SIS polyculture improved water quality, fish yield (up to 4.99 t ha^{-1}), and water productivity. The SIS polyculture system increased yield by 10.4% and reduced water footprint (2906 m^3 t^{-1}). Water use efficiency and economic returns were also higher under the system. Periphyton reduced feed requirement by 21–23.6% and maintained favorable water quality (WQSI: 7.5–9.0). Overall, integrating periphyton-based systems significantly enhanced production, resource efficiency, and sustainability in aquaculture.

Field testing of IoT-enabled AWD in transplanted rice

Field evaluation of IoT-enabled Alternate Wetting and Drying (AWD) systems in Odisha showed promising potential for water-saving irrigation. While AWD could not be implemented in kharif due to adequate rainfall, *rabi* trials indicated controlled water depletion (4–5.3 cm/day). Initial results highlight the effectiveness of real-time monitoring systems; though behavioral constraints remain. With continued demonstrations and awareness, partial to full adoption of AWD is expected, improving water use efficiency and sustainable rice cultivation.

REWARD Project – Hydro meteorological monitoring and water dynamics

During 2025, the comprehensive plans for major Natural Resource Management (NRM) interventions, including a soil and water conservation plan, water storage and recharge structures plan, and drainage line treatment plan was prepared and implemented. Weekly groundwater level monitoring, groundwater and surface water quality analyses, profile and surface soil moisture studies are carried out in both micro-watershed (MWS) clusters of Odagaon and Daspalla and discharge measurements were taken at the outlets of four micro-watersheds. A framework for a Water Demand Decision Support System (DSS) is developed, along with a web-based DSS to estimate domestic and livestock water demand at the micro-watershed level.

Increasing Agriculture Rresilience through Agricultural Disaster Risk Management Strategy in India (INTEGRATE)

The INTEGRATE initiative assessed flood impacts, groundwater dynamics, and response strategies across India in 2025 using satellite data and field observations. Severe flooding affected Assam, Odisha, and Uttar Pradesh, while Cyclone *Montha* impacted 1.38 lakh ha and 1.74 lakh farmers in Andhra Pradesh. Satellite-based mapping enabled identification of high-risk zones and targeted interventions like flood insurance and input support. Capacity-building efforts, including training and climate programs, strengthened resilience. Overall, the study underscores the need for integrated, technology-driven disaster management strategies to enhance agricultural resilience and farmer recovery.

Canal Water Management

Evaluating sub-surface drip irrigation in maize based cropping sequence

Sub-surface drip irrigation at 75% ET_c throughout the crop growth period for sweet corn and baby corn, and 75% ET_c during crop development stage+100% ET_c during mid-stage+50% ET_c during late stage for tomato with lateral spacing of 1.2 m was found as the best combination, which saved 32-44% water and improved water productivity by 22–71% compared with surface drip irrigation in a maize-based cropping system (sweet corn-tomato-baby corn).

Sensor-based irrigation under conservation agriculture

There was significant increase in the yield and water productivity of rice under DSR than PTR method of establishment and it increased significantly with N levels. However, there was no significant difference between 100% and 125% RDN with respect to yield and water productivity of rice. In the rabi season there was significant increase in the yield and water productivity of groundnut under no tillage than conventional tillage but the effect of irrigation and nitrogen levels on grain yield and water productivity of groundnut was not statistically significant.

Managing Irrigation Systems for Optimizing Water Productivity and Improving Resilience Using Advance Tools

The maximum grain yield of rice was recorded under SRI method, which was statistically similar to PTR-CF method, but significantly higher than PTR-AWD and DSR method of establishment. However, the water productivity of rice was highest under SRI method, which was similar to DSR method, but significantly higher than PTR and AWD method of crop establishment.

Pilot field demonstration of digital water measuring and soil moisture sensing systems for enhancing agricultural water productivity of Canal Commands

Under the AWD system of irrigation scheduling, there was 17.5% reduction in water use besides a minimal yield decline by 10.7% compared to conventional continuous flooding (CF) method of rice cultivation in *kharif* season. However, the water productivity of rice under AWD was 6% higher than the conventional CF method. Similarly, during *rabi* season the soil moisture sensor-based irrigation at 50% available soil moisture depletion improved irrigation water productivity by 42% and total water productivity by 18% with a minimal loss (5%) in the grain yield of sesame compared to the conventional farmers' practice of critical growth stage-based irrigation.

Reducing GHG emissions in irrigated crops through micro-irrigation

This project is being conducted in collaboration with six partner AICRP on IWM Centers (1. Coimbatore, 2. Rahuri, 3. Navsari, 4. Palampur, 5. Jabalpur, 6. Raipur) representing different zones of India. The Proforma for data collection has been circulated in the form of spreadsheet to these identified centers and data collection is in progress, which will be utilized for estimation of GHG emissions by indirect method.

Water management under conservation agriculture in intensive rice based cropping system

Precise irrigation (PI) significantly improved crop productivity and water use efficiency compared with conventional irrigation (CI) in rice-maize-green gram cropping system. Maize yield increased by 17–19% with PI, with the highest yield and water productivity recorded in T2. Green gram performed best under zero tillage with PI (T4), showing higher seed yield and water productivity. In rice, transplanted rice with PI (T2) produced the highest grain yield, while zero-tillage direct-seeded rice improved water productivity despite slightly lower yield.

Effect of water management and nano-fertilizer on water productivity and NUE in rice

Study on kharif rice to water management techniques (AWD and CF) and nano-urea–based nitrogen strategies under PTR, SRI, and DSR systems indicates that across establishment methods, grain and straw yields and water productivity were similar under irrigation and nitrogen treatments. Under SRI, water productivity differed significantly among nitrogen treatments, with highest value in full recommended NPK doses, followed by reduced N with nano-urea.

Natural Farming: Impact on crop and water productivity under different irrigation methods

A significantly higher grain yield (4.29 t/ha) of rice was observed in conventional farming (CF) than organic (OF) and natural farming (NF). In OF/NF, the grain yield was declined by 11-12% compared to CF. Yield response of tomato and green garm to CF, OF and NF was similar to rice. In all the crops, the highest water productivity (WP) was observed under drip irrigation, and the lowest under flat-bed irrigation. The WP ranged from 0.35 to 0.39 kg/m^3 in rice, 4.83 to 5.54 kg/m^3 in tomato, and 0.18 to 0.21 kg/m^3 in green gram.

Development of an IoT enabled mini pan evaporimeter

An IoT-enabled mini pan evaporimeter is under development for real-time estimation of pan evaporation to support precision irrigation scheduling. The system uses an ultrasonic sensor and Arduino mega-based data acquisition with cloud connectivity. It enables automated ET_c estimation, remote monitoring, and improved decision-making for irrigation.

IoT enabled sensor-based smart irrigation management system

Fiel experiment indicates that IoT-based drip fertigation system for banana (Grand Naine) achieved 21% water savings and a higher yield (59.3 t/ha) compared to conventional basin irrigation (52.4 t/ha). The automated system (95% uniformity) improved fruit quality, with higher TSS (15.5 °Brix) and lower titratable acidity (0.15%), enhancing water productivity.

Development of irrigation scheduling information system for major agricultural crops

A Python-based web program is under development to optimize irrigation scheduling using the FAO-Penman-Monteith method. By comparing Bhubaneswar observatory data with NASA POWER, the study validated an accurate ET_0 estimation tool (R^2=0.81–0.91), finding maximum water needs in May. It supports tailored, water-efficient irrigation scheduling for various crops and regions.

Groundwater Management

Management strategy in a coastal aquifer of eastern India

The water quality index maps for the pre-monsoon, monsoon, winter and post-monsoon season for the coastal Puri district of Odisha was prepared. The water quality index analysis showed that groundwater quality tends to deteriorate during pre-monsoon and monsoon periods due to hydrological stress and human influences, while improved conditions are generally observed during winter and post-monsoon seasons. Analysis of Kelly's Ratio values in the monsoon and post-monsoon seasons reflected favorable conditions, while SAR values throughout all seasons consistently classified the water as excellent too good.

Development of polymer linked slow-release fertilizer for improving water productivity and nutrient use efficiency

Polyacrylamide hydrogel was integrated with slow-release fertilizer magnesium doped urea hydroxyapatite through wet granulation process. Results revealed that PL-SRNF application at the rate of 70 and 80% of RND maintained significantly higher soil moisture content at 60 and 180 days after transplanting compared with neem coated urea (NCU) application at 100% of RND. Significant improvement in soil enzyme activities such as urease, dehydrogenase, and microbial biomass-N content and also plant growth parameters and root biomass were recorded with PL-SRNF applied @ 70-80% of RND. Moreover, application of PL-SRNF @ 70% of RND with 80% ETc irrigation regime produced the highest yield. This treatment combination also caused improvement in N use efficiency and water use efficiency as well.

Development of polymer bio-mineral composite for improving water and nutrient use efficiency and environmental sustainability

Various protocols were attempted for developing natural hydrogel from cellulosic biomass (Maize stalk). Crude cellulose was extracted from corn stalk powder following ultrasound assisted alkalization process. Carboxy methyl cellulose (CMC) was prepared by reacting bleached cellulose with sodium monochloro acetate. Solvation of CMC, the ratio of CMC to crosslinker, crosslinking temperature and time was standardized to synthesize natural hydrogel having water absorbency of 420 g/g in distilled water. Epichlorohydrin was used as crosslinker. The optimum mixing ratio of talc based fungal spores with insoluble mineral mixture comprising of rock phosphate and potassium feldspar was arrived based on viable cell count after 10 months of storage at room temperature under darkness. Among different protocol attempted for developing polymer biomineral composite, protocol-III was found superior in maintaining higher microbial viable cell count after storage at ambient condition under darkness.

Block-Level hotspot identification of irrigation-driven energy use and emissions in Nayagarh Using the Groundwater–Energy–Emission Index (GEEI) Approach

A block-level GEEI was developed for Nayagarh district to jointly assess hydrogeological stress, pumping energy demand, and associated CO_2 emissions. The index integrates energy intensity (kWh m^{-3}), emission intensity (kg CO_2 m^{-3}), and pre-monsoon groundwater depth using a weighted, normalized method giving higher importance to energy and emissions. Results show strong spatial contrasts across the district. Ranapur and Odagaon record very high stress (GEEI > 0.75) due to deeper groundwater tables, high pumping hours, diesel pump dominance, and numerous dug and tube wells. In contrast, Gania and Bhapur fall under low stress (GEEI < 0.25) with shallow water tables and lower energy demand.

Groundwater recharge shaft intervention in Nayagarh District

A groundwater recharge project was carried out in Nayagarh and Khandapada blocks of Nayagarh district, Odisha, with support under the RKVY scheme. A total of 200 recharge shafts (average depth 6 m and diameter 6 inches) were installed in defunct dug wells and existing water harvesting structures across 15 villages. The shafts were perforated and packed with sand and gravel to act as filtration units. Groundwater monitoring indicated a rise of 15–30 cm in treated wells. Rainfall analysis showed monsoon concentration of precipitation. Sentinel-2 based spectral indices (NDVI, NDWI, MNDWI, LSWI) confirmed improved pre-monsoon soil moisture and vegetation conditions, validating recharge effectiveness.

NMNF-Natural Farming Model Farms

The establishment of Natural Farming (NF) model farms has been commenced in the k*harif* season at the ICAR-IIWM research farm at Mendhasal and at three farmers' fields in Mendhasal, Khordha. The cropping system of the NF model farms consisted of rice, greengram, and *Sesbania* as a green manure crop during the pre-*kharif* season. It was noted that across the different NF Model Farms, the number of hills per square meter ranged from 26.8 to 30.2, the number of panicles per hill varied between 9.6 and 10.8, panicle length measured from 23 to 25 cm, panicle weight ranged from 3.3 to 4.4 g, and the number of grains per panicle was between 136 and 172. The rice grain and straw yield were 4.72–4.97, and 5.28–6.42 ton /ha, respectively.

On-Farm Technology Dissemination

Socio- economic evaluation of solar irrigation and its impact on farmers' livelihood in Eastern India

The study evaluated solar irrigation under the PM-KUSUM scheme across Odisha, Chhattisgarh, and parts of Andhra Pradesh, surveying 230 farmers. It promotes energy independence through solar power. Findings showed KVKs and fellow farmers as key information sources, OLIC's major role, increased cropping intensity and area, and significant cost savings from replacing diesel.

Catchment-command characterization and evaluation of rainwater harvesting structures in a treated watershed

Five rainwater harvesting structures in the Unnakotiswar Dakhinakali micro-watershed were evaluated for catchment-command characterisation. Their catchments ranged from 9.9 to 23.7 ha with slopes 3.66–6.5%. Runoff was estimated as 22.5–34.9% of rainfall. Storage, inflow–outflow, and irrigation potential were analyzed, developing catchment–command ratios from 3.14:1 to 9.43:1 for lifesaving irrigation.

Water management strategies for enhancing water productivity of millet-based production system

The study assessed moisture, establishment methods, and varieties in rice–millet systems during dry season indicates that transplanting of 2-week-old finger millet seedlings at 20×20 cm spacing improved yield, economic returns, and water productivity. Little millet variety OLM 217 outperformed OLM 218. Irrigation at 50% SMD matched 40%, while 60% reduced productivity.

Water management and production practices of dragon fruit under protected cultivation

Cocopeat and its combinations, particularly cocopeat + perlite, significantly improved root-zone aeration while substantially reducing water consumption (168 L compared to 624 L under soil cultivation). Average fruit weight was higher in cocopeat (404 g) and cocofiber (368 g) compared with soil-grown plants (152 g). Cocopeat+ perlite gave the highest yield (30.4 kg/pot), followed by cocopeat (21.6 kg/pot), cocofiber (14 kg/pot), and soil (12.5 kg/pot), confirming the superior performance of the soilless-based treatments in dragin fruit production.

Outreach activities

Enhancing land and water productivity through integrated farming system (Scheduled Tribe Component Project) (Tribal Sub Plan Project-Now STC)

A series of field-based extension and capacity-building activities were undertaken to strengthen agricultural practices among tribal farmers in four tribal aspirational villages in Rayagada, Gajapati and Koraput districts of Odisha. As per the directives of the Ministry of Tribal Affairs, Govt. of India, a fortnight long *Janjatiya Gaurav Varsh Pakhwada* (01-15 November, 2025) celebration was initiated in the tribal villages in the state of Odisha to mark the 150th Birth Anniversary of Bhagawan Birsa Munda.

Piloting Water Management Technologies for Enhancing Farm Productivity and Income (SCSP)

The SCSP programme was implemented in 15 numbers of villages covering Nimapapada, Balipatana, Salipur, Gondia and Bhawanipatana blocks of Puri, Khordha, Cuttack, Dhenkanal and Kalahandi districts of Odisha respectively. In order to bring in crop diversification and improve income of farmers more than 30.0 q of seeds of high value crops and 40.0q of paddy seeds and kitchen garden vegetable seed kits containing 12 vegetable seeds were distributed to 450 women. Other critical inputs like water soluble fertilizer, neem oil etc. and two power mini weeders of 1.5 hp capacity, two power weeders of 7.0hp capacity, one power tiller, HDPE sprinkler pipes etc were distributed. Thirteen one-day orientation workshop cum training, 33 nos of interaction meeting programme and 9 numbers of interface meeting on different aspects were organized under SCSP villages.

Farmer FIRST Project

Enhancing water and livelihoods security and improving water productivity in tribal dominated paddy fallow in rainfed agro eco-system of Odisha

The Farmer FIRST Programme strengthened water productivity and livelihood security of farming families in tribal rainfed rice eco-system of Odisha through technological interventions and promotion of climate-resilient and bio-fortified rice varieties, hybrid vegetable cultivation, micro-irrigation, integrated farming systems, mushroom farming, vermi-composting, dual purpose backyard poultry, improved goat rearing and pond-based aquaculture. Demonstrations of rice recorded 8–28% yield advantages over local checks, enhancing income, resilience, and sustainable resource management.

MGMG activities

The Government of India's *Mera Gaon Mera Gaurav (MGMG)* program was implemented across 33 villages in Odisha's Khordha, Puri, Nayagarh, and Cuttack districts. Scientists actively conducted training on crop and water management, along with demonstrations on vegetable cultivation, raised bed nurseries, and backyard mango planting. Over 500 farmers benefited from these initiatives. Additionally, under Green Drive Initiatives and *Swachha Bharat Abhiyan*, 650 grafted mango saplings and 500 nutri-garden seed kits were distributed. The program successfully enhanced farmer capacity, promoted sustainable agriculture, and contributed to environmental conservation through the *Ek Ped Maa Ke Naam* and *Meri LiFE* missions.

Swachh Bharat Abhiyan

ICAR-IIWM undertook a number of activities during Swachhata Hi Seva (SHS) 2025 campaign which was celebrated during 17th September and 2nd October, 2025. On the first day of SHS programme, i.e., on 17th September, 2025, Dr Arjamadutta Sarangi, Director, ICAR-IIWM administered *Swachhta Pledge* to all the staff and students of the institute and spoke on the theme of SHS Campaign, i.e.,'Swachhotsav.Banners were displayed near the main gate, entrance of office building and in the meeting rooms of the institute. The inaugural meeting was followed by a plantation programme *'Ek Ped Maa Ke Naam'* in which Director and other scientists of the institute planted saplings in the campus. On 19.9.2025, a *Swachhata Ki Pathshaala* (Swachhata Class) was organized for the school children in which various aspects of cleanliness, sanitation, and hygiene practices, plastic pollution, environment-friendly waste management at household and community level, water conservation and plantation for environment were discussed. More than 100 enthusiastic Class-VIII students participated in the *swachhata* sensitization and awareness programme. On 20.9.2025, essay and drawing competitions were organized on the theme '*Swachh Bharat Mission and its impact on Health, Environment and Society*' among students. Total 40 students participated in the event.

AICRP on Irrigation Water Management

ICAR-IIWM acts as a coordinating center of twenty-six centers of AICRP-IWM to carry out basic studies on soil, water plant relationship and their interaction, and extension work in the field of assessment of water availability, rainwater management in high rainfall areas, enhancing productivity by multiple uses of water, groundwater use at the regional level, groundwater assessment and recharge, evaluation of pressurized irrigation system, water management in horticultural and high value crops, conjunctive use of canal and groundwater, and drainage studies for enhancing water productivity.

Agri-Consortia Research Platform on Water

ICAR-IIWM acts as a coordinating unit of Agri-CRP on water (Phase-II) and research work is being conducted under four themes. Development and management of surface water resources and soil moisture in different agro-ecological regions of India using Geoinformatics and nano technology, automated canal irrigation system for efficient and smart irrigation water management, improving groundwater sustainability through analyzing groundwater-energy nexus, IoT enabled sensor based smart irrigation management system.

Publication, awards and recognitions

In 2025, scientists of ICAR-IIWM published 49 research papers, 5 policy document, 8 technical bulletins,12 popular articles and 8 book chapters. Scientists have received several awards along with many honors and recognitions.

Research projects

Scientists of ICAR-IIWM are working on 15 in-house, 19 externally funded and 3 consultancy research projects during the year.

HRD, training and capacity building

Our staff received training on various topics through programs conducted by different organizations. ICAR-IIWM organized 35 capacity building programmes for scientists, project staff, WEC members, and progressive farmers.

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INTRODUCTION

The ICAR-Indian Institute of Water Management was established on May 12, 1988, to cater to the research and development needs of agricultural water management at the national level. The institute is located at Chandrasekharpur, Bhubaneswar on 15.71 ha of land along with its main office-cum-laboratory building, guest house and residential complex. It is situated about 8 km north of Bhubaneswar railway station and at about 9.5 km away from Biju Patanaik International Airport, Bhubaneswar. The location of the Institute is at 20^0 15′ N and $85^0$52′E at 23 m above mean sea level. The research farm of the Institute (63.71 ha of farmland) is located at Deras, Mendhasal ($20^0$17′ N and 85^0 41′E at 61 m above mean sea level) and is 25 km away from main institute complex.

Mandate

- Strategies for efficient management of on-farm water resources for sustainable agricultural productivity.
- Coordinate research for generating location-specific technologies for efficient use of water resources.
- Centre for training in agricultural water management.

Research Achievements

Core research activities of the institute are carried out under four programs, viz., rainwater management (including waterlogged area management), canal water management, groundwater management and on-farm technology dissemination (including wastewater management, water policy & governance) to solve the agricultural water management related problems. The institute is bestowed with an experienced multi-disciplinary team of scientists. Significant research achievements for the year 2025 have been included in this annual report under four programs of the Institute. Our scientists are actively involved in the In-situ rainwater management for enhancing income and water productivity, water footprint trends in Odisha, climate trends in Balangir & Kalahandi, performance evaluation of periphyton-based Carp-SIS polyculture system, natural resource management interventions in Rapti River Basin, effect of nitrogen sources and application methods on rice growth and yield, evaluation of automated AWD irrigation and soil moisture sensor calibration for saline soils, streamflow modeling and surface waterbody extraction in Mahanadi Upper River Basin, flood mapping and management strategies for Lower Godavari and Mahanadi Basins, evaluation of subsurface drip irrigation (SDI) system in maize based cropping sequence, development of polymer linked slow-release fertilizer for improving water productivity and nutrient use efficiency, natural farming, precision irrigation management for rice-based system, resource conservation technologies in maize-sunflower cropping system, economic water productivity in irrigation canal commands, automated canal irrigation system, groundwater use and carbon emissions, groundwater recharge, vertical hydroponic systems etc.

Apart from research and development efforts at the Institute level, different agricultural water management related issues at the regional level are being addressed by different centers under AICRP on Irrigation Water Management. ICAR-IIWM acts as a coordinating center of twenty-six centers of AICRP-IWM to carry out basic studies on soil, water plant relationship & their interaction, and extension work in the field of assessment of water availability, rainwater management in high rainfall areas, enhancing productivity by multiple uses of water, groundwater use at the regional level, groundwater assessment and recharge, evaluation of pressurized irrigation system, water management in horticultural and high value crops, conjunctive use of canal and groundwater, and drainage studies for enhancing water productivity.

ICAR-IIWM acts as a coordinating unit of Agri-CRP on water project and under this, research work is being conducted in four themes i.e., development and management of surface water resources and soil moisture in different Agro-ecological regions of India using geoinformatics and nano technology, automated canal irrigation system for efficient and smart irrigation water management, improving groundwater sustainability through analyzing groundwater-energy nexus and IoT enabled sensor based smart irrigation management system.

ICAR-IIWM is one of the technical partners for World Bank funded project on Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARD) Project for Odisha. Centre has taken up Odagaon and Daspalla block in Nayagarh district of Odisha as model and monitoring watersheds, respectively. Many outreach activities livelihood improvement of the farmers were conducted during 2025. Scheduled caste community through SCSP projects in of Hansapada and Villigram villages of Nimapara block in Puri district of Odisha covering 250 families were provided with agricultural inputs to improve livelihood status of farmers. Nearly 300 Scheduled Tribe farmers are being addressed through Tribal Sub Plan Project (Now STC) in Gunupaur Block in Rayagada and R.Udaigiri block in Gajapati district of Odisha. The Farmers' FIRST project has been implemented in three villages i.e., Haridamada, Jamujhari and Giringaput in Khordha district. Different modules like NRM, horticulture, crop, livestock, fishery, enterprise and social media interventions were carried out. Field level training and demonstration programmes were conducted, in which more than 2000 farmers and farm women were benefited. Institute is organized *Mera Gaon Mera Gaurav* Activities in 33 villages in 4 Districts (Khordha, Puri, Nayagarh and Cuttack) of Odisha under 7 clusters. Training programs on Water management technologies were conducted in the adopted villages involving about 500 farmers. Demonstration program on summer vegetables with NHRDF seed kit, raised bed nursery for production of healthy vegetable seedlings and *rabi* vegetables were conducted. Nearly 500 farmers were participated in the demonstration program during 2025. Apart from this, Farmer-Scientist interaction meeting and *Swachhata* awareness program and vigilance programme was organized in these adopted villages. ICAR-IIWM participated actively in *Swachh Bharat Abhiyan*, cleanliness drives and *Swachata* Awareness Campaigns were conducted during 2025 in the Institute's main campus, public places and tourist spots; motivated students, organized debate, lectures, seminars and training.

Infrastructure facilities and organization

The Institute has state-of-art infrastructure facilities and has five well-equipped laboratories, viz., soil-water-plant relationship, irrigation & drainage, hydraulic, geoinformation and plant science with all the latest equipment for research activities. An engineering workshop also caters to the needs of the institute. The institute has its web server and regularly updated website (https://www.iiwm.res.in). The entire network administration of the computers, internet, and website management is lookedafter by the Agricultural Knowledge Management Unit (AKMU) cell. The AKMU cell also accommodates a fully developed GIS laboratory. The air-conditioned library of the institute has more than 20000 reference books and subscribes to 14 international and 6 national journals. It has a CD-ROM Server with a bibliographic, database from AGRIS. AGRICOLA, and Water Resources Abstracts. The on-line subscription of journals and its access through LAN to all the scientists is another useful facility of the library.

The ICAR-IIWM has linkages with various agencies through providing training, consultancy, collaboration, or contract research services. It has provided a platform for public and private sector institutions dealing with water management research to address their scientific problems, monitor research and development activities, and their evaluation in a cost-effective manner. The institute has developed linkages with different state and central government agencies like watershed mission (Government of Odisha), Directorate of Agriculture (Government of Odisha), Central and State Groundwater Board, Command Area Development Agency, Government of Odisha, WALMI, ORSAC to implement farmer-friendly water management technologies in the region. In addition to ongoing in-house research projects, the institute has been awarded with many sponsored collaborative projects by various organizations like NASF; ICAR, New Delhi; IWMI, Colombo; DST; REWARD with World Bank etc. The institute is the coordinating center for AICRP on Irrigation Water Management and ICAR-Agri-consortia Research Platform on water.

Finances

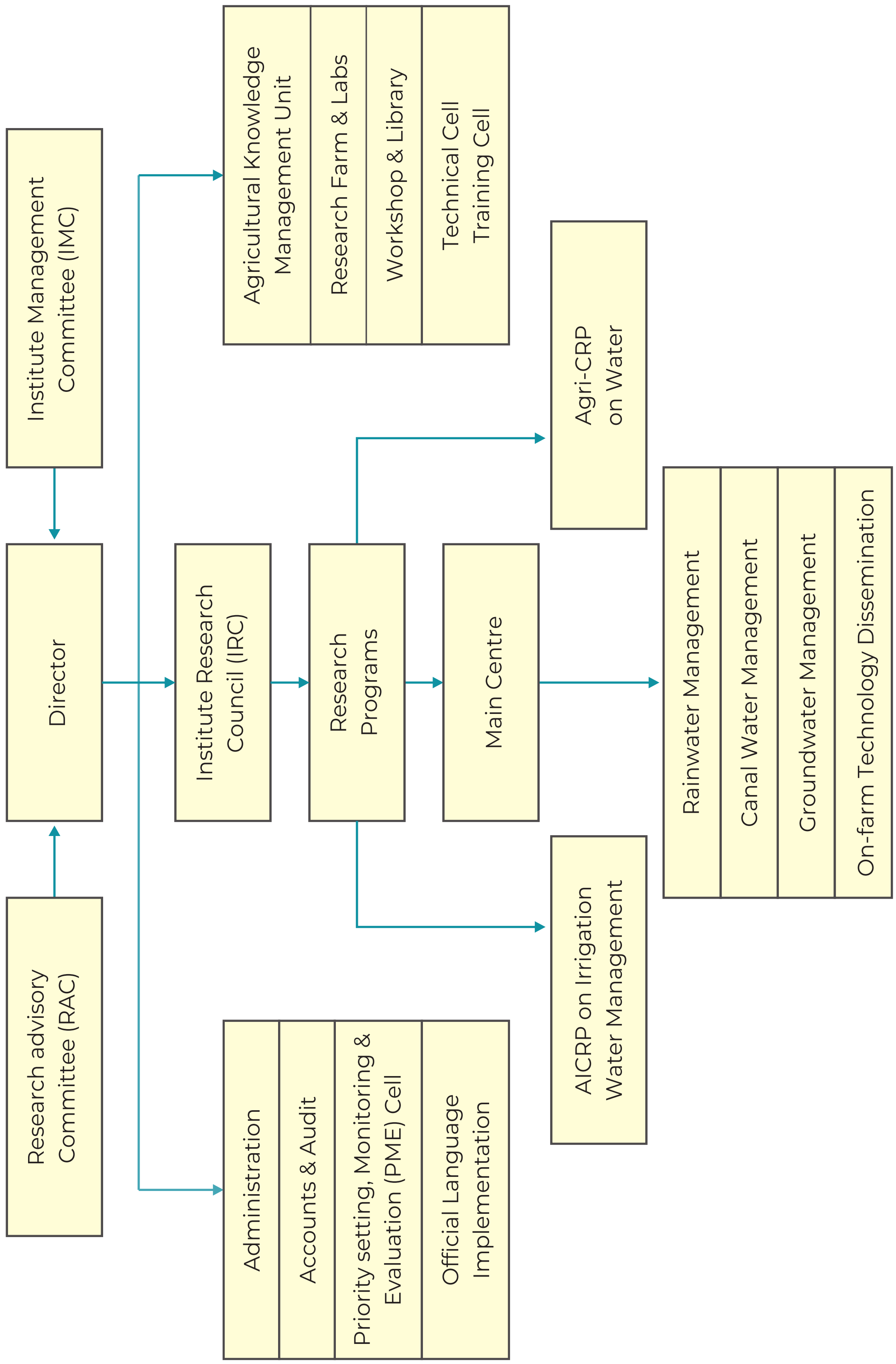
Summary of the income & expenditure account and balance sheet of the Institute during the year 2025 is presented at the end of this report.

Staff

As of December 31, 2025, ICAR-IIWM had 88 sanctioned posts (including AICRP-IWM coordinating center), out of which 62 are in position. Details of the personnel are given below:

Cadre	Sanctioned	In position	Vacant
RMP	01	01	-
Scientific	40	34	06
Technical	17	08	09
Administrative	24	14	10
Supporting	06	05	01
Total	88	62	26

ORGANOGRAM


Research advisory Committee (RAC)
Director
Institute Management Committee (IMC)
Administration
Accounts & Audit
Priority setting, Monitoring & Evaluation (PME) Cell
Official Language Implementation
Agricultural Knowledge Management Unit
Research Farm & Labs
Workshop & Library
Technical Cell
Training Cell
Institute Research Council (IRC)
Research Programs
Main Centre
AICRP on Irrigation Water Management
Agri-CRP on Water
Rainwater Management
Canal Water Management
Groundwater Management
On-farm Technology Dissemination

भाकृअनुप

ICAR

RESEARCH ACHIEVEMENTS

Rainwater Management

This program includes research projects on rainwater management & waterlogged area management

Estimation of water footprint for sustainable water management

Project code: NRMA/IIWM/CIL/2021/005/00207

Investigators: R.K. Jena, R. R. Sethi, U.K. Pradhan and S. Khedikar

The water footprint assessment of pulse crops across Odisha reveals pronounced spatial heterogeneity and temporal variability over the study period. The total water footprint (TWF), comprising blue (surface and groundwater), green (rainwater), and grey (pollution assimilation) components, is predominantly driven by the blue water footprint (BWF), indicating substantial irrigation dependence in several districts. Green water reflects effective rainfall utilization and shows considerable year-to-year variation. TWF of Bhadrak increased from 13.47 m^3/ton in 2009–10 to 2570.34 m^3/ton in 2022–23, while in Balasore, TWF increased from 201.92 to 1264.90 m^3/ton during 2009–10 to 2022–23. Keonjhar exhibited strong variability, ranging from 178.46 m^3/ton (2009–10) to 3135.61 m^3/ton (2021–22). Nabarangpur peaked at 1406.44 m^3/ton in 2021–22 (Fig.1a-d). These fluctuations indicate rainfall-driven productivity differences and changing crop-water relationships across agro-climatic zones. The blue component is the largest contributor to TWF across most districts. In 2009–10, extremely high BWF values were recorded in Puri (9409.84 m^3/ton), Keonjhar (9246.46 m^3/ton), Kandhamal (8966.30 m^3/ton), Kendrapara (7721.32 m^3/ton), and Nuapada (7341.21 m^3/ton). A substantial decline occurred in 2013–14; for example, Kendrapara reduced to 3125.88 m^3/ton and Jajpur to 2012.93 m^3/ton. However, fluctuations persisted, and in 2021–22, Kandhamal (8646.27 m^3/ton) and Keonjhar (6104.17 m^3/ton) again showed elevated irrigation dependence (Fig.1e-h). Western and upland districts consistently demonstrated higher blue water reliance, while districts such as Cuttack and Boudh maintained comparatively moderate levels. The grey component is relatively small but highlights localized pollution hotspots. Most districts record values below 10 m^3/ton, such as Cuttack (4.49–6.72 m^3/ton) and Kalahandi (2.43–4.25 m^3/ton). However, Nabarangpur reached 69.20 m^3/ton in 2021–22 and remained above 60 m^3/ton in 2022–23, while Sambalpur increased to 37.77 m^3/ton in 2021–22 (Fig.1-i). These elevated values indicate higher nutrient leaching and fertilizer application intensity in specific districts.

The TWF largely mirrors the blue component. In 2009–10, Keonjhar (9430 m^3/ton), Nuapada (7924.47 m^3/ton), Kendrapara (7779.24 m^3/ton), and Jagatsinghpur (7377.08 m^3/ton) recorded the highest values. Although reductions occurred in 2013–14, spikes re-emerged in 2021–22, particularly in Keonjhar (9249.70 m^3/ton). Central districts such as Boudh (3032–3689 m^3/ton) and Kalahandi (2666–3147 m^3/ton) maintained relatively moderate TWF levels (Fig.1m-p). Given the dominance of blue water in total footprint, improving irrigation efficiency is critical. Expansion of micro-irrigation systems (drip and sprinkler), precision irrigation scheduling, and promotion of less water-intensive pulse varieties can significantly reduce BWF. Enhancing rainwater harvesting and in-situ moisture conservation in upland districts such as Keonjhar and Kandhamal can strengthen green water utilization and reduce irrigation pressure. For grey water reduction, site-specific nutrient management, soil testing–based fertilizer application, and integrated nutrient management practices should be prioritized, particularly in hotspot districts like Nabarangpur and Sambalpur. Strengthening climate-resilient agronomic practices and promoting water productivity benchmarking at the district level will further support sustainable pulse production.

Overall, while Odisha's pulse sector exhibits high irrigation dependence in several regions, targeted water management interventions can substantially enhance water productivity and environmental sustainability.

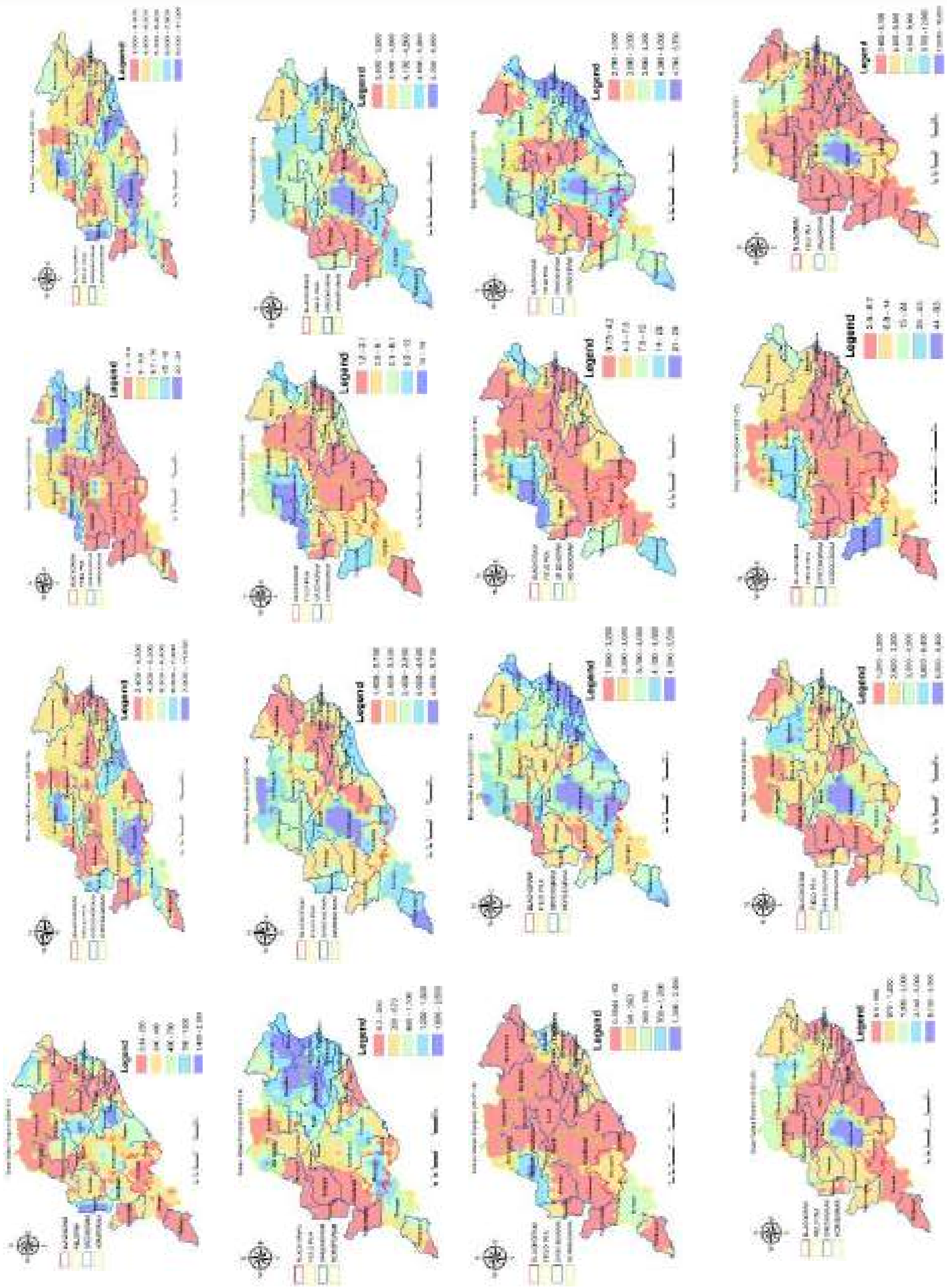


Fig. 1 Green, Blue, Grey and Total Water Footprints for the year 2009-10 (a-d), for the year 2013-14 (e-h), for the year 2017-18 (i-l) and for the year 2021-22 (m-p)

Crop planning under climate change scenario in Mahanadi and Godavari

Project Code: NRMA/IIWM/SIL/ 2022/003/00215

Investigators: A. Jha, D. Ghosh, D.K. Panda and A.K. Misra

Temperature and rainfall trends over a 33-year period (1990-2022) in Balangir and Kalahandi districts of Mahanadi basin and BhadradriKothagudem district of Godavari basin was studied using Mann-Kendall test, Sen's Slope estimator, Innovative Trend Analysis, and Pettitt's test. In Balangir, Tmin showed significant increases in September ($Z = 2.897$; $p = 0.004$; slope = 0.023 °C yr^{-1}) and December ($Z = 2.835$; $p = 0.005$; slope = 0.063 °C yr^{-1}) at the 95% confidence level. A significant decrease occurred in February ($Z = -1.751$; $p = 0.080$; slope = −0.027 °C yr^{-1}) at 90% confidence. January, April, June–August, October-November had non-significant increases, while March and May showed non-significant declines. The annual trend was positive but non-significant. In Kalahandi, significant Tmin increases were observed in September ($Z = 2.712$; $p = 0.007$; slope = 0.021 °C yr^{-1}) and December ($Z = 3.114$; $p = 0.002$; slope = 0.063 °C yr^{-1}) at 95% confidence. October showed a significant rise ($Z = 1.689$; $p = 0.091$; slope = 0.024 °C yr^{-1}) whereas, February showed a significant decline ($Z = -1.782$; $p = 0.075$; slope = −0.027 °C yr^{-1}) at 90% confidence. January, April, June–August, and November recorded non-significant increases, whereas March and May showed non-significant decreases. Annually, a significant positive trend was observed ($Z = 1.751$; $p = 0.080$; slope = 0.012 °C yr^{-1}) at the 90% confidence level.

For BhadradriKothagudem, minimum temperature (Tmin) trends were generally weak and statistically non-significant across most months. A significant increasing trend was observed only in December ($z = 2.6186$; $p = 0.0088$) with a relatively strong Sen's slope (0.0592), indicating notable winter warming. Several months: February to July showed negative Sen's slope values (e.g., −0.0197 in February and −0.0150 in June), but these trends were not significant. The annual Tmin trend was also non-significant ($z = 0.6353$; $p = 0.5253$) with a very small slope (0.0036), suggesting overall stability with localized warming limited to December. Maximum temperature: In Balangir and Kalahandi, January and May exhibited non-significant decreasing Tmax trends, while February-April and June-December showed non-significant increasing trends in both districts. Annually, Balangir recorded a non-significant positive trend, whereas Kalahandi showed a significant rise ($Z = 2.061$; $p = 0.0393$) with a slope of 0.0090 °C yr^{-1} at 95% confidence level. In BhadradriKothagudem, Mann–Kendall analysis indicated significant Tmax increases during the post-monsoon and winter months; October ($z = 2.2467$; $p = 0.0247$; slope = 0.0417), November ($z = 2.4946$; $p = 0.0126$; slope = 0.0391), and December ($z = 2.9904$; $p = 0.0028$; slope = 0.0469). The annual trend was also significant ($z = 2.6186$; $p = 0.0088$) with a Sen's slope of 0.0269 °C yr^{-1}, indicating a consistent regional warming in maximum temperatures. Other months such as January and August showed positive but non-significant trends.

In Balangir and Kalahandi, Sen's slope analysis of rainfall indicated decreasing trends in June and July and an increasing trend in September, while Kalahandi also showed a decline in November. Annual rainfall in both districts exhibited decreasing slopes (Balangir: −5.4241 mm yr^{-1}; Kalahandi: −7.0029 mm yr^{-1}), but all monthly and annual trends were statistically non-significant, suggesting no definitive long-term change despite a tendency toward drying. In BhadradriKothagudem, monsoon months (June–September) showed positive rainfall trends, strongest in September, July, and June, indicating a rising monsoon tendency. Pre-monsoon months (April–May) recorded moderate increases, whereas post-monsoon months (October–November) showed slight declines. The annual trend was positive (Sen's slope = 7.9444 mm yr^{-1}; $p = 0.1585$) but non-significant, reflecting high inter-annual variability without a clear long-term trend. These climatic trends support computation of moisture-based indices for regional agricultural planning, including development of a crop diversification index.

Periphyton-based carp-SIS polyculture system: effects on zootechnical and production performance

Project Code: NRMA/IIWM/SIL/ 2022/004/00216

Investigators: R. K. Mohanty, R. K. Panda and A. Jha

Under the study, after pre-stocking pond preparation IMC fingerlings (*C.catla*: 46.5g, *L.rohita*: 30.0g, *C.mrigala*: 22.6g) were stocked @ 5000 ha^{-1}, while stocking of *A. mola* (2.2g) was carried out @ 15000, 25000 and 35000 nos ha^{-1} in T_1 (Zero-water exchange ponds without substrate), T_2 (Zero-water exchange ponds with substrate; aquamats ≈ 10% water surface area only) and T_3 (Zero-water exchange ponds with substrate; aquamats ≈ 20% water surface area only), respectively. Stocking composition was SF:CF:BF: 30:30:40. After 300-DOC, growth performance of IMCs range between 1375-1490, 1015-1110, 930-955g respectively for *C. catla*, *L. rohita* and *C. mrigala* while that of *A. mola* ranged between 2.3-2.54g. Overall productivity (t ha^{-1} $300d^{-1}$) in T_1, T_2 and T_3 was 4.47, 4.99 and 4.87 respectively. Biomass contribution (%) of *C. catla*, *L. rohita*, *C. mrigala*and *A. mola* ranged between 36.7-38.1, 26.7-28.4, 30.6-34.3 and 2.3-3.9 respectively. Treatment-wise total water use (TWU) was 3.06, 3.07 and 3.10 ha-m, while the consumptive water use index, CWUI (m^3 kg^{-1} biomass) was 5.39, 4.89 and 4.9 in T_1, T_2 and T_3, respectively. Treatment-wise total water footprint (WF_t) was 3243, 2906 and 2977 m^3 t^{-1}, while the consumptive water use efficiency (WUE_c) was 185, 204 and 205 g m^{-3} in T_1, T_2 and T_3, respectively. The net total water productivity (INR m^{-3}) was 11.9, 14.5 and 13.9 in T_1, T_2 and T_3, respectively. Similarly, the net consumptive water productivity (INR m^{-3}) was 15.2, 18.3 and 18.1 in T_1, T_2 and T_3, respectively. The estimated Nutritional Water Productivity ($NWP_{protein}$, kg m^{-3}) was 0.051, 0.058 and 0.057 in T_1, T_2 and T_3, respectively.

The fish pond's water quality suitability index (WQSI) of substrate induced periphyton biomass in zero-water exchange condition (T_2 and T_3) improveed the overall suitability of water quality for fish culture. WQSI up to 300 days of culture (DOC) range between 7.5-9.0 (very good) in T_2 and T_3 and needs little management. WQSI up to 165 days of culture (DOC) range between 7.5 to 9.0 (very good) in T_1 while it was good (5.5-7.5) thereafter with moderate management requirements. Aautotrophic index in T_2 (218.6 – 301.1) and T_3 (192.3 – 325.8) indicates no organically polluted conditions (<400). Substrate induced periphyton biomass in zero-water exchange condition (T_2) gives significantly higher yield (4.99 t ha^{-1} $300d^{-1}$), economic benefit (Out put value/ Cost of cultivation, 2.24), net total water productivity (INR 14.5 m^{-3}) and lesser sediment load (29.4 m^3 t^{-1} biomass). Substrate induced periphyton biomass in zero-water exchange condition (T_2) significantly improved water quality, and enhanced fish yield by 10.4% against T_1 (Fig. 2)

Feed and nutrition management infers that at desirable rearing density (T_2) and in best production practice with substrate induced periphyton biomass in zero-water exchange condition (T_2), 0.38 kg crude protein in feed is required to produce 1 kg fish (Protein conversion ratio), while 5.79 kg of dry matter in feed is required to produce 1 kg dry mater of fish (Dry matter ratio). Similarly, 1.08 kg waste is produced per 1 kg fish production (Waste production ratio). Estimated Apparent feed conversion ratio was 1.86. 1.47 and 1,42 in T_1, T_2 and T_3, respectively. The consumption of microbes and algal communities present over submerged substrates enhanced the growth of fish by providing natural food and minimizes supplemental feed requirement by 21-23.6%.

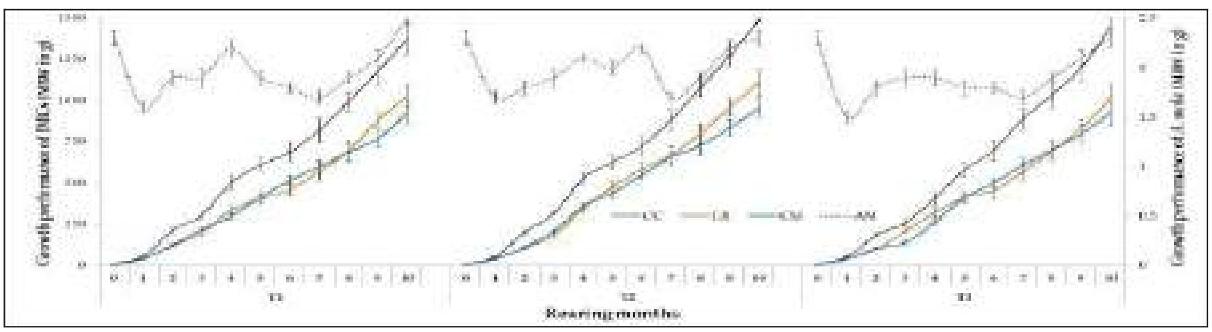


Fig. 2 Growth performance of Indian Major Carps and A. mola in carp-SIS polyculture system

Precision water and nutrient application in selected crops for enhancing input use efficiency and profitability

Collaborative Research Project: ICAR -Network Project on Precision Agriculture

Investigators: S.K. Rautaray, A. Sarangi, D. Sethi, S. Pradhan, Ajit K. Nayak, S.K. Jena, Ashok K. Nayak, K.K. Bandyopadhyay and Ashish M. Jadhav

(a) Field testing of automated AWD (Alternate wetting and drying) in transplanted rice

Two IoT-enabled sensing systems for AWD (Alternate wetting and drying) have been installed at ICAR-IIWM Research Farm, Mendhasal. Additionally, two systems have also been installed at Darpanarayanpur MIP in Nayagarh District and Usuma village in Cuttack district of Odisha during *kharif* 2025. Timely planting by mid-July, well-distributed rainfall, cultivation of a medium-duration rice variety, and the presence of ponded water in adjacent plots did not permit the imposition of AWD treatment during the *kharif* season. At Technology Park in IIWM Campus, there was frequent need of irrigation due to lateritic soil conditions surrounding the experimental field. The farmers were explained to irrigate after water level reaches 15 cm below ground level, but in most cases, they have irrigated after water level reached ground level or after disappearance of water, which indicates their apprehension of yield loss. Since, this was the first year of trial in farmers' field, it is expected that they may adopt the AWD partially in the next cropping season.

Multi-depth (up to 54 cm) soil moisture sensing unit

(b) Development of a multi-depth soil moisture sensing system

For development of a multi-depth soil moisture sensing system, four capacitive soil moisture sensors were tested and calibrated against ten different soil types. Out of the four, three soil moisture sensors, such as SMT-50, DF-robot capacitive soil moisture sensor v2.0 and Seeed studio grove capacitive soil moisture sensor were found to show promising results as low-cost sensors that can be used for developing a multi-depth soil moisture sensing unit. A prototype multi-depth soil moisture sensing unit having 54 cm length was developed using seeed studio grove capacitive soil moisture sensor. The unit consisting of six soil moisture sensors and three soil temperature sensors. It can give data for six different soil depths.

Increasing Agriculture resilience through Agricultural Disaster Risk Management Strategy in India (INTEGRATE)

Collaborative Research Project: ICAR-IIWM and IWMI, Colombo

Investigators: S. K. Jena and B.S. Satapathy, Roomesh K. Jena and D.K. Panda

The annual flood inundated areas of *Assam* state were delineated from sentinel-1 data for the period June 2025, and it was found that the flood affected area delineated was 1,002,880 ha (Fig. 3). The flood situation in *Nagaon*, *Kamrup* and *Dibrugarh* districts in *Assam* state continues to remain critical with 66 villages across six revenue circles submerged in *Dibrugarh* as of June 02, 2025. The flood situation

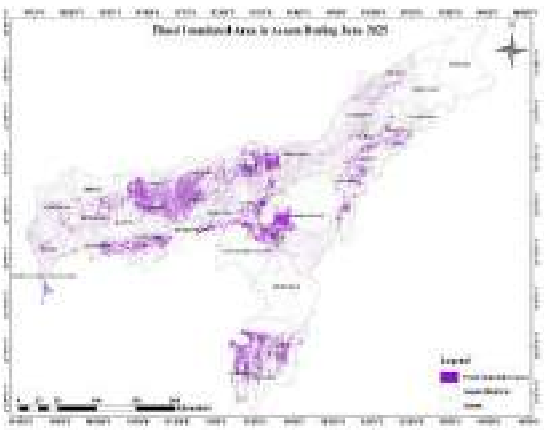


Fig. 3 Delineated flood inundated area during June 2025 in Assam

Fig. 4 Delineated flood inundated area during June-July 2025 in Subarnarekha basin

in *Bhograi*, *Baliapal, Basta, Balasore Sadar, Remuna* and *Jaleswar* blocks of Balasore district in the Subarnarekha River Basi n(78383.6 ha) was very critical, as 154 villages of these 6 blocks were affected due to flood (Fig. 4).

The fortnightly observation of the groundwater table in the flood affected sites (6116.9 ha in 2024) of *Athagarh* sub-division (22127.1 ha in 2024) in Lower *Mahanadi* basin has been taken since January 2025, as the low lying villages were affected due to frequent flood. The pre-monsoon groundwater table varied from 2.43-6.00 m below ground level (BGL) during April 2025 and 2.48-5.54 m BGL during June 2025. Similarly, the average groundwater table elevation from mean sea level varies from 60.5-91.2 m during April to June 2025. Year-wise Extent of Flood Affected Villages in Selected Talukas/Tehsils of *Basti* District in *Rapti* River Basin (2017-2024) and *Ghaghra* River Basin (2017-2024) were calculated and CharohaSirpar village was identified for providing flood insurance to selected farmers in the association of KVK, *Basti*, Uttar Pradesh.

The extent of damage caused by the cyclone "Montha" in various villages of Kakinada and B.R. Ambedkar Konaseema districts has been assessed by ground truthing and from Sentinel data (Copernicus S1-GRD), as over about 1.38 lakh ha (12,215 ha of horticultural crops) including 1.74 lakh farmers across the state were affected. Water stagnation in low-lying agricultural fields was noted, which led to further crop losses. The cyclone/flood affected areas in B.R. Ambedkar Konaseema (9262 ha), Kakinada (16472 ha), East Godavari (23616 ha) and West Godavari (6818 ha) districts of Andhra Pradesh were also delineated.

Comprehensive Hydrologic Assessment and Monitoring for Science-Based Watershed Planning and Management

Project: Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARD)

Investigators: S. K. Jena, D. C. Sahoo, R. R. Sethi and S. K. Rautaray

The world bank funded project on "Rejuvenating watersheds for agricultural resilience through innovative development (REWARD)" was carried out in two micro watershed clusters of Odagaon and Dasapalla block of Nayagarh district, Odisha, India. Fifteen-minute interval cloud-based data on rainfall, ambient temperature, relative humidity, wind speed, wind direction, soil temperature, soil moisture, and solar radiation are continuously recorded in the Rabara Model Micro-Watershed. In addition, daily evaporation and monsoon-period discharge data are collected. Weekly measurements of surface and profile soil moisture, along with groundwater levels, are being monitored at benchmarking sites established in the Odagaon and Daspalla micro-watershed clusters.

A total of 22 monitoring sites had been established in the Odagaon cluster to measure soil moisture at different depths using TDR access tubes. Weekly profile soil moisture observations were recorded at all sites. Analysis of soil moisture at an average depth of 40 cm shows that moisture levels attain their maximum during the monsoon season, reaching up to 24%, and progressively decrease during the summer season to approximately 12.5% in 2025 (Fig. 5). A comparative graph illustrating the average soil moisture (40 cm) for the years 2023, 2024, and 2025 has been presented in Fig. 6. A rainfall-adjusted soil moisture methodology was developed to incorporate the impact of rainfall into soil moisture assessment. Fig. 7 illustrates the rainfall-adjusted soil moisture variation at the Rabara Model MWS during 2025. Further, soil moisture at a depth of 5 cm in farmers' fields categorized as upland, midland, and lowland was measured using a theta probe. The graphical analysis indicates that surface soil moisture is highest in the lowland areas and lowest in the upland areas, with midland fields showing intermediate values.

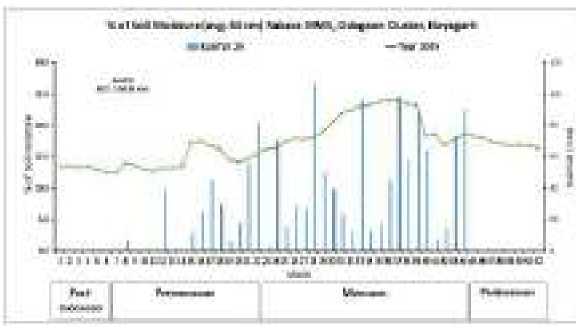


Fig. 5 Average 40cm Soil Moisture variation at Rabara model mws (Year 25)

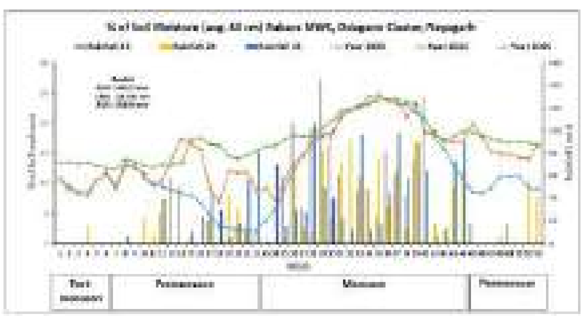


Fig. 6 Comparison of average 40cm Soil Moisture variation at Rabara model MWS)

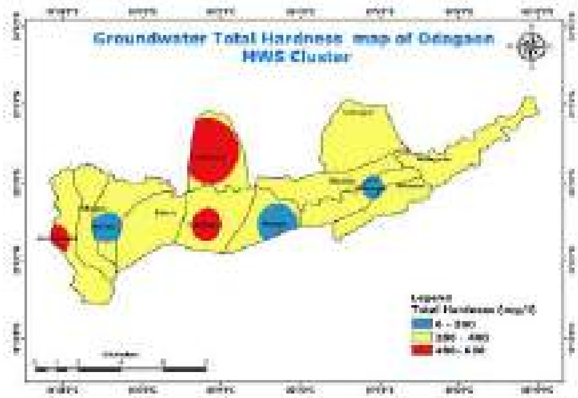


Fig. 7 Spatial distribution map of Total Hardness, Odagaon cluster

Weekly groundwater depth was monitored in 24 observation wells located within the model and monitoring micro-watersheds of the Odagaon cluster. The weekly groundwater level fluctuated from 0.95 m below ground level (mbgl) during the monsoon period to 3.68 mbgl in the pre-monsoon period. A comparative analysis of groundwater level variations for the years 2023, 2024, and 2025 shows a comparatively increasing trend from 2023 to 2025.

Twenty-four groundwater samples were collected from dug wells and tube wells within the Odagaon micro-watershed (MWS) cluster to assess their suitability for domestic and irrigation uses. Major physicochemical parameters-pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), chloride, fluoride, nitrate, iron, and residual chlorine-were analyzed and evaluated against the standards prescribed by the Bureau of Indian Standards (BIS). A geospatial approach was adopted to map and interpret the spatial distribution of groundwater quality parameters across the study area. The analysis indicated that Sardhapur, Nandighora, and Kumbhiyapali MWSs exhibited elevated total hardness (Figure17), whereas Sardhapur and Bhandar MWSs showed EC values exceeding permissible limits. Additionally, localized zones of high TDS concentrations were identified in Kalyanpur.

Canal Water Management

This program includes research projects on canal water management & related issues

Evaluating sub-surface drip irrigation in maize based cropping sequence

Project Code: NRMA/IIWM/SIL/2021/007/00209

Investigators: P. Panigrahi and Sanatan Pradhan

The study was conducted to evaluate the performance of sub-surface drip irrigation (SSDI) at different irrigation regimes in combination with different lateral spacing in a maize-based cropping sequence (sweet corn-tomato-baby corn) at the ICAR-IIWM research farm at Mendhasal, Khurdha, Odisha. The irrigation regimes imposed in tomato, baby corn and sweet corn crops were I_1: Irrigation at 50% ET_c during the development stage (DS) + 75% ET_c during the mid stage (MS) + 50% ET_c during the late stage (LS) of the crop, I_2: Irrigation at 75% ET_c during the DS + 100% ET_c during the MS + 50% ET_c during the LS, I_3: Irrigation at 75% ET_c throughout the crop growth period and I_4: Irrigation at 100% ET_c throughout the crop growth period (full irrigation, FI). The SSDI system was laid out at 0.15 m lateral depth with different lateral spacing (0.8 m, 1.2 m, 1.6 m) and operated at 125 kPa pressure. The performance of the crops under surface irrigation (SI) and surface drip irrigation (SDI) was also studied for comparison with SSDI.

During the rabi season, tomato (cv. Arka Samrat) was grown under the SSDI, SDI and SI systems. Under SI, 420 mm irrigation water was applied, whereas 198 mm and 292 mm irrigation water were applied under SSDI scheduled at 75% ET_c during the DS + 100% ET_c during the MS + 50% ET_c during the LS and SDI, respectively. Among different irrigation regimes in SSDI, the highest amount of water (247 mm) was applied in FI, followed by I_2. Overall, deficit irrigation scheduling under SSDI (I_2) saved 32% and 53% irrigation water compared to SDI and SI, respectively. The vegetative growth parameters (plants height, stock girth and canopy diameter) of the tomato plants were significantly ($p<0.05$) higher (12–26%) in FI under SSDI at 1.2 m lateral spacing and SDI than SI (plant height, 0.77 m; stem girth, 49 mm; canopy diameter, 1.27 m). However, the vegetative growth parameters of the plants under SSDI with I_2 and I_3 were statistically at par ($p>0.05$). The highest fruit yield was observed in SSDI at 75% ET_c during the DS + 100% ET_c during the MS + 50% ET_c during the LS (49.89 t/ha) which was 20% and 35% higher than that in SDI and SI, respectively. Higher yield with lower water use resulted in the highest water productivity (WP, 19.51 kg/m3) under SSDI, followed by SDI and SI. The WP under SSDI was 66% and 151% higher than that under SDI and SI, respectively for this crop (Fig. 8). The analysis of fruit qualities (pulp, juice percentage, total soluble solids, acidity and ascorbic acid) in different irrigation regimes under SSDI indicates that the higher total soluble solids with lower acidity in fruits were observed in I_2, followed by I_3. However, all the quality parameters were statistically ($p>0.05$) at par in SDI and SI. The soil moisture contents at 0–30 cm, 30–60 cm and 60–90 cm depths varied significantly among the treatments. Under SSDI, radiation use efficiency (RUE) and soil plant analysis development (SPAD) chlorophyll meter values were 8–14% and 11–26% higher than those under SI, respectively.

During the summer season (March–May), after tomato, baby corn (cv. G 5414) was grown under different regimes of SSDI and compared with that in SDI and SI systems. Under SI, 300 mm irrigation water was applied, whereas 144 mm and 260 mm irrigation water were applied under SSDI with I_3 and SDI, respectively. Overall, SSDI scheduled at 75% ETc (I_3) saved 44% and 52% irrigation water compared to SDI and SI, respectively. Vegetative growth of the plants was significantly ($p<0.05$) higher (13–31%) in SSDI with FI at 1.2 m lateral spacing compared with SI (plant height, 1.23 m; stock girth diameter, 44 mm; canopy diameter, 1.21 m). However, all the growth parameters under SSDI and SDI were statistically ($p>0.05$) at par. The highest yield under SSDI was observed under FI (2.31 t/ha) which was 17% and 30% higher than those under SDI and SI, respectively; whereas WP in SSDI at 75% ETc (1.03 kg/m^3) increased by 71% and 110% compared with SDI and SI, respectively. Under SSDI, RUE and SPAD values were 12–17% and 21–29% higher, respectively, than those under SI. The soil available N (221–248 kg/ha), P (8.8–11.3 mg/kg), K (234–252 mg/

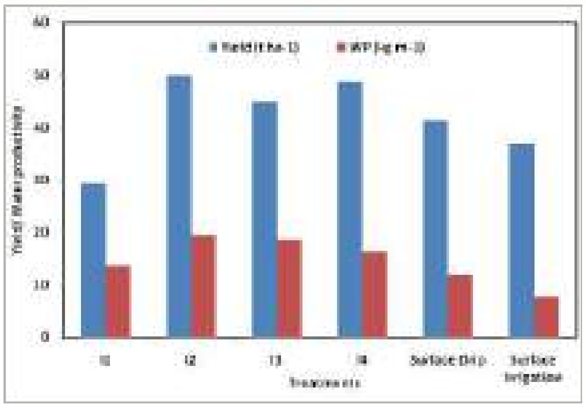


Fig. 8 Yield and water productivity of tomato under subsurface drip irrigation (SSDI), surface drip irrigation (SDI) and surface irrigation (SI)

kg) and organic carbon (0.52–0.67%) contents at the end of the crop season increased (6–11%) over the initial values of the nutrients and organic carbon in all the irrigation treatments. However, the increase in available N and K contents in soil under SSDI and SDI was significantly ($p<0.05$) higher (9–14%) than that under SI.

In maize (Sweet corn, cv. Sugar 75) which was grown during the kharif season (September–December), the highest yield (11.63 t/ha) under SSDI was recorded in irrigation at 100% ET_c with 0.8 m lateral spacing, followed by SSDI at 1.2 m lateral spacing (11.29 t/ha) and SI (10.37 t/ha). However, the yields in SSDI at 0.8 m and 1.2 m lateral spacings were statistically at par ($p > 0.05$) with that under SDI. The WP in SSDI (3.39 kg/m3) was 21.5% and 56% higher than that under SDI and SI, respectively.

Tomato under sub-surface drip irrigation (SSDI)

Water management under conservation agriculture for improving water productivity in intensive rice based cropping system of eastern India

Project Code: NRMA/IIWM/SIL/2021/008/00210

Investigators: Sanatan Pradhan, P. Panigrahi, K.K. Bandyopadhyay and B.S. Satapathy

The field experiment was conducted to study the performance of water management under conservation agriculture in an intensive rice-based cropping system of Eastern India. The treatments of the experiment are as follows: TPR-CTM-CTG with CI (T_1), TPR-CTM-CTG with PI (T_2), (TPR+GR)-(ZTM+RR) -(ZTG+MR) with CI (T_3), (TPR+GR)-(ZTM+RR)-(ZTG+MR) with PI (T_4), (ZTDSR+GR)-(ZTM+RR) -(ZTG+MR) with CI (T_5), (ZTDSR+GR)-(ZTM+RR)-(ZTG+MR) with PI (T_6) and TPR-F (Farmers' practice) (T_7). ZTDSR: zero tillage direct seeded rice, GR: green gram residue, ZTM: zero tillage maize, RR: rice residue, ZTG: Zero tillage green gram, MR: Maize residue, TPR: transplanted rice, CTM: conventionally tilled maize, CTG: conventionally tilled green gram, CI (Conventional irrigation) and PI (Precise irrigation based on SMP). The crops taken were maize (cv. Nilesh) during the rabi season, green gram (cv. Virat) during the summer, and rice (cv. MTU 1010) during the *Kharif* season.

The highest grain yield of maize was observed under CT with PI in T_2. The grain yield in T_2 was statistically ($p<0.05$) at par with T_4 and T_6. The lowest grain yield was observed in T_3 (4,916 kg/ha), which was statistically at par with T_1 (5,120 kg/ha) and T_5 (5,016 kg/ha). The grain yield of maize under PI was 17–19% higher compared to CI. Water use varied from 345 to 395 mm across various treatments. Precise irrigation saved up to 13% more water compared to conventional irrigation. The highest water productivity (18.03 kg/ha-mm) of maize was observed under CT with PI in T_2 (Fig. 9). The water productivity of T_2 was statistically ($p<0.05$) non-significant with T_4 and T_6. The lowest water productivity of maize was observed in T_3 (12.44 kg/ha-mm), which was statistically at par with T_5 and T_1. The water productivity of maize under PI was 37-42% higher compared to CI.

After maize, green gram (cv. Virat) was grown on the same plots. The highest green gram seed yield (1073 kg/ha) was obtained under ZT with PI in T_4. The seed yields in T_2, T_3 and T_6 were statistically at par with it. T_1 recorded the lowest seed yield (863 kg/ ha), which was statistically at par with T_3 and T_5 treatments. However, the highest stover yield (2500 kg/ha) was observed under ZT with PI in T_4. The stover yield of T_2, T_4 and T_6, T_2, T_3 and T_5, and T_1, T_3 and T_5 did not differ significantly among the treatments. PI recorded 9-18% and 9-12% higher seed and stover yields, respectively, compared to CI. The water productivity of green gram was highest (3.04 kg/ha-mm) under ZT with PI in T_4, which was statistically at par with T_6 and T_2. PI recorded 15-25% higher water productivity compared to CI.

After green gram, rice was grown on the same plots. The highest grain yield of rice (6933 kg/ha) was obtained from TPR with PI in T_2, while the lowest grain yield (5220 kg/ha) was recorded in T_5 (ZTDSR with CI). Similarly, the highest straw yield (6867 kg/ ha) was observed in T_4, whereas the lowest (5200 kg/ha) was recorded in T_1. The water use under different rice treatments varied from 781 mm to 1,191 mm. The highest water productivity (6.89 kg/ ha-mm) was obtained in ZTDSR with PI in T_6. The rice grain yield in DSR was 14% lower than in PTR. However, the water productivity of DSR was 14% higher than that of PTR.

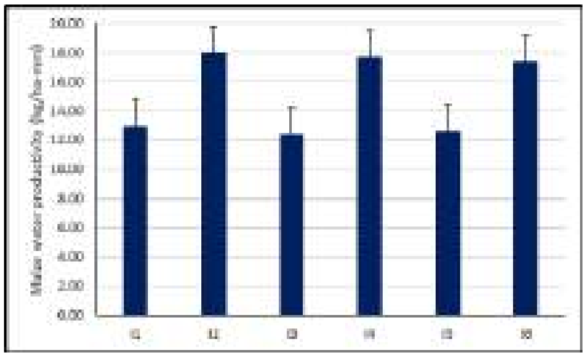


Fig. 9: Maize water productivity (kg/ha-mm) under differential conventional and zero tillage treatments. Error bars indicate CD value at p<0.05.

Rice crop under Zero tillage and precise irrigation

Effect of water management and nano-fertilizer on water productivity and NUE in rice-rice cropping system

Project code: NRMA/IIWM/SIL/2025/002/00224

Investigators: Sanatan Pradhan, K.K. Bandyopadhyay, A. Maity, P. Panigrahi, P.K. Panda, A. K. Thakur, A. Sarangi

Research achievements

A field experiment was conducted during the *Kharif* season of 2025 at the Deras Farm to study the effect of water management and nano-fertilizer on water productivity and nitrogen use efficiency in rice (cv. Swarna-Sub1) under puddled transplanted rice (PTR), system of rice intensification (SRI), and wet direct-seeded rice (DSR) conditions. The main plots comprised two irrigation treatments, and the subplots comprised three nitrogen treatments. The irrigation treatments were alternate wetting and drying (AWD) and continuous flooding (CF). The nitrogen treatments were: N_1 (100% recommended dose of N, P, and K), N_2 (50% recommended dose of N + 100% P and K with two sprays of nano-urea), and N_3 (75% recommended dose of N + 100% P and K with one spray of nano-urea). The nano-urea used contained 20% N (w/v).

Under PTR, rice grain yield varied from 5467 kg/ha (CF–N_3) to 6220 kg/ha (AWD–N_1), with a mean grain yield of 5,857 kg/ha. Straw yield ranged from 6,083 kg/ha (CF–N_2) to 7,283 kg/ha (CF–N_1), with a mean straw yield of 6592 kg/ha. Water productivity varied from 5.20 kg/ha-mm (CF–N_3) to 6.83 kg/ha-mm (AWD–N_1), with a mean value of 6.01 kg/ha-mm. Rice grain yield, straw yield, and water productivity did not differ significantly due to irrigation or nitrogen treatments under PTR. Under SRI, rice grain yield ranged from 4,540 kg/ha (AWD–N_2) to 5,807 kg/ha (AWD–N_1), with a mean grain yield of 5,398 kg/ha. Straw yield varied from 4,117 kg/ha (AWD–N_2) to 5,717 kg/ha (AWD–N_1), with a mean straw yield of 5,398 kg/ha. Water productivity ranged from 4.98 kg/ha-mm (AWD–N_2) to 6.37 kg/ha-mm (AWD–N_1), with a mean value of 5.52 kg/ha-mm. Rice grain and straw yields did not differ significantly due to irrigation or nitrogen treatments. However, water productivity was significantly highest in N_1 (5.85 kg/ha-mm), followed by N_3 (5.73 kg/ha-mm), and lowest in N_2 (4.99 kg/ha-mm). Under DSR, rice grain yield varied from 4,937 kg/ha (CF–N_1) to 6,067 kg/ha (CF–N_3), with a mean grain yield of 5,399 kg/ha. Straw yield ranged from 5,967 kg/ha (AWD–N_2) to 9,067 kg/ha (CF–N_3), with a mean straw yield of 7,533 kg/ha. Water productivity varied from 4.70 kg/ha-mm (CF–N_1) to 5.97 kg/ha-mm (AWD–N_3), with a mean value of 5.52 kg/ha-mm. Rice grain yield, straw yield, and water productivity did not differ significantly due to irrigation or nitrogen treatments under DSR.

Puddled transplanted rice crop under conventional irrigation and 50% replacement of N fertilizer by nanourea.

Sensor-based irrigation under conservation agriculture for enhancing water and nitrogen use efficiency and soil health of rice-groundnut cropping system

Project code: NRMA/IIWM/SIL/2024/001/00221

Investigators: K.K. Bandyopadhyay, P.K. Panda, Sanatan Pradhan, B.K. Sethi, D.K. Panda, D. Sethi, Ankita Jha, A. Sarangi

A Field experiment was conducted during rabi seson of 2025 to study the effect of tillage, irrigation and nitrogen management on yield, water productivity and partial factor productivity of N of groundnut (cv. K Lepakshi) in a rice-groundnut cropping system. The experiment was laid out in a split-split plot design with 12 treatments and 3 replications. The main plot factor was tillage (Conventional tillage and No tillage); the subplot factor was irrigation (full irrigation and deficit irrigation) and the sub-sub plot factor was nitrogen (75%, 100% and 125% of the recommended dose of nitrogen). The recommended dose of fertilizers for groundnut in this region is 20:40:40 kg N: P_2O_5:K_2O/ha. The maximum pod yield (2792 kg/ha) and physical water productivity (0.68 kg/m^3) of groundnut were recorded under no tillage with deficit irrigation and 100% of the recommended dose of N (NTIDN100%). It was observed that there was significant increase in the yield and water productivity (Fig. 10) of groundnut under no tillage than conventional tillage but the effect of irrigation and nitrogen levels on pod yield and water productivity of groundnut was not statistically significant. The maximum partial factor productivity of N was recorded under no tillage with deficit irrigation and 100% RDN (NTIDN100%). There was a significant increase in the PFPN of groundnut under no tillage compared to conventional tillage but it decreased significantly with the increase in N level.

Water balance in groundnut showed that ET ranged from 39.6 (CTIDN100%) to 49.3 cm (NTIfN75%) with mean value of 44.5 cm. Under full irrigation, the contribution of irrigation to ET was higher than that of rainfall. The contribution of soil moisture depletion to ET was very less (6.6%) compared to irrigation (47.2%) and effective rainfall (46.2%).

In *Kharif* season, effects of irrigation and nitrogen levels on yield, water productivity and partial factor productivity of N of rice (cv. Swarna Sub1) was studied. The experiment was laid out in a split-split plot design with 12 treatments and 3 replications. The main plot factor was tillage (Conventional tillage: puddled transplanted rice and No tillage: Direct seeded rice); the subplot factor was irrigation (Full irrigation and Deficit irrigation) and the sub-sub plot factor was nitrogen (75%, 100% and 125% of the recommended dose of nitrogen). The recommended dose of fertilizer for rice in this region is 80:40:40 kg N: P2O5:K2O/ha. The grain yield of rice under DSR was a significant increased (10.6%) in compared to puddled transplanted rice. The effect of irrigation on grain yield of rice was not statistically significant as there was a uniform distribution of rainfall during the kharif season. However, the grain yield of rice increased significantly with the increase in N level. This indicates that under well distributed rainfall the crop responds to higher levels of N. Application of 100 kg N/ha (N125%) increased the grain yield of rice by 5.1% over 80 kg N/ha (N100%) and by 32.5% over 60 kg N/ha (N75%). Water productivity (0.30 to 0.59 kg/m^3) of rice followed a similar trend as the grain yield of the crop. Grain yield of rice under DSR was significantly higher (42%) than PTR. The water productivity of rice increased significantly with the increase in N level but there was no significant difference in the water productivity of rice between 80 kg N/ha and 100 kg N/ha. Partial factor productivity of N (PFPN) of rice under DSR was significantly higher (10.4%) than PTR. The effect of irrigation on PFPN of rice was not significant but with the increase in N level PFPN decreased significantly.

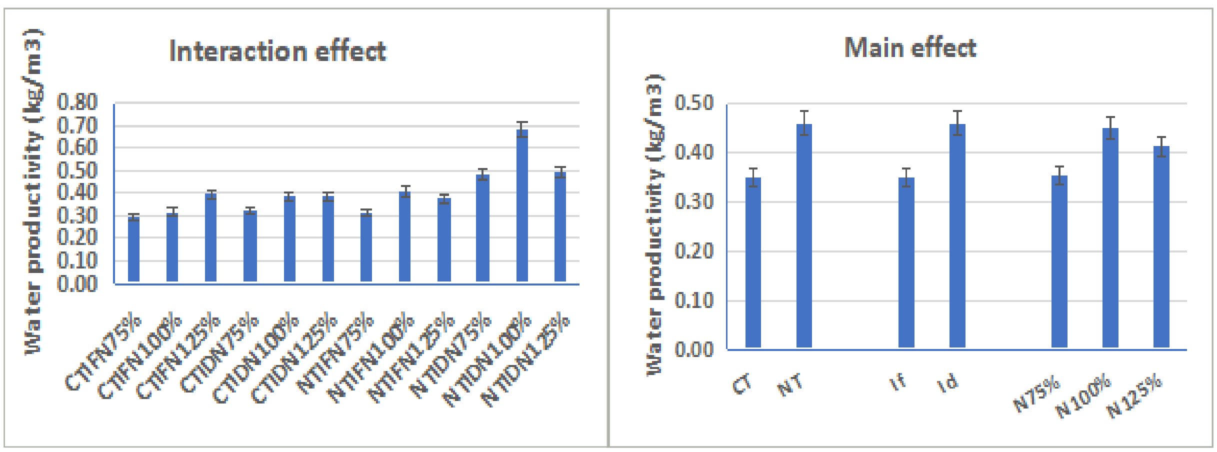


Fig. 10 Water productivity of groundnut as influenced by tillage, irrigation and nitrogen management

Managing irrigation systems for optimizing water productivity and improving resilience using advance tools (IWMI funded)

Externally funded project: IWMI, Colombo, Sri Lanka

Invetigators: K.K. Bandyopadhyay, R.K. Panda, A. Sarangi, Ashok Kumar Nayak. Sanatan Pradhan, Ajit Kumar Nayak. D. Sethi, Dibakar Ghosh, Ashish M. Jadhav, Ankhila R. Handral

A field experiment was conducted at the IIWM research farm at Mendhasal in rabi season of 2025, to study the residual effect of four rice establishment methods (PTR-CF, PTR-AWD, SRI and Wet-DSR) and two irrigation levels (Full irrigation (If) and Deficit irrigation (Id) on yield and water productivity of tomato. There was no significant difference in the residual effect of rice cultivation methods on the yield of tomato (Table 1) but it increased significantly with the increase in the irrigation level. The soil water balance shows that the ET of tomato ranged from 39.7 to 44.6 mm. There was no significant difference in the ET of tomato under different rice establishment methods but under deficit irrigation the ET was lower than that of full irrigation (Fig. 2). Water productivity of tomato was not significantly affected either by the residual effect of rice establishment methods nor by irrigation levels (Table 2).

Table 1. Yield of tomato (kg/ha) as influenced by rice establishment methods and irrigation levels

Irrigation Levels (B)			
Residual effect of Rice establishment Methods (A)	**I-F**	**I-D**	**Mean Rice Planting Method (A)**
DSR	19,515	18,780	19,148
SRI	21,108	16,898	19,003
AWD	22,253	20,549	21,401
PTR	23,428	21,699	22,564
Mean Irrigation level (B)	21,576	19,481	
Factors	C.D.	SE(d)	SE(m)
Factor(A)	N/A	2,630.92	1,860.34
Factor(B)	1,316.36	597.543	422.527
Factor(B)at same level of A	N/A	1,195.09	2,630.92
Factor(A)at same level of B	N/A	2,763.31	1,953.95

Table 2. Physical water productivity of tomato (kg/m^3) as influenced by the residual effect of rice establishment methods and irrigation levels

Irrigation Levels (B)			
Rice establishment Methods (A)	**I-F**	**I-D**	**Mean Rice establishment Method (A)**
DSR	4.38	4.53	4.45
SRI	4.83	4.15	4.49
AWD	5.10	5.20	5.15
PTR	5.25	5.23	5.24

Mean Irrigation level (B)	4.89	4.78	
Factors	C.D.	SE(d)	SE(m)
Factor(A)	N/A	0.621	0.439
Factor(B)	N/A	0.132	0.094
Factor(B) at same level of A	N/A	0.265	0.621
Factor(A)at same level of B	N/A	0.648	0.459

In the farmer's field trial at Darpanarayanpur MIP command, a green gram crop was grown after rice harvest with two irrigation scheduling methods (T_1): Farmer's Practice (Irrigation at the Critical growth stage approach) and (T_2): Researcher's Practice (Irrigation at 50% ASMD). It was observed that, irrigation at 50% ASMD resulted in higher yield (14.3%) and physical water productivity of green gram (0.291 kg/m^3) than that of the farmer's practice (0.208 kg/m^3).

In the ICAR-IIWM farm, rice (cv. Swarna Sub 1) was grown during kharif, 2025 with four establishment methods, i.e., T_1: Puddled transplanted rice with continuous flooding (PTR-CF) (Farmer's practice); T_2: Puddled transplanted rice with alternate wetting and drying (PTR-AWD); T_3: System of rice intensification (SRI) and T_4: Direct seeded rice (DSR). For irrigation at alternate wetting and drying, an IoT enabled AWD device developed by ICAR-IIWM was used. A measured quantity of water was applied to the field using an IoT enabled digital water measuring device. It was observed that the maximum grain yield of rice was recorded under the SRI method (6237 kg/ha), which was statistically similar to the PTR-CF (5813 kg/ha) method and PTR-AWD (5574 kg/ha) but significantly higher than the DSR method (4874 kg/ha). The maximum biomass yield was recorded under the SRI method, which was statistically similar to PTR-CF and PTR-AWD methods but significantly higher than the DSR method. However, the harvest index under the PTR-AWD method (0.501) was similar to the SRI method (0.464) and PTR-CF (0.488) but significantly higher than the DSR method (0.449) of establishment. The water productivity of rice was highest under the SRI method (0.575 kg/m^3), which was significantly higher than PTR-CF (0.442 kg/m^3) and PTR-AWD (0.444 kg/m^3) and DSR (0.485 kg/m^3) methods of crop establishment.

Field view of rice crop

Pilot field demonstration of digital water measuring and soil moisture sensing systems for enhancing agricultural water productivity of Canal Commands

Externally funded project: CAD WM funded, Govt. of Odisha

Invetigators: K.K. Bandyopadhyay, R.K. Panda, A. Sarangi, P. Panigrahi, A.K. Thakur, Ashok Nayak. Ajit K. Nayak, D. Sethi, Sanatan Pradhan and Ashish M Jadhav

A pilot demonstration trial was conducted in the farmer's field (Mr. Ashok Kumar Sahu) in Usuma village in a rice-sesame cropping system to estimate the water productivity using a digital water measuring device. One rice-refuge pond was constructed for storing water for subsequent use in the rabi season. While constructing the rice refuge pond, it was ensured that the optimum dyke height of 22 cm, as suggested by IIWM technology, was maintained, and any excess water was collected in the rice refuge pond, which can be used for irrigation in the rabi season. The treatment structure of the project is given below.


Rice refuge pond

Treatments

Cropping sequence: Rice-Sesame

Kharif treatments

T1: Puddled transplanted rice continuous flooding (Conventional Farmer's practice)

T2: Alternate wetting and drying method of irrigation

Rabi Treatments

T1: Critical growth stage-based irrigation (Conventional Farmer's Practice)

T2: Soil moisture Sensor based irrigation (50% soil moisture depletion)

The results are presented below.

***Kharif*, 2025**

Rice (cv *Kala Champa*)

Thus, under the AWD system of irrigation, there was a 17.5% reduction in water use but there was a minimal yield decline of 10.2% compared to continuous flooding. However, the water productivity under AWD (0.476 kg/m^3) was higher than underthe continuous flooding (0.447 kg/m^3 in 2025) (Table 3).

Table 3. Water productivity of rice under different water management practices

	T1: Continuous Flooding	T2: Alternate wetting and drying
Rice Grain yield	5390 kg/ha	4890 kg/ha
Irrigation (Nursery+ Land preparation)	250 mm	250 mm
Post transplanting irrigation	360 mm	180 mm
Total rainfall	940 mm	940 mm
Effective rainfall	596.8 mm	596.8 mm
Total water use	1206.8 mm	1026.8 mm
Total water productivity	0.447 kg/m^3	0.476 kg/m^3

***Rabi*, 2024-25**

Construction of rice refuge pond helped in crop diversification and the farmer took sesame crop in the rabi season.

Deficit irrigation based on soil moisture sensor improved irrigation water productivity by 42% and total water productivity by 18% of sesame without significant reduction (5%) in the grain yield (Table 4).

Table 4. Water productivity of sesame under different water management practices

	T1: Critical growth stage-based irrigation	T2: Soil moisture Sensor based irrigation
Grain yield of sesame	1020 kg/ha	970 kg/ha
Irrigation water used	180 mm	120 mm
Total rainfall	181 mm	181 mm
Effective rainfall	128.6 mm	128.6 mm
Total water use	308.6 mm	248.6 mm
Irrigation water productivity	0.57 kg/m^3	0.81 kg/m^3
Total water productivity	0.33 kg/m^3	0.39 kg/m^3

Reducing GHG emissions in irrigated crops through micro-irrigation in different agroecological regions of India

Externally funded project: Ministry of Agriculture and Farmers Welfare, Govt. of India

Invetigators: K.K. Bandyopadhyay, S. Mohanty, Sanatan Pradhan, P. Panigrahi, D.K. Panda, A. Sarangi

This project is being conducted in collaboration with six partner AICRP on IWM centres (Coimbatore, Rahuri, Navsari, Palampur, Jabalpur, Raipur) representing different zones of India. The proforma for data collection has been circulated in the form of a spreadsheet to these identified centers and data collection is in progress, which will be utilized for the estimation of GHG emissions by indirect method.

AICRP-IWM Jabalpur center has conducted a survey on farmers at Pahanbarri village in Narmadapuram after the harvest of the crops based on our proforma on the following aspects viz., (i) Demographic and socioeconomic profile, (ii) Land and soil, (iii) Irrigation and energy use, (iv) Fertilizer use and (v) Crop and biomass yield for the major crops (Tomato, Chilli, Okra, Sponge Gourd, Brinjal, Bottle Gourd). This survey provides a detailed baseline of carbon-relevant parameters such as biomass production, fertilizer input, energy source, irrigation method, and soil carbon levels across smallholder farmers. AICRP IWM Palampur center has collected the information in the prescribed format for three experiments undergoing at the Centre and from three farmers in Mandi district. AICRP IWM Rahuri center has initiated the collection of information from the farmers as per the format developed at the lead center and sent to KVKs and state university scientists for data collection. AICRP IWM Navsari center has collected the district-wise data on area, production and productivity of major crops viz., Arhar, Banana, Bajra, Castor seed, Cotton, Dry chilli, Garlic, groundnut, guar seed, jowar, maize, green gram, rape seed and mustard, soybean, sugar cane, black gram, tobacco, paddy and

Farmers' awareness programme at Marchinayakan Palayam (Coconut Cluster) by AICRP IWM, Coimbatore

wheat. In AICRP IWM Coimbatore center the baseline survey and field assessments have been successfully completed in two clusters (Marchinayakan Palayam and Vaazhaikombu Nagoor). Farmer consultation meetings have been conducted in these two clusters. Soil samples from both clusters have been collected and analyzed for different parameters including soil organic carbon. Farmer awareness programmes and preliminary advisories have already been disseminated. For the third cluster (Annur), farmer details have been collected, and soil sampling with field investigations is scheduled. AICRP IWM Raipur Center has also started collecting information from the farmers as per the format.

Natural Farming: Impact on crop and water productivity under different irrigation methods

Project Code: NRMA/IIWM/SIL/2021/010/00213

Investigators: A.K. Thakur, P. Panigrahi, Ashis Maity and O.P. Verma

During the *Kharif* season, rice (var. MTU-1001) was grown following the cultivation methods, *viz*., conventional farming (CF), organic farming (OF) and natural farming (NF) systems. Under a conventional/ chemical farming system, 5 t/ha FYM and N: P_2O_5:K_2O @ 80:40:40 kg/ha were added. For organic farming, 25 tonnes FYM /ha was applied, and under natural farming, *Jeevaamri*t was added at 500 litres/ha every month. A significantly higher grain yield in rice was obtained under conventional farming (4.29 t/ha) than under organic and natural farming (Fig. 11a). An 11-12% decline in grain yield was observed in organic/ natural farming compared to conventional chemical farming. This decline in grain yield was mainly due to a significant reduction in the numbers of panicles and grain filling under organic and natural farming systems.

After the rice harvest, tomato (var. VNR-3348) was grown under three similar systems, along with three irrigation methods, *viz*., flat-bed, ridge-and-furrow, and drip irrigation, during the *Rabi* season. A significantly higher yield was obtained under conventional farming (24.25 t/ha) than under organic and natural farming (Fig. 11b). A 12% and 6% decline in fruit yields was observed under organic and natural farming, respectively. There was no significant difference in fruit yield under organic and natural farming.

After the tomato harvest, green gram (var. Virat) was grown under these systems, along with three irrigation methods, *viz*., flat-bed, ridge-and-furrow, and drip irrigation between April and July 2025. The highest yield was recorded under conventional farming (0.613 t/ha), followed by NF (0588 t/ha), and the lowest under OF (0.534 t/ha). Under organic and natural farming, a significantly lower yield (4-13%) in green gram was recorded than that under conventional farming systems (Fig. 11c). However,

An experimental plot view of tomato grown under different farming systems with drip irrigation during the rabi season of 2025

a significantly higher yield under natural farming was observed than under organic farming. In all three crops, the highest water productivity (WP) was observed under drip irrigation, and the lowest under flat-bed irrigation. The WP ranged from 0.35 to 0.39 kg/m^3 in rice, 4.83 to 5.54 kg/m^3 in tomato, and 0.18 to 0.21 kg/m^3 in green gram.

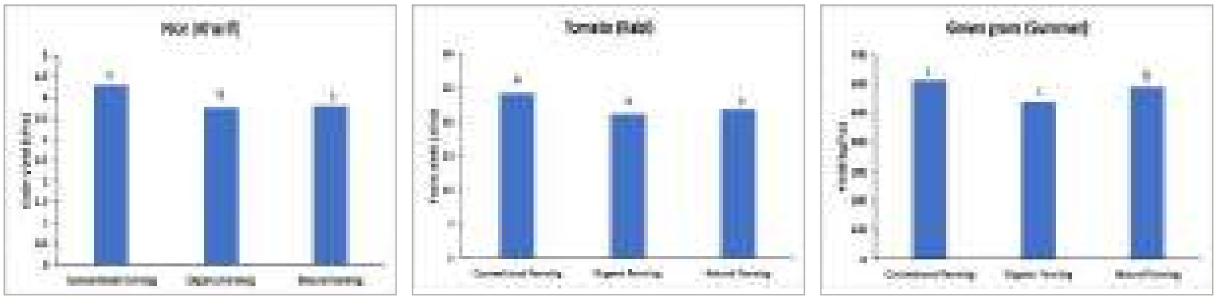


Fig. 11 Yield of rice (a), tomato (b) and green gram (c) under different farming systems during 2024-25

Development of irrigation scheduling information system for major agricultural crops

Project code: NRMA/IIWM/SIL/2025/001/00223

Investigators: Ashok K. Nayak, R.K. Jena, A. Jha, P. Panigrahi, S. Mohanty, A. Sarangi

The study has been initiated to develop an irrigation scheduling information system for different crops grown in various regions of the country. A web-based programme is under development for irrigation scheduling based on crop water requirement estimated using FAO-Penman-Monteith method. A computer program for the estimation of reference evapo-transpiration has been formulated through the Python language. By using the program and the weather parameters (temperature, RH, wind speed, solar radiation) obtained from NASA POWER and the meteorological observatory at Bhubaneswar, ET_0 for the location has been estimated. The monthly PM-ET_0 computed using weather data from the meteorological observatory (PM-ET_0-MO) at Bhubaneswar varied from 59.60 mm to 182.73 mm, whereas the monthly ET_0 computed from weather data obtained from NASA POWER (PM-ET_0-NASA POWER) was 68.69–191.85 mm. Under both methods, the minimum and maximum ET_0 were observed in December and May, respectively. The seasonal (kharif, rabi and summer) analysis indicates that the PM-ET_0-MO during kharif was 20.55% higher than PM-ET_0-NASA POWER; whereas during rabi and summer, the PM-ET_0-MO was 6.03% and 7.12% lower than PM-ET_0-NASA POWER, respectively. The daily PM-ET_0-MO showed good co-relations (R^2 = 0.81–0.91) with PM-ET_0-NASA POWER during kharif, rabi and summer seasons (Fig. 12-a, b, c). Development of irrigation scheduling protocols for different crops based on the crop water requirements and rainfall conditions of various regions are in progress.

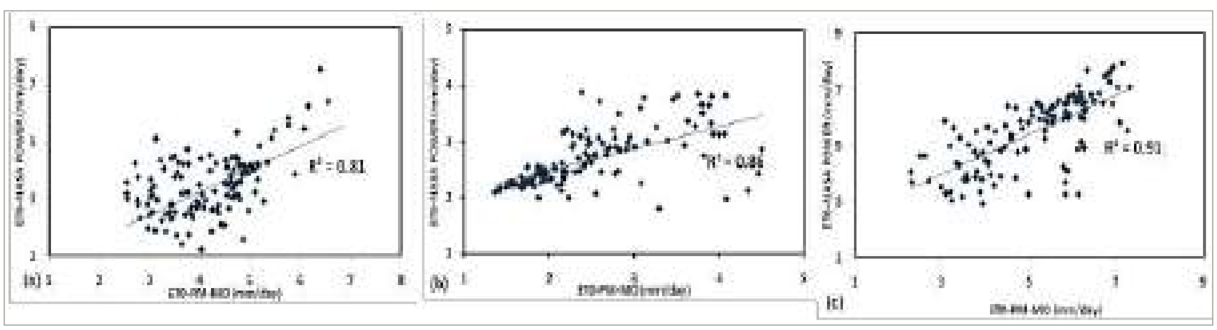


Fig.12 Relationships between refernce evapotranspiration (ET_0) estimated from data from meteorological observatory (PM-ET_0-MO) and NASA POWER (PM-ET_0-NASA POWER) during (a) kharif, (b) rabi and (c) summer season at Bhubaneswar

Automation of irrigation method using IoT enabled evaporimeter

Project code: NRMA/IIWM/SIL/2025/003/00225

Invetigators: A. K. Nayak, P. Panigrahi, S. Pradhan, A. Sarangi

An IoT-enabled mini pan evaporimeter is under development for high-resolution, real-time estimation of pan evaporation (Epan) to support data-driven irrigation scheduling. The system comprises a mini-panevaporimter, integrated with an ultrasonic water level sensor for non-contact measurement of water depth fluctuations. An Arduino Mega microcontroller-based embedded unit acquires sensor data at predefined temporal intervals and transmits it to a cloud server via wireless communication (Wi-Fi/GSM). The evaporation rate wass computed from the temporal change in water level after correcting for rainfall and refilling events. Sensor calibration and signal filtering techniques were applied to minimize measurement noise and improve accuracy. The system architecture enables automated data logging, processing, and visualization through a web/mobile interface, facilitating remote monitoring and decision support.

Groundwater Management

This program includes research projects on groundwater management & related issues

Study of Seawater Intrusion Dynamics and Development of Management Strategy in a Coastal Aquifer of Eastern India

Project Code: NRMA/IIWM/SIL/2021/001/00203

Investigators: S. Mohanty, Atulya Mohanty and M.K. Jha

Groundwater quality data for the pre-monsoon, monsoon, post-monsoon and winter season of the Puri district was used to calculate water quality index (WQI) for each season. For the calculation of WQI, ten parameters such as pH, electrical conductivity, total hardness, TDS, bicarbonate, chloride, sulphate, calcium, sodium and magnesium were used. The water quality index map for each season has been shown in Fig. 13 - 15. The WQI analysis demonstrated that groundwater quality tends to deteriorate during pre-monsoon and monsoon periods due to hydrological stress and human influences, while improved conditions are generally observed during winter and post-monsoon seasons, emphasizing the strong role of seasonal hydrology and land-use practices in shaping groundwater quality dynamics.

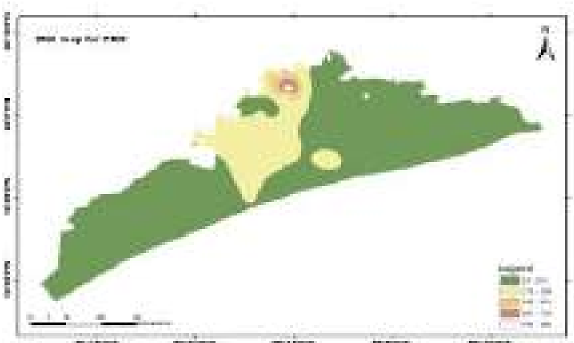


Fig. 13 Water quality Index map for Pre-monsoon season

Fig. 14 Water quality Index map for monsoon season

The irrigation suitability assessment through analysis of Kelly's ration and SAR values demonstrated that the groundwater is generally appropriate for agricultural use. Kelly's Ratio values in the monsoon and post-monsoon seasons reflected favorable conditions, while SAR values throughout all seasons consistently classified the water as excellent to good, although most samples remained below critical limits for salinity and sodium concentrations, the presence of isolated high-salinity pockets warrants caution to prevent long-term soil degradation and reduced crop productivity. Elevated parameters such as EC, TDS, and TH in specific locations reflected localized anthropogenic and natural impacts, highlighting the need for continuous monitoring to track temporal trends and emerging water quality risks.

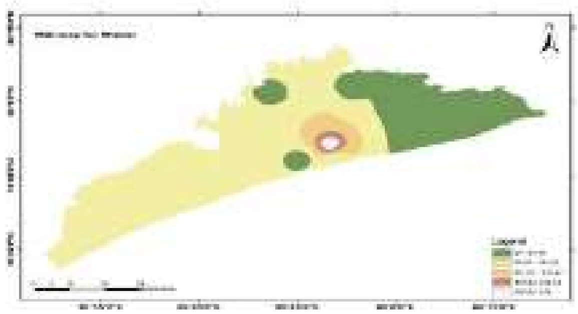


Fig. 15 Water quality Index map for winter season

Development of polymer linked slow-release fertilizer for improving water productivity and nutrient use efficiency

Project Code: NRMA/IIWM/SIL/2023/002/00220

Investigators: A. Maity, D.K. Panda, D. Ghosh, S. Jana

The polymer-embedded slow-release urea fertilizer was characterized using Fourier Transform Infrared (FTIR) spectroscopy, X-ray Diffraction (XRD), and Scanning Electron Microscopy (SEM). The FTIR analysis confirmed that the functional group ($–NH_2$), responsible for water absorption in the hydrogel, remained unblocked even after integration with Mg doped urea–hydroxyapatite. XRD results indicated the formation of Mg doped urea hydroxyapatie with low intensity and semi-crystalline orientation of the polymer matrix, while SEM micrographs revealed the presence of Mg-doped urea–hydroxyapatite nanoparticles unevenly distributed as an inhomogeneous mass on the surface of the hydrogel polymer.

The evaluation of polymer-linked slow release nitrogen fertilizer (PL-SRNF) in pot culture study with chilli crop revealed that PL-SRNF applied at the rate of 80, 70, and 60% of RND under irrigation regime of 100% ETc consistently enhanced soil moisture over NCU at the rate of 100% RND, with pronounced effects at 60 and 180 DAT. Under irrigation regime of 80% ET_c PL-SRNF applied at the rate of 80% of RND significantly raised soil moisture content over NCU application at 100% of RND at 60 DAT and towards crop's reproductive stage. Their application maintained low NH_4^+-N, NO_3^--N in soil at initial crop growth stage compared to NCU application @ 100% of RND but significantly enhanced NH_4^+-N and NO_3^--N content in soil towards crop's reproductive stage than NCU application or even maintaining NH_4^+-N and NO_3^--N content at par with NCU explaining their slow-release characteristics.

Application of PL-SRNF@70–80% of RND significantly improved soil enzyme activities such as urease, dehydrogenase, and microbial Biomass-N content and also plant growth parameters including plant height, number of secondary branches, and root biomass in comparison to conventional NCU application. Consequently, its application @ 70-80% of RND enhances fruit yield with higher average fruit length and N concentration than NCU application. The fruits obtained with PL-SRNF @ 60 to 80% of RND had significantly higher P concentration in fruit than those obtained with NCU application at the rate of 100% of RND. Unlike P, fruits obtained with PL-SRNF at the rate of 80% of RND recorded significantly higher K concentration in fruit than with NCU application at 100% of RND. Although fruit N-uptake was significantly higher with PL-SRNF applied @ 60 to 80% of RND. While, shoot uptake of N was highest with NCU application at the rate of 100% of RND followed by PL-SRNF application @ 80, 70 and 60% of RND. PL-SRNF application @ 80% of RND resulted in highest N uptake by the root followed by NCU application @ 100% of RND. The highest fruit yield (277.98 g $plant^{-1}$) was recorded with the application of PL-SRNF at 70% of RND under 80% ETc irrigation regimewhich was 30% higher than that obtained with NCU applied @ 100% of RND under full irrigation. Significantly higher Agronomic Efficiency of Nitrogen (AE_N), Recovery Efficiency of Nitrogen (RE_N), and Physiological Efficiency of Nitrogen (PE_N) were observed with the application of PL-SRNF @ 60%, 70%, and 80% of the RND compared to NCU applied @100% of RND. Furthermore, different application rates of PL-SRNF also resulted in significantly higher Partial Factor Productivity of Nitrogen (PFP_N) than NCU @ 100% of RND. Further, WR-SRUF applied @ 60–80% of RND significantly increased water use efficiency (WUE) by 7.5–34.8% over NCU @ 100% of RND. The highest WUE was recorded with PL-SRNF applied @ 70% of RND under 80% ETc irrigation regime.

Effect of water retaining slow-release nitrogenous fertilizer on the growth performance of chilli at 80% ETc irrigation regime (N_0: No N fertilizer, N_1: 100% of RND through neem-coated urea, N_3: 70% of RND through PL-SRNF)

Development of polymer bio-mineral composite for improving water and nutrient use efficiency and environmental sustainability

Project Code: CRG/2023/001787

Funding agency: DST-ANRF

Project personnel: A. Maity, A. Sarangi, D. Ghosh, S. Jana

Standardization of protocol for synthesis of natural hydrogel from cellulosic material was performed. Carboxy methyl cellulose was produced from maize stalk power via alkalization for extraction, bleaching followed by carboxy methylation. The dissolution of initial cellulosic material i.e. carboxy methyl cellulose sodium salt (CMC-Na) was made in NaOH solution. It was found that with the decrease in concentration of NaOH solution from 10.14% to 7%, the water absorbency of hydrogel increased from 114.84 g/g to 318.99 g/g and the highest water absorbency was observed when carboxy methyl cellulose sodium salt of medium viscosity was dissolved 7% NaOH solution (Fig. 16). Addition of urea into the NaOH solution and use of this mixture solution for dissolution of carboxy methyl Cellulose-Na salt resulted in reduction of water absorbency of resultant natural hydrogel and with the increasing concentration of urea, water absorbency got decreased, while maintaining CMC-Na salt to epichlorohydrin (ECH) ratio at 0.34. Regarding the quantity cross linker to be added with respect to CMC-Na salt, it was observed that with the increasing ratio of CMC-Na salt to ECH from 0.34 to 0.75, the water absorbency of resultant natural hydrogel increased from 134.28 g/g to 318.99 g/g and with further increase in ratio caused reduction in water absorbency of resultant natural hydrogel. With the increase in duration of cross linking reaction at 50°C in water bath from 10 hours to 24 hrs., the water absorbency of resultant natural hydrogel increased from 335.68 g/g to 410.05 g/g. But there was not any significant change in water absorbency while the crosslinking time increased from 20 to 24 hrs. So, the optimum crosslinking time should be 20 hrs. The water absorption characteristics of synthesized natural hydrogel was studied and it was observed that cumulative water absorption increased with time and attained maximum absorbency of 440.54g/g after 72 hrs. The pH of drained water decreased over time reaching to near neutrality.

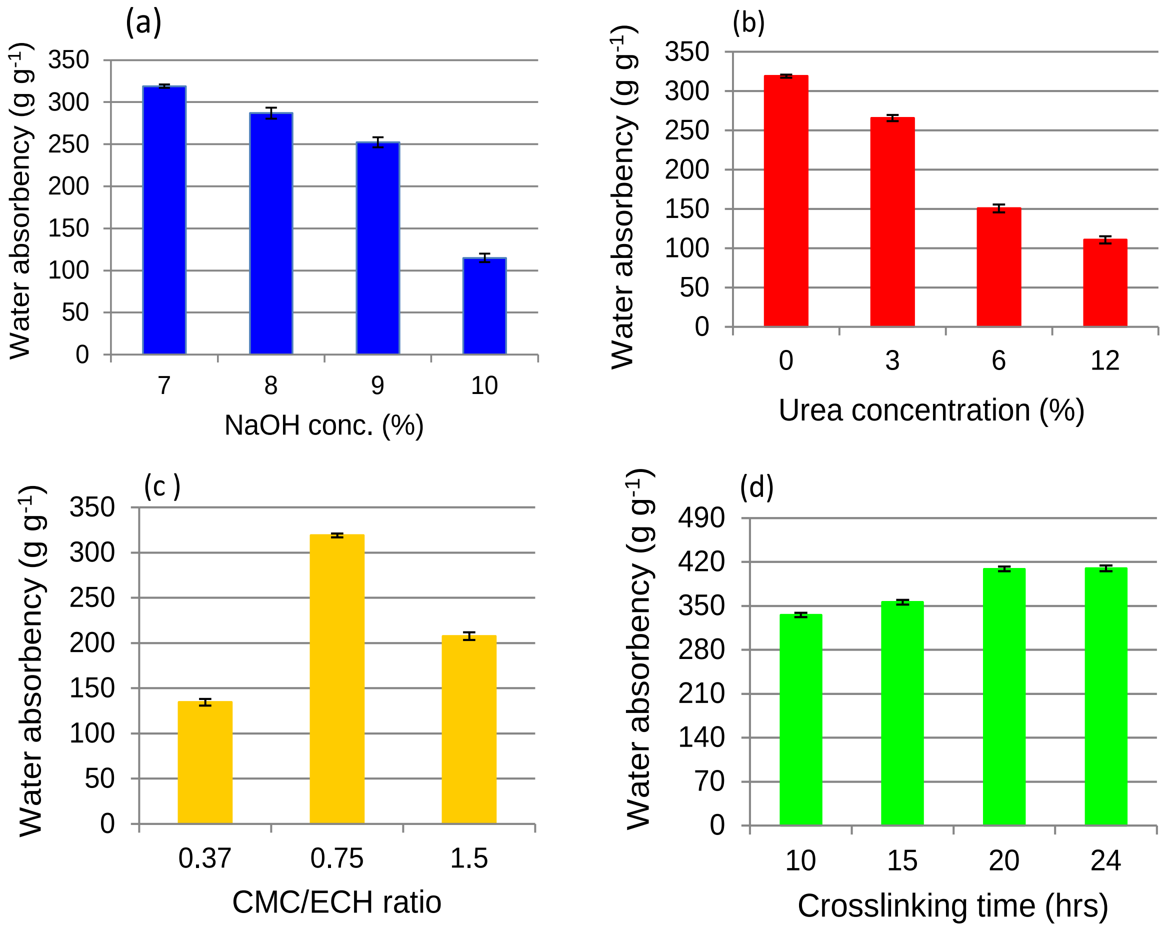


Fig. 16 Standarization of natural hydrogel synthesis protocol (a) effect of NaOH as solvent (b) effect of urea concentration in addition with NaOH as solvent (c) effect of CMC to crosslinker ratio and (d) effect of crosslinking time on water absorbency of natural hydrogel.

Sustainable groundwater management through artificial recharge for enhancing crop productivity in Nayagarh (East and South Eastern region of Odisha)

PM-RKVY Funded project

Investigators: R. R. Sethi, O. P. Verma and D.C Sahoo

A groundwater recharge intervention was implemented in Nayagarh and Khandapada blocks of Nayagarh district, Odisha, with financial support under the *Rashtriya Krishi Vikas Yojana* (RKVY) scheme. The project aimed to enhance recharge to the shallow hard rock aquifer through recharge shafts installed in abandoned dug wells. A total of 200 recharge shafts were constructed in defunct dug wells and existing water harvesting structures (WHS)/ponds across 15 villages, including Gunthuni, Sajanapada, Melemba, and Pelaguthuni. Each shaft had an average depth of 6 m and a diameter of 6 inches. The shafts were designed with perforations to facilitate infiltration and were packed with coarse sand and gravel around the casing to act as an effective filtration unit, thereby improving recharge water quality and minimizing sediment entry into aquifers.

To assess the impact of recharge interventions, groundwater levels in the treated dug wells and nearby wells within the area of influence were monitored regularly. Observations recorded four times per month indicated measurable improvement in water levels following shaft installation. The water table in dug wells with recharge shafts showed an increase of approximately 15–30 cm compared to pre-construction conditions. Seasonal monitoring further revealed that groundwater depths ranging between 2 to 6 m below ground level (bgl) during the pre-monsoon period of 2025. During the monsoon season, groundwater levels in most wells rose significantly, remaining within 4 m bgl, while in the post-monsoon season, depths improved further, ranging between 0 to 4 m bgl. These trends confirm the positive contribution of recharge shafts toward augmenting shallow groundwater storage.

Multi- Spectral index analysis revealed clear improvements in pre-monsoon vegetation health and soil moisture within recharge influence zones. NDVI results showed 15.24% reduction in bare soil area (42.79% to 27.54%) and a strong rise in sparse-to-moderate vegetation by 16.69%, indicating improved crop establishment and reduced land exposure. LSWI analysis reflected enhanced soil moisture conditions, with transitional wetting zones increasing by 23.09%, confirming infiltration-driven moisture redistribution through soil profiles. NDWI findings demonstrated significant improvement in vegetation turgidity, with dense vegetation nearly doubling from 29.12% to 59.48%, while low-moisture crop areas almost disappeared. MNDWI outputs validated enhancement around ponds/WHS, with dense vegetation increasing sharply from 17.45% to 62.99%, supporting the role of recharge structures in improving water retention.

Under the project, approximately 5 quintals of paddy seeds were distributed to 233 farmers, along with 5 quintals of pulse seeds (green gram and black gram), 3000 coconut seedlings, 1000 mango saplings, 4000 vegetable saplings, 500 units of liquid bio-fertilizers, 500 vegetable kits, and 450 irrigation pipes to promote diversified and sustainable farming practices. Overall, nearly 3000 farmers across 35 villages benefited from these interventions. In addition, five sprinkler irrigation systems and four solar-powered drip irrigation units were installed in farmers' fields to enhance water-use efficiency. To further strengthen livelihoods and encourage women's participation in agriculture, 25 women farmers from the Jay Jagannath PG Group SHG were mobilized to demonstrate a marigold-based livelihood model using water from a recharged dug well.

Development of model climate resilient agricultural ecosystems in vulnerable rainfed blocks (Badamba-Narasinghpur) of Odisha

PM-RKVY Funded project

Investigators: D. K. Panda and R. R. Sethi

With an objective to develop model climate resilient agriculture ecosystems and improve livelihood and income of 3000 farm families in the vulnerable region of Badamba-Narsinghpur, this project was initiated with PM-RKVY funding. Our first intervention was to make the study area climate resilient through seed security for the predominant crop rice. So we experimented with 12 varieties of rice from CRRI which can adapt to flood and drought. They are: CR Dhan 305; CR Dhan 310; CR Dhan 314; CR Dhan 319; CR Dhan 327 (Madhumita); CR Dhan 317 (Roshan); CR Dhan 507; CR Dhan 911; Swarna SUB1; Gayatri (CR 1018). The breeder and other seeds were tried across 50 villages and 950 farmers. A scientists and farmers meeting was conducted, where 250 rice farmers who grew these varieties participated and offered the feedbacks. Progressive farmers reported more than 5 tonnes per hectare for the variety CR Dhan 314. They were trained by CRRI scientists on how to harvest and preserve for seed purpose. During the post-monsoon *rabi* season, the "Pulse for Climate Resilient Agriculture" campaign started, through which 30 quintals of greengram and blackgram was experimented involving 450 farmers. High yielding vegetable seeds were procured from ICAR-IIHR and tested among 1000 farmers. Particularly the hybrid tomato *Arka Samrat* performed very well and provided livelihoods. To generate long-term livelihood, we also have planted 8000 coconuts, 7000 mangos and 1000 guava and 1000 passion fruits, involving 1000 farm families across 20 villages. We have provided training and capacity building to 500 farmers.

NMNF-Natural Farming Model Farms

ICAR –IIFSR, Modipuram Funded project

Investigators: D. Ghosh, O. P. Verma, A. K. Thakur, P. Panigrahi, K.K. Bandyopadhyay and A. Maity

The establishment of Natural Farming (NF) Model Farms commenced in the *Kharif* season of 2025 at the ICAR-IIWM research farm in Mendhasal and at three farmers' fields in Mendhasal, Khordha. The cropping system of the NF Model Farms consisted of rice, greengram, and *Sesbania* as a green manure crop during the pre-*kharif* season. Prior to the experiments, initial soil samples were studied, revealing that the soil pH at NF Model Farms ranged from 5.31 to 6.28. The bacterial population ranged from 4.1 to 6.4 $\times 10^7$ CFU/g of soil, actinomycetes from 2.5 to 4.4 $\times 10^5$ CFU/g of soil, and fungi from 3.4 to 5.7 $\times 10^7$ CFU/g of soil. The largest microbial population in the first soil sample seen in the ICAR-IIWM Research Farm compared to the farmers' fields. The rice varieties MTU 1156, CR Dhan 801, Pooja, and Lal Kuber were cultivated at the IIWM research farm, farmers 1, 2, and 3, respectively. The rice seedlings of 22 to 25 days were transplanted under different NF Model Farms. Azolla was grown as live mulch in rice field and on the bunds red gram as trap crop and *Gliricidia* as border crop was grown. Two to three irrigations were administered for the rice crop, contingent upon field conditions. The weeding was done manually or with the help of the cono weeder. Different NF bio-inputs like beejamrut, ganjeevamrut, jeevamrut, brahmastra, neemastra and sontashtra were prepared and applied as per the NF protocols and crop requirements.

Various plant growth parameters and yield-related characteristics were assessed throughout the study period. It was noted that across the different NF Model Farms, the number of hills per square meter ranged from 26.8 to 30.2, the number of panicles per hill varied between 9.6 and 10.8, panicle length measured from 23 to 25 cm, panicle weight ranged from 3.3 to 4.4 g, and the number of grains per panicle was between 136 and 172. The rice grain and straw yield was varied from 4.72 to 4.97, and 5.28 to 6.42 ton /ha, respectively (Fig. 17).

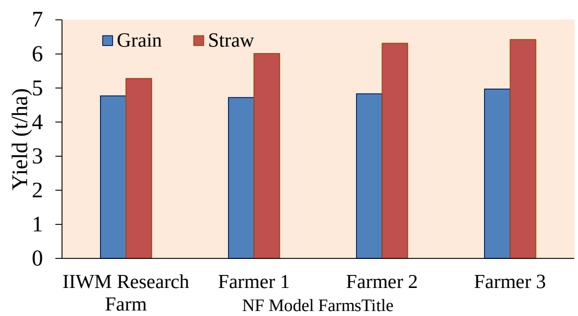


Fig. 17 Grain and straw yield of rice under different NF Model Farms

Natural Farming Model Farms at ICAR-IIWM Research Farm and Haridamada, Khordha

On-Farm Technology Dissemination

This program includes research projects on OFTD, wastewater management, water policy & governance

Socio- economic evaluation of solar irrigation and its impact on farmers' livelihood in Eastern India

Project code: NRME/IIWM/SIL/2021/009/00211

Investigators: Ankhila R. H., R.R. Sethi, O.P. Verma and D. Sethi

The project was taken up to evaluate solar irrigation through the PM-KUSUM scheme in helping the farmers to avail solar irrigation. Enabling the farmers' energy independence to irrigate their fields is the motto of the scheme. Thus, the PM-KUSUM scheme achieves this motto by shifting to renewable sources of energy, i.e., Solar, in place of diesel and electricity as fuel to meet the irrigation needs of the farmers. Thus, it provides a cost-effective means of assured irrigation to farmers in the long run.

The study was conducted in the state of Odisha, along with Chhattisgarh, and a few locations of Andhra Pradesh adjacent to Odisha, with a primary survey of 230 farmers.

Results of the primary survey revealed that KVK and fellow farmers are the major sources of information of the PM-KUSUM scheme, and OLIC has the major role in the installation of solar panels in Odisha. The adopted farmers agreed that with solar, there is a significant increase in cropping intensity and cropped area at the farmers' level. Along with this, the results also found effective cost reduction with solar pumps in farming, as in terms of diesel cost amounting to 25-30,000 per annum being replaced with free solar power.

Solar irrigation under PM-KUSUM scheme at Poipani, Odisha

Impact assessment of agricultural water management technologies for wider adoption

Project code: NRMA/IIWM/SIL/2024/002/00222

Investigators: S.K. Mishra, P. Nanda, H.K. Dash, R.K. Mohanty, P.K. Panda and B.K. Sethy

During 2025, six award winning and ICAR-certified IIWM technologies were assessed at eight locations in three districts of Odisha, namely, Dhenkanal Jagatsinghpur and Khordha as mentioned in the following table 5.

Table 5. Details of the technologies assessed and the locations of experiments, demonstration and validation

Sl. No.	Name of the Technologies/ Products assessed	Name of the Awards received & Developers	Period of Invention	Location of Experiments, Demonstration & Validation
1	Enhancing Aquaculture WUE using Artificial Substrate induced Periphyton Biomass	ICAR Certificated Technology (Developers: Dr. R.K. Mohanty & Team)	2012-2017	Ambiki in Ersama block of Jagatsingpur
2	Bio-drainage for reclamation of water-logged area	ICAR Certificated Technology (Developers: Dr. S. Roy Choudhury & Team)	2005-2008	Ambiki in Ersama block of Jagatsingpur
3	Land shaping option for increasing farm income in coastal waterlogged area	ICAR Certificated Technology (Developers: Dr. S.K. Rautaray & Team)	2017-2020	Ambiki in Ersama block of Jagatsingpur and IIWM Research Farm, Deras Khordha
4	Water harvesting based Integrated Farming System (NAIP)	ICAR Certificated Technology (Developers: Dr. S. Mohanty & team)	2008-2012	Khalibandha in Dhenkanal Sadar block and peripheral villages in Odapada block of Dhenkanal
5	Rainwater Conservation for Rice-Fish Integrated Farming System (NATP)	ICAR Team Research Award (Developers: Dr. Ataram Mishra & Team)	1999-2005	Sadeiberini and Gajamara of Dhenkanal & IIWM Research Farm, Deras Khordha
6	Alternate Raised Bed and Sunken Bed technology for improved productivity in canal command	ICAR Team Research Award (Developers: Dr. Rabindra Singh & Team)	2000-2004	Biswanathpur, Khamanga and Barillo of Balipatna, Khordha

Data were collected from over twenty participating & beneficiary farmers as well as sixty non-beneficiary adopted farmers in the same villages and neighbouring villages using interview schedules, conducting site visits and organizing focussed group discussions. With respect to the technology on 'Enhancing aquaculture WUE using artificial substrate induced periphyton biomass' undertaken in nine-earthen ponds in water-logged farmers' fields of Baghadi village, Ambiki in Ersama block, Jagatsingpur, it was found that during post-intervention period, the introduced disease resistant *Vannamei* shrimp farming technology has spread in the locality over the years with mushrooming of traders, franchise dealers and well-established market chain. There has been a significant adoption of the technology in the Baghadi village with 360.91% increase in total number of ponds (from 87 in 2011 to 401 in 2025), 196.18% increase in pond area (22.76 ha to 67.41 ha) and 1520 % increase in number of adopted households (from 5 in 2011 to 81 in 2025)

The findings on the 'Water harvesting based Integrated Farming System' technology in Sadar and Odapada blocks Dhenkanal district were also found very encouraging. Despite withdrawal of support and discontinuance of the project almost 12 years back, the adopted farmers have expanded the WHS-based IFS model with new integration of crop diversification, aquaculture and poultry farming with proper maintenance of the constructed WHSs. Inspired and motivated by the net returns from the demonstrated units, the technology has been adopted by at least seven farmers in four neghbouring villages (Khamara-1 no, Simulia-1 no, Sundhi-3 nos., Khalibandha-2 nos.). It was found that the technology of 'Rainwater conservation for rice-fish Integrated Farming System' in Sadeiberini, Dhenkanal yielded a total system production of 1.5 to 2.0 times per annum (two seasons) during the technology demonstration period and succeeding 4-5 years. This rainwater conservation system accommodated crop diversification in the area of over 7.4 ha land, enhanced productivity and income, and reduced the risk of economic loss as two or more subsystems were involved, instead of a single-commodity rice farming system. However, theft of fishes from the ponds and vegetables from fields and escalating maintenance cost of the WHSs, bunds, bushes and weed problem over the years discouraged the farmers for aquaculture production. Responding farmers opined that rural youths were more attracted towards lucrative non-farm activities because of better employment opportunities and more labour wage in the nearby urban areas.

The technologies on (i) 'Bio-drainage plantation with *Casuarina, Acasia, and Eucalyptus* for reclamation water-logged area' at Baghadi village, Erasama during 2005-08 and (ii) 'Land shaping option for increasing farm income in coastal waterlogged area' during 2017-20 have not spread to nearby waterlogged areas as shrimp farming was reported by farmers to be a better option in these ecologies in Jagatsinghpur district with more return to invest in less time. However, government has taken up the initiatives in mass scale road side/ avenue/ fallow land plantation of these bio-drainage plants. The 'Alternate raised bed and sunken bed technology' for improved productivity in canal command introduced during 2000-04 in the Balipatna areas of Khordha has been adopted by a few farmers in their respective vegetable fields with suitable modifications.

Catchment-command characterization and evaluation of rainwater harvesting structures in a treated watershed

Project Code: NRMA/IIWM/SIL/2022/005/00217

Investigators: B.K. Sethy, P.K. Panda, S.K. Mishra, H.K. Dash and D.C. Sahoo

It has been observed that water harvesting structures created under watershed development programme are left abandoned after completion of the work phase of the programme. Scientific assessment of demand and availability of water in the catchment is lacking before construction of WHSs in watershed development programme. Characterization of catchment and command in a watershed based on water demand and availability, evaluation of performance of rainwater harvesting structures in developed watershed and assessment of impact of rainwater harvesting structure(s) on socio-economic aspects of beneficiaries are important. The study was conducted in a treated micro-watershed "Unnakotiswar Dakhinakali" at Latadeipur in Gondia block of Dehenkal, developed during 2010-2015 under IWMP-II and PMKSY. Five numbers of rainwater harvesting structures (Size: 30 x30 to 50 x50 m, capacity: 1350 to 5000 m^3) were selected for the study, whose location has been presented in Table 1.

Catchment area of water harvesting structures varied from 9.9 ha to 23.7 ha with average slope ranging from 3.66 to 6.5%. Command area of water harvesting structures varied from 7.2 ha to 14.9 ha. 10 numbers of AWSLRs were installed at the inlets and outlets of each rainwater harvesting structure (RWHSs) for monitoring inflow, outflow, and stored water in the RWHSs. During the reporting period, the area received annual rainfall of 1449.1 mm in 68 events during 2025. Runoff was estimated using SCS-CN method for the catchment of each water harvesting structure, which varied from 22.5 to 34.9% (Table 6).

Table 6. Estimated potential runoff from catchments of RWHSs

RWH	Catchment Area (ha)	Slope (%)	Land use	Practice	Hydrologic Condition	Hydrologic Soil group	Estimated Runoff (mm)	Runoff (%)
1	12.2	5.25	Pasture or range	Contoured	Good	A	497.5	34.3
2	23.7	5.13	Pasture or range	Contoured	Good	B	438.7	30.3
3	9.9	5.07	Wood lands	-	poor	B	458.2	31.6
4	19	3.66	Wood lands	-	Good	A	331.2	22.9
5	16.7	6.5	Wood lands	-	Good	B	500.3	34.5

Based on the recording of the runoff, runoff (both inflow and outflow to each RWHSs, no. times water filled in the structures, command area required for life saving irrigation for 5 cm, 10 cm and 15 cm were estimated with the available water in the storage structures. Catchment and command area relationships were developed for each RWHSs and presented in the Table 7.

Table 7. Hydrological characterization and catchment command relationship of rainwater harvesting structures

Particulars	RWHS1	RWHS2	RWHS3	RWHS4	RWHS5
Catchment Area (ha)	12.2	23.7	9.9	19	16.7
Command Area (ha)	14.9	13.7	7.2	12.5	9.8
Storage capacity (ha.m)	0.315	0.5	0.135	0.225	0.237
Rainfall (mm)	1449.1	1449.1	1449.1	1449.1	1449.1
Runoff (mm)-Inflow	432.85	359.7	357.38	241.78	415.28
Runoff (mm)-Outflow	35575.33	15388.25	29501.97	33720.68	31902.51
Evaporation	594.7	594.7	594.7	594.7	594.7
No of times WHS Filled	5	8	4	5	5
Inflow Runoff (m^3)	52807.7	85248.9	35380.62	45938.2	69351.76
Filled pond (m^3)	15750	40000	5400	11250	11850
Evaporation (m^3)	1873.31	2973.50	802.85	1338.08	1409.44
Outflow runoff (m^3)	35184.40	42275.40	29177.78	33350.13	56092.32
Outflow runoff (m^3) actual	32017.80	38470.61	26551.78	30348.61	51044.01
No. of 5 cm irrigation	0.21	0.28	0.37	0.24	0.52
Command area required for 5 cm irrigation-1 (ha)	6.3	10	2.7	4.5	4.74
Command area required for 5 cm irrigation-2 times (ha)	3.15	5	1.35	2.25	2.37
Command area required for 5 cm irrigation-3 times (ha)	2.1	3.33	0.9	1.5	1.58
	1.94	2.37	3.67	4.22	3.52
Catchment: Storage: Command ratio for 10 cm irrigation:1	3.87	4.74	7.33	8.44	7.05
Catchment: Command ratio for 15 cm irrigation:1	5.81	7.11	11.00	12.67	10.57

Water management strategies for enhancing water productivity of millet-based production system

Project code: NRMA/IIWM/M/SIL/2023/001/219

Investigators: B S Satapathy, S K Jena, and S K Mishra

A field experiment was conducted at ICAR-IIWM research farm, Deras, during the 2025 dry period to study different soil moisture regimes under various crop establishment methods and varieties for higher water productivity and yield of finger millet in rice-finger millet cropping system. The experiment was laid out in split plot design with two crop establishment methods in main plot (C_1: transplanting of 2 weeks old seedlings at 20 × 20 cm) and C_2: transplanting of 3 weeks old seedlings at 20 × 10 cm), three varieties in sub plot (V_1: Arjun, V_2: Shreeratna and V_3: Ganjam local) and three irrigation schedules (I_1: at 40% SMD, I_2: at 50% SMD and I_3: at 60% SMD).

Experimental results revealed that transplanting of 2 weeks old young seedlings at 20 × 20 cm spacing registered 12.5, 9.9, 12.5, 19.8, 13.7 and 12.5 % of higher grain yield, straw yield, gross return, B: C ratio, physical water productivity and economic water productivity of finger millet respectively as compared to transplanting of 3 weeks old seedling at 20 × 20 cm. Among the Varieties, Shreeratna recorded significantly higher grain yield (2297 kg/ha), gross return (Rs. 100960/ha), B: C ratio (2.17), physical water productivity (0.63 kg /m^3), and economic water productivity (27.81 Rs/m^3). Irrigation schedule at 50% SMD resulted in grain yield, gross return, B: C ratio, and physical and economic water productivity at par with irrigation at 40% SMD. Whereas irrigation at 60% SMD recorded a reduction in grain yield, gross return, and water productivity (Table 8).

Table 8: Growth, yield, economics, and water productivity of finger millets as influenced by crop establishment methods, varieties and irrigation schedules.

Treatments	Plant ht (cm)	Grain yield (kg/ha)	Straw yield (kg/ha)	Gross Return (Rs/ha)	B:C	PWP (Kg/m^3)	EWP (Rs/ m^3)
Crop establishment methods							
C_1	70.6	2310	2818	101920	2.24	0.58	25.52
C_2	70.4	2053	2565	90620	1.87	0.51	22.69
CD (p=0.05)	NS	73	73	3188	0.07	0.02	0.80
Varieties							
V_1	70.4	2084	2818	92240	1.96	0.49	21.85
V_2	64.4	2297	2408	100960	2.17	0.63	27.81
V_3	76.5	2162	2847	95610	2.03	0.51	22.65
CD (p=0.05)	1.6	61	80	2698	0.06	0.02	0.69
Irrigation schedules							
I_1	73.1	2359	2894	104090	2.15	0.59	26.02
I_2	71.9	2340	2872	103260	2.19	0.57	25.42
I_3	66.4	1845	2307	81460	1.82	0.47	20.86
CD (p=0.05)	1.8	42	53	1818	0.04	0.02	0.62

(C_1: Transplanting of 2 weeks old seedlings at 20 × 20 cm, C_2: Transplanting of 3 weeks old seedlings at 20 × 10 cm, V_1:Arjun, V_2: Shreeratna, V_3: Ganjam local, I_1: Irrigation at 40% SMD, I_2: Irrigation at 50% SMD and I_3: Irrigation at 60% SMD)

Another field experiment was conducted during the dry season of 2025 to study different soil moisture regimes and varieties for higher water productivity and yield of little millet in rice-little millet cropping system. The treatments consist of two varieties in main plot (V_1: OLM 218 and V_2: OLM 217) and 3 irrigation schedules (I_1; at 40% SMD, I_2: 50% SMD and I_3: 60% SMD) in subplots. Experiment results revealed that Variety OLM 217 recorded 30.9, 52.5, 32.3, 26.7,10.3 and 14.8 % higher grain yield, straw yield, gross return, B: C ratio, physical water productivity, and economic water productivity, respectively, as compared to OLM 218. Irrigation schedule at 50% SMD resulted in grain yield, gross return, B: C ratio and physical and economic water productivity at par with irrigation at 40% SMD, whereas irrigation at 60% SMD registered a reduction in grain yield, gross return, and water productivity (Table 9).

Table 9: Growth, yield, economics, and water productivity of little millets as influenced by varieties and irrigation schedules.

Treatments	Plant ht (Cm)	Grain yield (Kg/ha)	Straw yield (Kg/ha)	Gross Return (Rs/ha)	B :C	PWP (Kg/m³)	EWP (Rs/ m³)
Varieties							
V_1	116.9	964	1980	61800	1.5	0.29	18.3
V_2	137.3	1262	3020	81780	1.9	0.32	21.0
CD (p=0.05)	8.8	80	146	4862	0.1	0.027	1.48
Irrigation schedules							
I_1	129.7	1218	2738	78580	1.8	0.33	21.1
I_2	128.0	1200	2700	77400	1.8	0.33	20.8
I_3	123.7	921	2068	59400	1.4	0.27	17.1
CD (p=0.05)	2.1	54	176	3365	0.1	0.014	0.95

(V_1: OLM 218, V_2: OLM 217, I_1: Irrigation at 40% SMD, I_1: Irrigation at 40% SMD I_1: Irrigation at 40% SMD)

Water management and production practices of dragon fruit under protected cultivation

Project Code: NRMA/IIWM/SIL/2021/002/00204

Investigators: Prativa Sahu, Ajit K. Nayak, Kundan Kishor, and Roomesh K. Jena

The analysis of variance (ANOVA) and mean comparisons reveal significant differences among the treatments (soil, cocopeat, cocofiber, and cocopeat+perlite) in their effects on yield attributing characteristics of dragon fruit. For the number of fruits per pot, cocopeat+perlite recorded the highest mean (79.8 fruits), significantly outperforming all other treatments. Soil (63.07 fruits) and cocopeat (53.7 fruits) showed notable differences, while cocofiber (39.1 fruits) produced the lowest number of fruits. In terms of average fruit weight, cocopeat demonstrated the highest mean (418.5 g), significantly outperforming the other treatments. Soil had a considerably lower mean (206.5 g), while cocofiber (375.5 g) and cocopeat+perlite (390 g) exhibited similar effects, with cocopeat slightly ahead. Fruit yield (kg), cocopeat+perlite again led with the highest yield (30.3 kg), followed by cocopeat (21.59 kg), cocofiber (14 kg), and soil (12.53 kg), confirming the superior performance of the cocopeat-based treatments (Table 10). In conclusion, the results indicate that cocopeat+perlite consistently demonstrated superior effects, particularly in fruit yield, number of fruits, and average fruit weight. Cocopeat also outperformed soil in most characteristics, especially pulp weight and peel weight. Soil exhibited the lowest performance across all measured traits, underscoring the advantages of soilless media, particularly cocopeat and cocopeat+perlite, for improving fruit production and quality.

The analysis of the biochemical parameters based on the box plots reveals that Cocopeat, Cocofiber, and Cocopeat + Perlite consistently exhibit superior performance compared to Soil across all measured variables. For Total Carbohydrate Content, Cocopeat recorded the highest median value, followed by Cocofiber and Cocopeat + Perlite, all of which demonstrated significantly higher carbohydrate levels than Soil, which exhibited the lowest median and the greatest variability. Similarly, for Protein Content, Cocopeat emerged as the most effective substrate, showing the highest protein levels, while Cocofiber and Cocopeat + Perlite also performed better than soil, which ranked lowest. In the case of Ascorbic Acid, both Cocopeat and Cocofiber outperformed Soil, achieving the highest medians and demonstrating enhanced ascorbic acid accumulation. Cocopeat + Perlite also showed moderate improvement compared to Soil, which remained the least effective substrate. For Betacyanin, Cocofiber showed the highest levels, followed by Cocopeat and Cocopeat + Perlite, while Soil exhibited the lowest betacyanin content. For Total Polyphenols, Cocopeat demonstrated the highest antioxidant potential, closely followed by Cocofiber, with Cocopeat + Perlite also surpassing Soil, which again displayed the poorest results. Similarly, for Total Flavonoids, Cocofiber exhibited the highest flavonoid content, with Cocopeat showing slightly lower but still superior values. Cocopeat + Perlite also demonstrated enhanced flavonoid accumulation compared to Soil, which recorded the lowest levels.

Table 10: Effect of media on yield attributing characters of dragon fruit

Treatment	No. of fruits/ pot (1st year)	No. of fruits/ pot (2nd year)	Yield (kg)/pot (1st year)	Yield (kg)/pot (2nd year)	Avg. Fruit weight (g) 1st year	Avg. Fruit weight (g) 2nd year
Soil	24.9	63.1	3.5	12.5	152.9	206.5
Cocopeat	16.5	53.7	6.1	21.6	404.0	418.5
Cocofiber	14.3	39.1	4.2	14.1	342.0	375.5
Cocopeat+perlite	24.5	79.8	8.6	30.4	369.6	390.0
SEM (±)	0.40	0.7	0.0	0.2	9.3	9.7
CD (0.05)	1.29	2.38	0.28	0.62	30.41	31.48
CV%	3.43	2.15	2.69	1.66	5.09	4.81

Demonstration of hydroponic based vertical farming for high-value horticultural crops

Funded by: MIDH, Govt. of India
Investigators: Prativa Sahu, A. K. Thakur, and D.C. Sahoo

An experiment was conducted to assess the effects of aggregate hydroponics with drip and sprinkler irrigation and aeroponics on *Dendrobium nobile* orchid grown on coconut husk at the ICAR–Indian Institute of Water Management, Bhubaneswar, Odisha, during 2025. Drip irrigation under soilless cultivation increased plant height (27.46%), shoots per plant (13%), and spike weight (5.4%) compared to aeroponics, while sprinkler irrigation increased leaf number by 12.12%. Aeroponics, however, enhanced floret number per spike (32%) and root length (16%) over drip irrigation and reduced water use by 27.5%. Another research was conducted to evaluate the effect of different growing media and cultivar interactions on the growth, yield, and quality of lettuce (*Lactuca sativa L.*). The experiment was laid out by adopting FCRD (factorial completely randomized block design) with two levels viz., three growing media [cocopeat + perlite (M_1), cocopeat (M_2), and soil (M_3)] in combination with three lettuce cultivars [Lollo Rosso (V_1), Romaine (V_2), and Red Rose (V_3)], each replicated thrice. It was revealed that cocopeat + perlite (M_1) consistently enhanced seedling performance, recording the highest germination (85.90%; 11.67% higher germination than soil), survival rate (95.86%), maximum seedling shoot (7.60 cm), and root length (4.38 cm). Accordingly, vegetative growth was superior in cocopeat + perlite (M_1), producing taller plants (26.73 cm; 51.18 % higher than soil), longer leaves (16.81 cm; 49.68% higher than soil), broader leaves (12.26 cm), and higher leaf area (680.25 cm^2) as compared to cocopeat alone (M_2) and soil (M_3). Yield parameters were also maximized in cocopeat + perlite, enabling the earliest harvest (47.63 days, around 9 days earlier than soil-grown lettuce), highest marketable leaves (25.83), fresh leaf weight per plant (93.44 g; 16.60 % higher fresh weight than soil), and shoot fresh weight (102.58 g). Romaine excelled in chlorophyll content and SPAD values, while Red Rose exhibited higher carotenoid (0.43 $mg.g^{-1}$), ascorbic acid (14.07 mg/100 g^{-1}), and anthocyanin accumulation (251.85 mg/100 g^{-1}). The most favourable combination was Red Rose in cocopeat + perlite, achieving maximum shoot fresh weight (124.71 g) and leaf area (848.45 cm^2). Overall, cocopeat + perlite proved to be the most efficient medium, and Red Rose was the most productive cultivar under aggregate hydroponics, highlighting their suitability for sustainable lettuce cultivation.

Orchid *(Dendrobium nobile)* grown on coconut husk with drip irrigation.

Sensor-based integrated vertical farming for horticultural crops and aquaponic system

Externally funded project: NASF, ICAR

Investigators: Prativa Sahu, R.K. Mohanty, and Ajit Kumar Nayak

An experiment was conducted to evaluate the growth performance of mint (*Mentha* spp.) under distinct hydroponic system configurations and nutrient sources, with particular emphasis on system design and nutrient solution composition. The study compared the effects of two hydroponic systems (Deep Flow Technique vs. Tower system) and nutrient source (hydroponic solution vs. aquaponic effluent) on plant yield and quality. Results indicated that mint cultivated in T_1 (DFT with hydroponic solution) produced 12% greater biomass compared to T_3 (DFT with aquaponic effluent). Conversely, the Tower system supplied with hydroponic solution (T_2) achieved a higher yield per unit area, which is attributed to the vertical arrangement enhancing spatial efficiency. Notably, T_3 (DFT with aquaponic effluent) exhibited superior quality parameters, presumably due to efficient nutrient mineralization from *Channa* fish waste and the balanced nutrient profile inherent to the aquaponic effluent. An experiment was conducted to evaluate the effects of hydroponic system type (non- circulating and recirculating) on the growth, yield, and fruit quality of strawberry (*Fragaria × ananassa* Duch.). The results indicated that strawberries cultivated in a recirculating hydroponic system exhibited 32% increase in leaf length and 2.8% increase in leaf width, along with 7.6% reduction in the number of days to flowering, compared to plants grown in a non-circulating system. Furthermore, the recirculating system enhanced fruit production, with a 12% increase in the number of fruits per plant and a 7.55% increase in average fruit weight. Fruit quality parameters were also improved, showing a 9.6% increase in total soluble solids (TSS) and a 4.5% increase in vitamin C content. These findings indicate that the recirculating hydroponic system is superior to the non-circulating system in terms of promoting growth, accelerating flowering, increasing yield, and enhancing fruit quality in strawberry. The observed differences are likely attributable to improved nutrient availability, enhanced root-zone aeration, and higher nutrient use efficiency in the recirculating system.

Deep Flow Technique-based aquaponic system on Mint (Mentha spp.)

Outreach Activities

Enhancing land and water productivity through integrated farming system (Tribal Sub Plan Project)

Project: Scheduled Tribe Component (Formerly TSP) Programme

Investigators: R. K. Panda, R. R. Sethi, R. K. Mohanty, Ashok K. Nayak, O.P. Verma and R. K. Jena

During the year, a series of field-based extension and capacity-building activities were undertaken to strengthen agricultural practices among tribal farmers in the four tribal aspirational villages of Rayagada, Gajapati and Koraput districts of Odisha.

Farm tools and allied facilities were created and distributed in the target villages to strengthen on-farm operations and enhance farmers' capacity in water management practices. A capacity-building programme on agricultural water management was organized on 23 April 2025 at Charagaon village, during which essential farm implements such as Cycle Weeders (50 nos.), Mandua Weeders (50 nos.), Irrigation water pipes (48 bundles), and Threshing mats (50 nos.) were distributed to beneficiary farmers. A total of 100 farmers, including 51 women farmers, participated in the programme. The distribution of materials was carried out in the presence of the Ward Member and Samiti Sabhya, ensuring transparency and community involvement. Subsequently, another capacity-building programme was conducted in the same village on 16 October 2025, with the participation of 120 farmers, including 67 women farmers, focusing on improved water management and efficient use of farm tools. Similarly, on 23 April 2025, farm implements comprising Cycle Weeders (50 nos.), Mandua Weeders (50 nos.), Irrigation water pipes (48 bundles), and Threshing mats (50 nos.) were distributed in Chougaon village. The programme was attended by 93 farmers, including 10 women farmers. The distribution event was organized in the presence of the Ward Member, with active involvement of women Self Help Group (SHG) members. A follow-up capacity-building programme was conducted on 16 October 2025 in the same village, wherein 102 farmers, including 71 women farmers, participated. In addition, on 19 August 2025, post-harvest and intercultural operation tools - threshing mats (50 nos.), cycle weeders (50 nos.) and mandua weeders (50 nos.) were handed over to representative farmers in Khaira village, including the Ward Member, Director of LAMP, and eight other prominent community members for distribution among tribal farmers. Likewise, on 20 August 2025, similar farm tools - threshing mats (50 nos.), cycle weeders (50 nos.), and mandua weeders (50 nos.) were handed over to representative farmers in Phatachanchada village, including the village President, Ward Member, and seven other prominent members for distribution among tribal farming households. During the year, provisions for other farm tools like sickle, hand cultivator, crow bar and manually operated sprayers have also been made.

As per the directives of the Ministry of Tribal Affairs, Govt. of India, a fortnight long *Janjatiya Gaurav Varsh Pakhwada* (01-15 November, 2025) celebration was initiated in the tribal villages. Details are given below in Table 11. Total 1089 tribal farmers including more than 434 women farmers and 75 school children participated during the fortnight programme.

Table 11. ***Janjatiya Gaurav Varsh Pakhwada*** **(01-15 November, 2025) celebration**

Date	Details of the programme	Place of the programme	Total participation
1.11.2025	Socio Economic Development and Awareness	Barapita, Khorda	90
2.11.2025	Education & Skill Development	Haridamada, Khorda	70
3.11.2025	Livelihood and Entrepreneurship	Jamujhari, Khorda	69
4.11.2025	Health and Wellness	Chargaon, Koraput	102
5.11.2025	Art	Chougaon, Koraput	100
6.11.2025	Culture & Heritage	Kumharput, Koraput	106
7.11.2025	Infrastructure Development	Khaira, Rayagada	96

8.11.2025	Good Governance and Institutional Development	Khaira, Rayagada	94
9.11.2025	Awareness of on-going Schemes and Field Presence	Phatachanchada, Gajapati	99
10.11.2025	Digital Inclusion and Sustainable Development	Pokhariput, Khorda	
11.11.2025	Educational initiatives that Highlight the Legacy of Tribal Freedom Fighters	Patia, Khorda	78
12.11.2025	Public Awareness Campaigns in Area with Predominantly Tribal Population	Saliasahi, Khorda	60
13.11.2025	Tribal Agri-Entrepreneurship Summits Connecting Farmers and Agri-start ups	Odisha state tribal museum cum SC &ST Research & Training Institute, Bhubaneswar	30
14.11.2025	Establishing Tribal Farmers "Markets for Direct Sale of Produce"	Guptapada, Jatni, Khurda	45
15.11.2025	Set up Seed Banks to Preserve Indigenous Crop Varieties	Kantalei, Khurda	50
Total Participation			1089

Exposure visits on scientific water management in cotton, maize, brinjal, cauliflower, paddy using SRI technique and potato crops were organized at Khaira village and Phatachanchada village. Details are presented below in Table 12.

Table 12. Water management techniques and improved agricultural practices

Sl. No.	Crops	Average crop Yield (t/ha)
1	Brinjal (var. Kajal) - Piped irrigation with regular weeding	18.2
2	Cauliflower - Piped irrigation	6.2
3	Cabbage - Piped irrigation	19.1
4	Cotton (var. Bunny) - Expert advice of KVK, Rayagada like regular plucking at shorter interval to avoid over bursting	2.4
5	Paddy (var. Lalat, Ankur) - SRI	4.7
6	Sweet Potato - High yielding crop cuttings arranged from CTCRI, Bhubaneswar	7.1
7	Potato - Mulching	7.3

Janjatiya Gaurav Varsh Pakhwada celebration

Capacity Building Programme

Piloting water management technologies for enhancing farm productivity and income (SCSP Project)

Project: Scheduled Caste Sub-plan Project
Investigators: B.K. Sethy, S.K. Mishra, H.K. Dash, O.P. Verma, P.K. Panda, R.K. Mohanty, R.K. Jena and P. Sahu

To bring in crop diversification and improve the income of farmers, more than 30.0 q of seeds of high value crops and 40.0q of paddy seeds (var. *Pooja, Sarala, Gayatri, CR-314,312,311,317, Swarna Soban,Pradhan Dhan*) were distributed among 250 farmers in 06 villages of Nimapara, Balipatana and Salepur block under SCSP. Further, to improve access of farm families to vegetables, kitchen garden vegetable seed kits containing 12 vegetable seeds were distributed to 450 women during the period. Distributed 2.0 q of vegetable seeds and other critical inputs like water-soluble fertilizer, neem oil, etc. to farmers of project villages of Balipatana, Nimapara, Dhenkanal, and Bhawanipatna

Distribution of seeds and other inputs at Balipatna block of Khurda district

Seedlings developed from these seeds were transplanted in an area of about 140.0 ha in project villages

Distribution of Blackgram& Green gram seed at Belera village of Salipur block, Cuttack

Distribution of Blackgram& Green gram seed and vegetable kits at Champapur village of Salipur block, Cuttack

Crop cultivation at Champapur, Cuttack

To ease the burden of land preparation, intercultural operation, two (2) power mini weeders of 1.5hp capacity, two(2) power weeders of 7.0hp capacity, one power tiller 2000 sq.mt of shade net, 1500sq. mt of plastic cladding film for protected cultivation structure, 540mt (90 number of 6mt each) of HDPE sprinkler pipes, 450mt of HDPE conveyance pipes, fittings of sprinkler irrigation(including riser and sprinkler, end caps, Qc bend, Tee, pump connectors etc), were distributed to farmers of Belera and Makundapur villages of Salipur block. Forty kg onion seeds of variety 'agri-found light red & red-4 were distributed to 50 farmers of project villages of Bhawanipatna, Balipatna, and Nimapara blocks for onion cultivation in about 8 ha area during the *rabi* season.

Under SCSP, Thirteen numbers of one-day orientation workshop cum training programme on different aspects was organized under SCSP which is given in table 13.

Table 13. Details of workshop-cum-training program in SCSP villages during 2025

Training programme on "Crop Intensification and Diversification of Rice Based Production System for Enhancing Water Productivity and Farm Income" was organized at Chanrapada village on 02.01.2025. 64 beneficiary farm families participated in the programme.
Training programme cum demonstration on "Improved Oyster Mushroom Cultivation Practices for Increasing Family Income and Nutritional Security" Was organized at Belera village on 23.01.2025. About 46 beneficiary farm families participated in the programme.
Training programme on "Crop Diversification in Horticulture Based Production System for Enhancing Water Productivity and Farm Income" Was organized at Champapur village on 23.01.2025. About 69 beneficiary farm families participated in the programme
Training programme on "Crop Diversification for Enhancing Water Productivity and Farm Income" at Kathapal village on 28.01.2025. About 62 farm families from two wards attended the programme.
Training programme cum demonstration on "Paddy Straw Mushroom Farming as a Profitable Enterprise for Promoting Self-reliance and Nutritional Security" was organized at Garedipanchan village on 04.03.2025. About 44 farm families from attended the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" was organized at Makundapur village on 08.07.2025. About 62 numbers of farmers attended the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" was organized at Belera village on 15.07.2025 .About 71 numbers of farmers attended the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" was organized at Champapur village on 25.07.2025. About 62 beneficiary farm families participated in the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" Was organized at Chanrapada village on 30.07.2025. About 74 beneficiary farm families participated in the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" was organized at Nijogakasoti village on 08.08.2025. About 62 beneficiary farm families participated in the programme
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" at Garedipanchan village on 19.08.2025. About 64 farm families attended the programme.
Training programme on "Crop Diversification in Rice Fallow for Enhancing Soil Fertility & Farm Profit" was organized at Belera village on 11.11.2025. About 64 farm families from Garedipanchan attended the programme.
Training programme on "Scientific Crop & Water Management Strategies for Enhancing Income in Rice-based Production System" was organized at Garedipanchan village on 26.11.2025. About 76 numbers of farmers attended the programme.

Interaction meeting and Input Support:
25 nos. of interaction meeting were oraganized at different villages under SCSP programme.

Sl. No	Date	Village	Total Participant	Input Support
1	02.01.2025	Chanrapada	64	Kitchen Garden Kit (64pkts)
2	03.01.2025	Makundapur	52	Black Gram (4Qntl), Green Gram (1.8Qntl)
3	16.01.2025	Garedipanchan	39	Black Gram (276kg) Green Gram (224kg) and Rhizobium (12 bottle)
4	23.01.2025	Belera	46	Oyster Mushroom (250 Bottle) and Polythene
5	04.03.2025	Garedipanchan	44	Paddy Straw Mushroom (200bottle) and Polythene
6	04.04.2025	Belera	15	Bidge Garden(500gm), Cucumber(500gm), Spade(50nos), Brusher Cutter(2nos), Power Sprayer(3nos), Earth Auger Machine(1no), Power Thresher (1no), Insecticides(20 Bottle), Fungicide (15bottle)
7	08.04.2025	Garedipanchan	36	Spade (45nos), Power Sprayer (26nos), Power Thresher (1no), Galvanized Sheet (22 pis)
8	08.04.2025	Nijogakasoti	13	Power Thresher (1no), Spade(40 nos)
9	25.04.2025	Makundapur	10	Spade (58nos), Power Thresher(1no)
10	25.04.2025	Champapur	10	Spade (32nos), Power Thresher (1no)
11	22.05.2025	Nuagaon	1	Hand Sprayer(1no), Tomato, Chilli, Cucumber, Raddis, Palak (500gm), Nano Uria(1 bottle), Nano DAP(2 bottle), Rhizobium(2 bottle),Fungicide(2 Bottle), Herbicide (2 Bottle)
12	04.06.2025	Makundapur	39	Mango Sapling(250 Plant),Water tank 4, Barbed wire 13, Brush cutter 1, 3HP Earth Auger 1, Sprayer 6, Saw cutter 1, Water motter 1, Flexi delivery pipe 100m, Sucttion pipe 10m, Tarpulin 2, NRRI Endom(12 bottle)
13	04.06.2025	Belera	10	Mango Sapling 250, Sepeta45, Guava 75,Water tank 4, Barbed wire 7, Polithene Mulching 8 roll, Sprayer 3, Tarpulin 2,Nano DAP(30 bottle), Nano Uria(30 bottle), NRRI Endom (24 bottle)
14	10.06.2025	Makundapur	56	Paddy Seeds (13.5 Qntl)
15	10.06.2025	Belera	51	Paddy seeds (21 Qntl)
16	08.07.2025	Makundapur	62	Mango Sapling (35nos), Power Sprayer (2 nos),AyaanKresoxim Fungicide (100gm-15), Bispyribal sodium Herbicide (100gm-15), Thiamethoxam WG (500gm-5)
17	15.07.2025	Belera	71	Ayaan Kresoxim Fungicide (100gm-10), Thiamethoxam WG (500gm-5)
18	25.07.2025	Champapur	62	Brush Cutter(3nos), Sprayer Mannual (3nos), Battery Sprayer (3nos),Herbicide (6 Bottle), Thiamethoxam WG (500gm-5), Ayaan Kresoxim Fungicide (100gm-4)
19	30.07.2025	Chanrapada	64	Ayaan Kresoxim Fungicide (100gm-15), Bispyribal sodium Herbicide (100gm-15), Thiamethoxam WG (500gm-5)
20	08.08.2025	Nijogakasoti	62	Battery Sprayer (35nos),Submersible Pump 1, HDPE Pipe 55ft, Electric wire 55ft, Brusher Cutter 1, Earth Digger Machine 1, Rope 22m, Pump accessories 1 set, Garden french net 2 bondle, Barbed wire 4 bondle, Tarpulin 1,Bispyribal sodium Herbicide (100gm-12), Thiamethoxam WG (500gm-10), Ayaan Kresoxim Fungicide (100gm-4)

21	19.08.2025	Garedipanchan	64	Nano DAP (24 bottle),Thiamethoxam WG (500gm-12), Bispyribal sodium Herbicide (100gm-12), Ayaan Kresoxim Fungicide (100gm-3)
22	04.11.2025	Makundapur	19	Kitchen Garden Kit(100pkts),Power Weeder(1no), Shade Net 1 big bundle, Drip kit 1 box, Sprinkler plastic pipe 22 bundle(10 pis each bundle) Sprinkler Accessories 7 pkts, Sprinkler iron pipe 3 bundle
23	04.11.2025	Belera	17	Kitchen Garden Kit(100pkts),Power Weeder(1no), Shade Net 1 big bundle, Drip kit 1 box, Sprinkler plastic pipe 20 bundle (10 pis each bundle) Sprinkler Accessories (10 pkts), Sprinkler iron pipe (2 bundle)
24	13.11.2025	Belera	49	Black Gram(184kg), Green Gram(188kg)
25	13.11.2025	Makundapur	50	Black Gram(212kg), Green gram(400kg)
26	13.11.2025	Champapur	32	Black Gram(100kg), Green Gram(200kg)
27	20.11.2025	Kathapal	10	Black Gram(52kg), Green Gram(4kg)
28	26.11.2025	Garedipanchan	63	TrichoVir 1% SC (10 bottle), Pseudo Guard (10 pkts), Bio brave (10pkts), Onion red 4 seed(4kg)
29	02.12.2025	Garedipanchan	63	Black Gram(200kg), Green Gram(148kg), Tomato (100gm-12pkt), Chilli(50gm-10pkt), Garlic (200kg), Rhizobium(15 Bottle)
30	02.12.2025	Murudi, Bhatabandha, Chanrapada, Hansapada	89	Black Gram(525kg), Green Gram(660kg)
31	10.12.2025	Garedipanchan	32	Power Weeder 3, Sprinkler plastic pipe 155pis, Tarpulin 24 pis,Polythene mulching 36 roll, Drip kit 11 set, Sprayer 9no, Water tank 2no, Grow Bag 15no, Barbed wire 3 bundle, Sprinkler fitting 3 bag, iron pipe 1 bag,
32	10.12.2025	Parichanrapada	35	Kitchen garden kit (70 pkts),Water pipe (2 bundle), Fencing ho (3nos)
33	26.12.2025	Bhatabandha	40	Kitchen garden kit (40 pkts)

Interface Meting

Sl. No	Date	Village	District	Total Participant
1	03.01.2025	Champapur	Cuttack	16
2	25.04.2025	Belera	Cuttack	23
3	25.04.2025	Makundapur	Cuttack	42
4	25.04.2025	Champapur	Cuttack	16
5	02.06.2025	Balara	Puri	34
6	05.06.2025	Parichanrapada	Puri	86
7	11.09.2025	Mallick sahi, Balipatna	Khordha	11
8	11.09.2025	MathaSahi, Balipatna	Khordha	16
9	23.12.2025	Belera	Cuttack	220

Enhancing water and livelihoods security and improving water productivity in tribal dominated paddy fallow rainfed agro eco system of Odisha

Project: Farmer FIRST Programme (FFP)

Investigators: S.K. Mishra, H.K. Dash, B.S. Satapathy, S. Mohanty, P.Sahu, R.K. Jena and D. Sethi

Research and extension interventions under the ICAR-sponsored Farmer FIRST Project were implemented during 2025 in three tribal-dominated adopted villages of *Haridamada*, *Barapita*, and *Jamujhari* in Khordha district, Odisha, with the broad objective of enhancing agricultural farm productivity, water-use efficiency, climate resilience, farmers' income and livelihood security through need-based, location-specific and integrated farming system (IFS) approaches. Enriching knowledge, imparting skills, inculcating a positive attitude, and capacity-building of farmers were the major driving forces of the project interventions, wherein more than 340 farmers and farm women were directly benefited through five training-cum-demonstration programmes on crop protection measures in the field and horticultural crops, integrated soil-water-crop management, bio-fertilizer application, natural farming practices using *Jeevamrut*, *Beejamrut*, *Panchagavya*, *Ghana Jeevamrut,* and *Neemastra*, dual-purpose backyard poultry farming, mushroom cultivation, improved goat farming, and dairying. These interventions improved farmers' technical competence and promoted climate-resilient and income-generating farming systems. In addition, community-level convergence activities such as "*Health Camps*", "*Swachhata Hi Seva*" cleanliness drives, and plantation programmes under "*Ek Ped Maa Ke Naam*" were conducted for promoting the general well-being of family members, strengthening environmental awareness, and social participation. Across all interventions, more than 800 beneficiary farmers and farmwomen received critical inputs to facilitate on-field demonstration and adoption of improved technologies.

Crop production interventions focused on varietal replacement and improved agronomic management practices. Summer rice demonstrations involving varieties *CR Dhan 206* (aerobic), *CR Dhan 805* (BPH resistant) and *CR Dhan 807* (drought resilient and herbicide tolerant)were conducted in over 35 acres, while *Kharif* rice demonstrations covered about 100 acres using *CR Dhan 801* (climate smart - tolerant to both draught & submergence), *CR Dhan 409* (submergence tolerant)and *Pooja* (YSB resistant). Field monitoring confirmed improved crop establishment, higher tillering, and better crop vigour under recommended practices such as line transplanting, balanced nutrient management, and the use of natural farming inputs. Results from six Rice Field Days and nine Crop Cutting Experiments conducted during November–December 2025 indicated a grain yield advantage of 8–20% in improved varieties over local checks such as *Lal Kuber*, with *Pooja* recording the highest yield performance. Farmer-scientist interaction meetings and exposure visits further facilitated technology validation and adoption.

Horticultural interventions contributed significantly to crop diversification and nutritional security. These interventions were further intensified through targeted input support and improved management practices under horticultural demonstration modules. Key inputs included hybrid seeds of diverse vegetable crops such as okra, bitter gourd, watermelon, cucumber, pumpkin, brinjal, chilli, cowpea, tomato, beans, radish, and red amaranthus, benefiting over 100 farmers across the three adopted villages. In addition, 'Amrapali' grafted mango saplings were provided to 60 farmers, while papaya saplings (cv. Red Lady) were provided to 20 farmers to promote perennial fruit-based systems. Supportive inputs such as PSB bio-fertilizer, vermibeds, and *rabi* season vegetable seeds were supplied to 70 farmers as critical inputs, along with neem oil (25 litres) and selected plant protection chemicals for integrated pest management. Gravity-fed drip irrigation systems were demonstrated to improve water-use efficiency and supported the plantation of more than 500 pineapple suckers (cv. Queen). Further plantation activities in dugout sunken ponds were also undertaken to enhance diversified horticultural production of hybrid vegetable seeds covering solanaceous, cucurbitaceous, and leguminous crops.

Livestock and fisheries interventions were implemented as part of the integrated farming system approach. In the fisheries component, 1,500 fingerlings of Indian Major Carps (*Catla*, *Rohu*, and *Mrigal*) were stocked in farm ponds to develop composite aquaculture systems. Livestock interventions included the distribution of four '*Black Bengal*' breeding bucks and 2,100 improved poultry chicks (*Vanaraja*, *Vejaguda*, and *Rhode Island Red*), contributing to income diversification and nutritional security. Mushroom cultivation was promoted as a micro-enterprise through the distribution of 200 spawn bottles along with substrates and training support, benefiting over 90 farmers and farm women. Extension and institutional activities played a critical role in strengthening project outcomes. Several Farmer-scientist interaction meetings, field days, crop cutting experiments, and exposure visits to research institutions in Bhubaneswar enhanced knowledge exchange and entrepreneurial awareness among farmers. Health camps organized in collaboration with AIIMS, Bhubaneswar, provided medical screening and treatment to approximately 180 villagers, particularly focusing on non-communicable diseases. Continuous field monitoring ensured effective implementation and adoption of interventions, with farmers reporting high satisfaction regarding timely input supply and technical guidance. Recognition of project impact was reflected through important national awards such as the 'IARI Innovative Farmer Award 2025' and 'NAARM Best Farmer Award 2025', and documentation of success stories in IIWM *Jal Samachar*. Overall, the project demonstrated significant improvements in productivity, resource-use efficiency, diversification, and livelihood resilience in rainfed tribal agro-ecosystems.


Distribution of critical inputs to farmers


Field monitoring of demonstrated rice crops at vegetative and reproductive stages


Rice Field Day: Farmers, scientists, and B.Sc. (Ag) 4th year RAWE Internship students from SOA University, Bhubaneswar, visiting the demonstrated fields

Mera Gaon - Mera Gaurav Program

The flagship programme '*Mera Gaon- Mera Gaurav*' (MGMG) of the Government of India is being implemented in 33 adopted villages in 4 districts (Khordha, Puri, Nayagarh and Cuttack) of Odisha in seven clusters with the active participation of all scientists. Training programmes on crop and water management technologies were conducted in the adopted villages involving adopted farm families. Demonstrations on vegetables with ICAR-IIHR seed kits, raised bed nursery for production of healthy vegetable seedlings and backyard planting of grafted mango saplings were conducted by providing critical inputs. Over 500 farmers and farm women participated and got benefited through various demonstrations, farmers-scientists interaction meetings and capacity building programmes during 2025. In order to give a boost to the 'Green Drive Initiatives' through '*Ek Ped Maa Ke Naam*', and '*Meri LiFE*' (Lifestyle For Environment) Missions by the central government, 650 grafted mango saplings of five varieties and 500 IIHR & NHRD nutri-garden vegetable seed kits were distributed to 500 participating farmers & farmwomen as part of the *Swachha Bharat Abhiyan*.

Institute Technology Management Unit (ITMU) under National Agricultural Innovation Fund (NAIF) Project

Associated Scientists: S. K. Jena, D. Sethi, and Ajit Kumar Nayak

The project on Institute Technology Management Unit (ITMU) which is funded by National Agricultural Innovation Fund, various activities for Intellectual property right initiatives were undertaken. There were four ITMC meetings in which IPR related applications were considered. World Intellectual Property Day was celebrated on May 1, 2025 at ICAR-IIWM, Bhubaneswar. A lecture on "Role of IP rights such as Patent, Trademarks, Copyrights etc. in Agricultural Water Management Research" was delivered by the Director, ICAR-IIWM. Worldwide, this 2025World IP day theme highlighted how creativity and innovation, backed by IP rights, keep a thriving music scene that benefits everyone, everywhere. The World IP Day 2025 invited us to explore how IP rights and innovation policies empower creators, innovators, and entrepreneurs to bring fresh ideas to the music industry, safeguarding the work of songwriters, composers, performers, and all those who shape the music that moves us.

- ICAR-IIWM applied software copyright application for the "Agricultural Water Management Information System (AWMIS)" headed by Dr Ashok Kumar Nayak and team.
- ICAR-IIWM applied software copyright application for the "Water demand calculator" headed by Dr Susanta Kumar Jena and team and it was registered.
- ICAR-IIWM applied software copyright application for the "Evapotranspiration and Crop Water Requirement Calculator" headed by Dr Susanta Kumar Jena and team.
- ICAR-IIWM applied software copyright application for the "App on Optimum micro irrigation scheduling information system" headed by Er Ajit Kumar Nayak and team.
- Dr. Susanta Kumar Jena, PI and I/C ITMU attended three ITMC meetings of CIFA as an external member during 2025.

ITMC meeting held at ICAR-IIWM, Bhubaneswar

AICRP on Irrigation Water Management

Theme 1

Assessment of surface and groundwater resources

Water resources budgeting for Tamil Nadu (Coimbatore centre)

Water resource budgeting for the state of Tamil Nadu was done to develop a comprehensive plan using a river basin approach for Aliyar sub-basin. Water balance analysis (2018–2024) revealed that Aliyar sub-basin receives an average annual rainfall of 912 mm, yet experiences a persistent deficit because evapotranspiration (~1295 mm/year) consistently exceeds precipitation. Of the total rainfall, only 26% contributes to surface runoff and 11% to groundwater recharge, indicating limited effective water availability. Soil moisture storage averages around 248 mm, helping buffer short-term variability but insufficient to offset long-term deficits. Seasonal analysis showed strong dependence on monsoon, with the southwest and northeast monsoon periods contributing most of the water, while summer months (March–May) face acute scarcity.

Water availability in the basin is highly variable, ranging from 48.36 MCM (2019) to 108.20 MCM (2020), with an average of 79.18 MCM annually. Reservoir releases contribute approximately 82.3% of total water supply, while groundwater recharge accounts for 17.7%, highlighting heavy dependence on controlled water releases. In contrast, annual water demand ranges between 153 and 174 MCM, consistently exceeding the water supply. Agriculture dominates water consumption, accounting for 93.6% of total water demand, followed by domestic (4.4%), livestock (1.3%), and industrial (0.6%) uses. The average annual irrigation demand alone is about 153.9 MCM, driven by crop evapotranspiration (~261.86 MCM) and effective rainfall (~41.2%). A major concern is the large volume of unutilized runoff (around 67–100% of available water), indicating significant potential for water harvesting. Additionally, a mismatch between peak demand (winter cropping season) and water availability further intensifies water stress. Monthly water balance patterns for the year 2030 compared with the baseline period (2018-24) reveals a consistent temporal mismatch that is, intensified monsoon rainfall generates surpluses, while high agricultural demand drives severe winter in a year. This seasonal volatility renders annual surplus figures misleading, as climate change shifts precipitation toward intense downpours that increase unutilized runoff (111.7–148.4 MCM annually) rather than useful soil moisture.

Identification and revival of traditional *hyran* (spring) system in Aravalli foothills of Udaipur district *(Udaipur centre)*

Traditional *hyran*, in the Aravali hill region of Udaipur district, is the major source of irrigation for the local tribal farmers. Owing to the alarming rate of drying of springs and deterioration in spring water quality in the Aravalli foothills, a study was conducted for spring revival through adoption of various conservation measures. Five perennial springs namely, Kamleshwar Mahadev Spring, Pipliya Ji Spring, Madri Spring, Dodawali Spring and Alsigarh Pai Spring were identified using community-led inventory. Maximum discharge was recorded in the month of September i.e. 16.0-29.5 lps, 16.2-29.1 lps and 17.0-31.0 lps and minimum discharge was found in May i.e. 3.0-15.0 lps, 4.1-15.0 lps and 4.5-15.5 lps during the years 2022, 2023 and 2024, respectively. Among the five springs, Kamleshwar Mahadev Spring showed maximum variation in spring discharge during pre- and post-monsoon recording 15 lps in 2022, 14.2 lps in 2023 and 16.0 lps in 2024. Area irrigated under the springs (command area) showed maximum area (41 ha) under Alsigarh Pai Spring followed by Kamleshwar Mahadev Spring (29 ha), Pipliya Ji Spring (25 ha), Madri Spring (24 ha) and Dodawali Spring (18 ha). Water quality i.e. pH, EC and TDS were as good as rainwater quality in all the five springs. Sustainable management plan of the springs was suggested by managing the springs as part of a larger springshed.

Theme 2

Rainwater harvesting and groundwater recharge

Use of harvested roof top rain water for irrigating year round off-season vegetable crops in polyhouse *(Jorhat centre)*

The study was conducted to explore a way to cut down exploitation of groundwater to grow off-season crops throughout the year in protected condition using harvested rainwater. Low cost bamboo based polyhouse was built with a dimension of 20 m length and 5 m breath with a floor area of 100 m^2, and top of the polyhouse was covered by UV stabilized polyfilm of 200 micron thickness. The polyhouse was covered by insect proof net up to a height of 1.2 m from the base for preventing insect entry. Rainwater was collected from the roof top of the polyhouse through gutters, made of PVC of 5 inch diameter and 1% slope, placed at either side of the polyhouse. Harvested rainwater was collected in a syntex tank of 1000 L placed on a bamboo platform at a height of 0.75 m from the ground. Three crops i.e. cucumber (December-February) - tomato (March-July) - capsicum (August-November) were grown organically inside the polyhouse using gravity-fed drip irrigation with the stored water in the tank using 2 lph drippers along with laterals, main and sub-main pipes. Irrigation water requirement for drip irrigation was calculated based on water requirement of different polyhouse crops. The crops were fertigated by using 19:19:19 grade NPK water soluble fertilizer. The dose of fertigation adopted for 58.4 g of 19:19:19 along with 24.4 g MOP for cucumber, 70 g of 19:19:19 along with 10 g urea for tomato, and 52.5 g 19:19:19 + 24.2 g urea for capsicum.

Results showed that mean yield of cucumber (var. Malini), tomato (var.Anoop) and capsicum (var.Mahabharat) was 660, 580 and 520 kg/100 m^2, respectively. Water budgeting for polyhouse sequential crops showed potential collection of 124047 L, actual collection of 41583 L, with total water requirement of 59788 L. Thus, there is water deficit of 18205 L.This water deficit for the year round cultivation of vegetable crops (Cucumber-Tomato-Capsicum) can be effectively resolved by increasing the number of tanks bearing a total capacity of 10,000 L. Water use efficiency was 73.3, 20.0 and 23.6 kg/m^3 for cucumber, tomato and capsicum, respectively. This gutter fitted polyhouse with gravity based drip fertigation system can fetch a gross annual income of Rs. 19800 from cucumber, Rs. 23200 from tomato and Rs. 31200 from capsicum along with a benefit-cost ratio of 1.46 with hired labour and 3.53 without hired labour.

Recharge potential of village ponds in over-exploited blocks of Punjab

(Ludhiana centre)

In Punjab, shrinking and degradation of the village ponds have occurred due to negligence, encroachment, and converting them into waste disposal sites. A study was conducted using advanced tools like remote sensing and GIS to systematically assess the status and potential of village ponds in water conservation and groundwater recharge in the blocks where groundwater is over-exploited blocks and depletion of water table is alarming. The study employed a geospatial approach integrating remote sensing and GIS techniques to map and analyze village ponds. It was conducted across 117 over-exploited blocks of Punjab. Sentinel-2 multispectral imagery for March 2017 and March 2023 was acquired and processed using Google Earth Pro and QGIS. Three spectral indices *viz.*, NDWI, MNDWI, and NDPI were computed to identify water bodies. Change detection analysis was performed by overlaying pond maps of 2017 and 2023 to identify spatial variations such as expansion, contraction, or disappearance.

The analysis revealed significant variation in the performance of different spectral indices in delineating village ponds. NDWI identified 3,837 ponds covering 647.65 ha but underestimated pond area due to limitations in distinguishing small or shallow water bodies. NDPI achieved about 77–80% efficiency in pond detection and 58–60% accuracy in area estimation, making it the most reliable spectral method. Whereas, manual digitization identified 14,854 ponds with a total area of 7,711.51 ha, serving as the most accurate reference. Field validation confirmed strong agreement between mapped and actual pond locations. The analysis of village ponds for March 2017 and March 2023 revealed significant spatial and temporal variations in pond area and number across the overexploited blocks of Punjab. Total pond area declined from 4,870.70 ha in 2017 to 4,518.75 ha in 2023, resulting in a net loss of 351.95 ha, mainly due to the shrinkage or disappearance of small and irregular ponds. There is a consistent reduction in pond area, with an average decline of about 17.6 ha per district. It was concluded that NDPI proved to be the most effective spectral index for pond delineation, offering a practical balance between accuracy and efficiency. The observed decline of 351.95 ha in pond area over six years indicates that geospatial techniques can be integrated with conservation policies to support large-scale monitoring and rejuvenation of village ponds in Punjab and thereby support groundwater recharge.

Theme 3

Irrigation scheduling and fertigation

Standardization of organic fertigation schedule for banana var. Nendran *(Chalakudy centre)*

A study was conducted to evaluate the effect of drip schedules involving organic, inorganic, and integrated nutrient management practices on Nendran banana. The experiment included seven fertigation treatments i.e. T_1:Cow urine + neem cake + groundnut cake + water (5:1:1:50) and Sulphate of Potash (SOP), T_2: Vermiwash + panchagavya + fish amino acid + water (5:1:1:50) and SOP, T_3: Cow urine + vermiwash + water (1:1:20) and SOP, T_4: Organic POP recommendation, T_5: Inorganic POP recommendation, T_6: 50% organic + 50% inorganic fertilizers, and T_7: 75% organic + 25% inorganic fertilizers.

Results showed that the highest yield was obtained with T_5 (24.84 t/ha), but statistically at par with T_1, T_2 and T_6. Economic analysis revealed that T_1 recorded the highest benefit–cost ratio of 1.98, indicating better cost effectiveness due to the higher price of organic produce in the market, and it was found at par with treatments T_4 (1.71) and T_5 (1.45). Organic fertigation also showed significant influence on banana quality. Fruit acidity was significantly higher in T_3 among the treatments. It is concluded that organic treatment enhances the fruit quality in contrast to inorganic fertilization.

Response of drip fertigation on growth and yield of papaya under Red Ferruginous soils of Konkan *(Dapoli centre)*

A study was conducted to optimize drip fertigation schedule in papaya local cultivar SP-130-1-1 in red ferrogenous soils of Konkan. The treatments comprised of T_1: 100% N through fertigation and 100% P & K through conventional fertilizers, T_2: 100% N & K through fertigation and 100% P through conventional fertilizers, T_3: 100% NPK through fertigation, T_4: 25% NPK through conventional fertilizers and 75% NPK through fertigation, T_5: 75% N through fertigation and 75% P & K through conventional fertilizers, T_6: 75% N & K through fertigation and 75% P through conventional fertilizers, T_7: 75% NPK through fertigation, T_8: 25% NPK of 75% through conventional fertilizers and remaining NPK through fertigation, T_9: 100% NPK through conventional fertilizers and method, and T_{10}: Absolute control (no fertilizerDrip irrigation was applied on alternate days with 92.2% efficiency, and fertigation was scheduled weekly from October to May. Results showed that plant growth, yield and water use efficiency due to fertigation treatments significantly improved. The highest number of fruits per plant (25.75) and yield (61.07 t/ha) was observed in T_4 (25% NPK conventional + 75% NPK fertigation), which was significantly superior to most treatments and the control (22.85 t/ha). Water use efficiency was also highest in T_4 (23.2 kg/ha-mm) compared to 8.7 kg/ha-mm in the control. Economic analysis revealed that T_1 fetched highest net return of Rs. 6,49,641/ha with a benefit-cost ratio of 2.18, followed by T_5 (net return- Rs. 763159 and B:C- 2.09). Thus, it was recommended to adopt drip irrigation on alternate days from November to May, combined with fertigation scheduling in the lateritic soils of Konkan region.

Effect of water application through vertical inserted pipe in clay soil with different levels of irrigation and fertigation on growth and yield of sapota *(Navsari centre)*

A study was conducted to optimize the application of irrigation water and fertilizer through drip irrigation to improve water and fertilizer use efficiencies in South Gujarat. Sapota var. *Kalipatti* was grown with four treatments of subsurface drip irrigation levels *i.e.*, 0.40 ETc (I_1), 0.60 ETc (I_2), 0.80 ETc (I_3), 0.75 ETc (I_4) and three fertigation treatments *i.e.*, 60% recommended dose (RD) of N&K (F_1), 80% RD of N&K (F_2) and 100% RD of N&K (F_3) each applied in 10 splits. Two equal splits of P were applied as basal. Drip irrigation in I_1, I_2 and I_3 were applied at 45 cm below ground level using 75 mm diameter HDPE pipes (vertically inserted) connected with 8 lph drippers through spaghetti tubes, whereas I_4 is Control with surface drip irrigation. The highest fruit yield of 44.45 kg/tree was under 0.80 ETc (I_3), which was at par with 0.60 ETc (43.00 kg/tree), but significantly superior to I_1 and Control. Among the fertigation levels, F_3 produced highest sapota yield (42.34 kg/tree), though it remained at par with F_2 (41.30 kg/tree). Water productivity was highest in I_1 (26.16 kg/m^3) followed by I_2 (19.06 kg/m^3), indicating efficient water use under deficit irrigation. Fertilizer use efficiency was highest under the interaction effect I_3F_2 showing highest nitrogen use efficiency of 50.5%, phosphorus use efficiency of 21.0% and potassium use efficiency of 51.3%. Economic analysis indicated that I_3 yielded highest net income of Rs. 1,70,967/ha and benefit-cost ratio of 2.40 followed by I_2. Among the fertigation levels, F_3 gave highest net income of Rs. 1,62,819/ha while F_2 recorded highest benefit-cost ratio of 2.26.

Effect of different microirrigation systems on crop and water productivity in onion cultivation *(Jabalpur centre)*

A study was conducted to evaluate performance of onion var. *Prashant Fursungi* under different irrigation systems to analyze crop performance and identify an efficient irrigation method that enhances yield while conserving water resources. The experiment was done in RBD with four irrigation treatments *viz.*, conventional practice (flood irrigation), perforated pipe irrigation system, drip irrigation system, and micro-sprinkler irrigation system. Each treatment was replicated five times. Recommended fertilizer dose of NPK (110:40:60 kg/ha) was applied. A significant difference among irrigation treatments in terms of growth, yield, and water productivity was observed. The average bulb weight of onion was maximum under drip irrigation (102.60 g), followed by perforated pipe irrigation (98.32 g), while conventional irrigation recorded the lowest bulb weight (84.50 g). Tuber yield was significantly influenced by irrigation methods, with drip irrigation producing the highest yield of 28.76 t/ha, followed by perforated pipe irrigation (24.83 t/ha), micro-sprinkler (22.40 t/ha), and conventional irrigation (19.36 t/ha). Water productivity was also highest under drip irrigation (9.30 kg/m^3), which was substantially greater than micro-sprinkler (6.80 kg/m^3), perforated pipe (6.03 kg/m^3), and conventional irrigation (1.81 kg/m^3). Therefore, drip irrigation is strongly recommended for onion farmers in Jabalpur region aiming to maximize yield and water use efficiency, especially in water-scarce regions.

Theme 4

Basic studies on soil-plant-water relationships

Effect of different levels of saline water and mulching on drip irrigated summer okra in coastal saline soil *(Navsari centre)*

A study was undertaken with okra (var. GAO-5) grown in summer followed by *kharif* rice (var. GNR-3) in the coastal saline-sodic soils of Navsari to mitigate the adverse effect of saline irrigation water with better water use through micro irrigation and mulching. Treatments included salinity levels, S_1: Best available water (BAW), S_2: 2 dS/m, S_3: 4 dS/m, S_4: 6 dS/m, and mulching, M_1: No mulch, M_2: Sugarcane trash mulch (STM) @ 5 t/ha, M_3: Silver black plastic mulch (SBPM) of 25 μ thickness with 50% coverage. Drip irrigation system was operated at 0.8 PE on alternate days. Results showed that interaction effect of saline water irrigation (2 dS/m) and SBPM i.e. S_2M_3 gave significantly higher okra pod yield of 18.00 t/ha, but it was found at par with S_1M_2, S_2M_2, S_1M_3 and S_3M_3. In okra leaves, Na/Ca and Na/K were found to be highest in S_4M_1 (0.45) andS_4M_2 (26), respectively. Economic analysis showed that net income was maximum for S_2M_3i.e. Rs. 2,19,482/ha, with S_1M_3 and S_3M_3 slightly lower at Rs. 2,18,222 and Rs. 2,17,502/ha, leading to corresponding benefit–cost ratios of 2.10, 2.09, and 2.08, respectively. It was concluded that application of irrigation water with an electrical conductivity (EC) of 2 dS/m resulted in growth parameters comparable to those under best available water (BAW), while higher salinity levels of 4 and 6 dS/m reduced plant growth. Application of saline water of 4 dS/m combined with SBPM (S_3M_3) still supported relatively high yield (17.89 t/ha), indicating its potential use under limited freshwater availability.

Modeling spatiotemporal dynamics of soil water and nitrogen under different land configuration and fertilizer doses for rabi maize in eastern Indo-Gangetic plains *(Pusa centre)*

A field experiment was conducted on *rabi* maize to assess spatiotemporal dynamics of soil water and nitrogen under different land configurations and fertilizer application rates, supported by numerical simulation using HYDRUS-2D model. The model was run to estimate soil N dynamics of different forms under different land configurations and fertilization scenarios. The experiment compared two land configuration treatments *viz.*, flat sown (S_1) and raised bed (S_2), and four fertilizer treatments i.e. Control (F_0), recommended dose of fertilizer (F_1: 150-75-50 kg NPK/ha), soil test crop response (F_2: STCR @ 180-52-23 kg NPK/ha), and farmer's practice (F_3) (Fig. 4). Results revealed that among, the nutrient management practices, soil test crop response (STCR)-based fertilizer recommendation (F_2) proved most effective in optimizing soil moisture retention at different soil depths (0-15 cm, 15-30 cm and 30-45 cm) and nitrogen use efficiency. This may be due to better nitrogen availability that supports efficient plant water use. F_2 also resulted in higher nitrate (NO_3^-–N) availability in surface soil layer while substantially reducing nitrate leaching relative to the Control (F_0) and Farmer's practice (F_3). The combined application of bed planting and STCR also led to superior light interception and higher leaf area index (LAI), contributing to increased biomass accumulation and improved crop productivity. HYDRUS-2D model successfully simulated temporal and spatial variations of water, root water uptake, and NO_3^-–N movement within the soil profile with acceptable precision, thereby demonstrating its effectiveness as a decision support tool.

Estimation of crop coefficient for sugarcane under drip irrigation

(Bhavanisagar centre)

Study was conducted to estimate crop coefficient (K_c) of sugarcane at different growth stages under drip irrigation using tensiometer and develop an optimal irrigation schedule based on the estimated K_c values for achieving higher productivity in the Western Zone of Tamil Nadu. Reference evapotranspiration (ET_o) was estimated using FAO Penman–Monteith method based on local meteorological data. Actual crop evapotranspiration (ET_c) was determined using soil water balance approach, which considers inputs such as irrigation and precipitation and outputs like runoff, deep percolation, and changes in soil moisture storage. Crop coefficient estimated using the relationship $K_c = ET_c/ET_o$ varied across the growth stages of sugarcane crop. During the initial stage (90 days), K_c ranged from 0.52 to 0.56, which was higher than FAO recommended value of 0.4. In the mid or grand growth stage (150 days), K_c values ranged from 1.36 to 1.56, exceeding the FAO value of 1.25, indicating higher crop water demand during this period. In the late stage (60 days), K_c ranged from 0.81 to 0.85 compared to FAO value of 0.75. Sugarcane yield was 95 t/ha under 80% K_c, 115 t/ha under 100% K_c (control), and 125 t/ha under 120% K_c. Highest yield with 120% K_c suggested that slightly higher water application than standard recommendation may enhance productivity under local conditions. The study emphasized the importance of precise irrigation scheduling using locally derived K_c values for improving water use efficiency and yield of sugarcane.

Agri-Consortia Research Platform on Water

Theme 1

Development and Management of Surface Water Resources and Soil Moisture in Different Agro-ecological Regions of India using Geoinformatics

Investigators: S. K. Jena, D. Sethi and B. S. Satapathy

Development and Management of Surface Water Resources in different agro-ecological regions of India using geoinformatics" progress was made in the two identified study basins-the surplus Mahanadi basin and the deficit upper Krishna basin (Bhima sub-basin). The study focused on assessing the hydrological behavior of the Kantamal and Dhond watershed using Soil and Water Assessment Tool (SWAT) modelling by performing sensitivity analysis, calibration, and validation through SWAT- CUP. The Upper Bhima Basin, situated in the Daund region of Maharashtra, India, is a sub-basin of the Bhima River within the Krishna River system. It covers an area of 11,205 km^2 and is crucial for its agricultural and hydrological significance. The basin's geographical coordinates are approximately 17.5°N to 18.5°N latitude and 74.5°E to 75.5°E longitude. This study sets up the SWAT model with 49 sub-basins and 338 HRUs for the Kantamal region. In comparison, the Daund region was represented by 27 sub-basins and 213 HRUs, with calibration performed at a daily time step. The monthly calibration involved six iterations of 250 simulations each, totaling 1500 simulations, achieving excellent model performance as indicated in the daily calibration results. Key metrics showed significant results: NSE = 0.75, KGE = 0.74, R^2 = 0.75, PBIAS = -14.9 %, P-factor = 0.65, and R-factor = 0.27 for Kantamal region; NSE = 0.65, KGE = 0.63, R^2 = 0.68, PBIAS = -19.5 %, P-factor = 0.53, and R-factor = 0.19 for Daund region, indicating strong calibration at the monthly scale. The validation period also yielded good performance. Fourteen calibration parameters were utilized, informed by existing literature and local knowledge, with additional insights on parameter sensitivity and model uncertainty provided. A water balance analysis of the Kantamal and Daund regions shows distinct hydrological patterns affected by climatic and physiographic conditions. Kantamal receives about 1488 mm of annual precipitation, with 35% lost to evapotranspiration, 37% as surface runoff, and 28% infiltrating into the subsurface for groundwater recharge. In contrast, Daund, with 916 mm of precipitation, experiences 45% loss to evapotranspiration and 36% surface runoff, while only 19% infiltrates. This assessment underscores the different hydrological responses shaped by precipitation variability and local environmental factors in both regions.

Development and impact evaluation of eco-Friendly rubber material for the lining of water harvesting structures was initiated at ICAR-IIWM campus, and the system is working satisfactorily with no leakage and loss is only through evaporation Three types of rubber lining material (EPDM (P), EPDM (E), Bromobutyl), were tested in the small experimental pond (5m x 5m x 2m depth) and there is no leakage. The water level of the pond was measured daily using an ICAR IIWM micro pan evaporometer and a USWB class A pan evaporometer to compare the evaporation losses from the rubber lined experimental ponds.

For automation of rubber dam, a water level ultrasonic sensor regulates the inflation and deflation process by controlling the pump and valves based on water levels in channels. The pump operation has been made IoT enabled. The deflation mechanism has been made command based. When command is given through mobile phone, the pump gets activated for inflation or it gets deflated through command. The automated deflation through ultrasonic sensor mechanism is under progress.

Theme 2

Automated Canal Irrigation System for Efficient and Smart Irrigation Water Management

Investigators: R.K. Panda, K.K. Bandyopadhyay, Ashok K. Nayak, P.K. Panda, S. Pradhan, D. Sethi, Ajit K. Nayak and A.M. Jadhav

During the period under report, the catchment, the minor irrigation reservoir and the command area of the *Darpanarayanpur* Minor Irrigation Project (MIP) was delineated in GIS platform. The cropping system of the study region is predominantly rice during *kharif,* followed by fallow in the *rabi* season. There was inequitable water supply in the head and tail reaches of the command and the rostering was based on the available water without any real-time monitoring of the water delivered to fields through each outlet. There was low cropping intensity with limited crop diversification. Prior to the operation of the canal automation, a baseline survey was undertaken using the data acquired from 54 farmers across 12 field outlets (head, middle, and tail reaches) of the command. The study revealed Cultivable Land Utilization Index (CLUI), Crop Productivity Index(CPI), Rice cropping intensity (CI), Crop Fertilization Index (CFI), Irrigation water productivity, Partial Factor Productivity of Fertilizer (PFPF) and Gross Benefit-Cost Ratio (B:C) were 0.243-0.369, 0.193-1.000, 100-200%, 0.271-2.350, 0.62, 3.7-65.2 and 1.01-5.02, respectively.

The SWAT model was used to estimate the impacts of land use, climate, and management practices on reservoir catchment hydrology and sediment yield. Using the data of 2024, the simulation model resulted in a surface runoff of 492.82 mm (approx. 35% of rainfall depth of 1401 mm) and sediment yield of 16.56 t/ha. Soil water storage of 281.23 mm indicated moderate but seasonally variable root-zone moisture, while the water yield of 932.08 mm (approx. 67% of rainfall depth) was observed. The significant gap between PET (1466.95 mm) and AET (586.77 mm) indicated significant climatic water stress which necessitated canal automation-enabled, demand-based irrigation to ensure water availability during the *rabi* season to enhance agricultural water productivity and improve system resilience under a changing climate.

Impact evaluation of the canal automation project indicates that canal automation led to 28% irrigation water saving compared to the previous supply-based system, enhanced conveyance efficiency (62% to 81%), and increased cropping intensity through pulse cultivation using saved water and residual moisture in rice fallows. Analysis of *kharif* 2024-2025 data showed an increase in rice water productivity from 0.42 to 0.49 kg/m^3. Despite multiple dry spells during this period, assured water availability through automation enabled timely nursery raising at the tail end and enhanced resilience to climatic variability. Assured irrigation by the stored water in the reservoir converted rice fallow land into productive *rabi* cropping and increased land productivity besides increasing the *kharif* rice yield by 9.4% after the operation of canal automation and short term changes in cropping intensity and income of the stakeholders were observed (Table 14).

Table 14. Observed short term changes in cropping intensity and income of the stakeholders due to the canal automation

	Pre-automation	Post-automation	Change	Reasons of the change
Cropping intensity	100%	165%	+65%	Optimal, timely and uniform water application
Water productivity	0.47	0.63	+34%	Optimal irrigation supply
Income of the stakeholders	Rs. 4,000/ha/year	Rs. 1,02,000/ha/year	+59%	Higher yield of the crops and lower use of inputs

Canal automation ensured uniform water availability and efficiency across all reaches. Upper and middle reaches exhibited improved productivity and cropping intensity due to better hydraulic control and reduced losses. In the lower reach, water reliability increased from 55-60% to ~90%, rice productivity from 0.32 to 0.58 kg/m^3, and the irrigated area from 65% to 95%, enabling crop diversification and convergence in overall command performance (Table 15).

Table 15. Water productivity and crop diversification before and after the canal automation project

Canal reach	Indicator	Before automation	After automation	Change (%)
Upper and middle reach	Water delivery reliability (%)	70	95	35.7%
	Irrigated area coverage (%)	100	165	65%
	Rice water productivity(kg/m^3)	0.47	0.63	34.0%
	Crop diversification	1 (Paddy)	3 (Green gram, Peas, Mustard)	

Lower reach	Water delivery reliability (%)	55	90	63.6%
	Irrigated area coverage (%)	65	95	46.2%
	Rice water productivity (kg/m^3)	0.32	0.58	81.2%
	Crop diversification	0-1 (Paddy)	3 (Green gram, Peas, Mustard)	

Theme 3

Improving Groundwater Sustainability through analyzing Groundwater-Energy Nexus

Investigators: R. R. Sethi and Ankhila R. H

A study was conducted to analyze variations in groundwater depth, energy use, and emissions across different blocks of Nayagarh district of Odisha. During the pre-monsoon season, the deepest groundwater level was recorded in Ranapur (9.08 m), while Gania had the shallowest depth (5.75 m), with Ranapur showing the highest seasonal fluctuation of 2.80 m, indicating greater groundwater stress. The analysis of groundwater pumping in Nayagarh district shows that dug wells, which are the most common structures (2103 units), use the most energy and produce the highest carbon and CO_2 emissions. Dug wells, the most common structures, consume the highest energy and produce the largest carbon and CO_2 emissions. Ranapur emerged as the most energy- and emission-intensive block, with diesel pumps in medium and deep tube wells consuming up to 0.048 kWh m^{-3} and emitting 0.128 kg CO_2 m^{-3}. Across all structures, diesel pumps generated 3– 4 times more CO_2 per cubic meter than electric pumps. In Odagaon, there was the highest diesel energy use (0.173 kWh m^{-3}) and notable electric energy consumption (0.112 kWh m^{-3}), reflecting intensive irrigation demand. Ranapur led in electric consumption (0.134 kWh m^{-3}) alongside high diesel use (0.143 kWh m^{-3}), indicative of mechanized extraction. Nayagarh and Khandapara had moderate but balanced reliance on diesel and electric pumps. Dasapalla leaned slightly more on diesel (0.124 vs. 0.078 kWh/m^3 electric), while Nuagaon used nearly equal amounts at lower levels. Bhapur depended solely on diesel (0.051 kWh/m^3), and Gania recorded the lowest diesel (0.029 kWh/m^3) and electric (0.018 kWh/m^3) use. Carbon and CO_2 emissions followed similar trends. Odagaon recorded the highest emissions from diesel pumps (0.127 kg C/m^3; 0.465 kg CO_2/m^3) and significant electric emissions (0.031 kg C/m^3; 0.114 kg CO_2/m^3), while Ranapur followed closely. Nayagarh and Khandapara contributed moderately high emissions, whereas Bhapur and Gania were the lowest emitters. Diesel pumps consistently produced substantially higher emissions than electric pumps, highlighting the environmental benefits of transitioning to electric and solar-powered irrigation.

Theme 4

IoT Enabled Sensor-Based Smart Irrigation Management System

Investigators: A. Nayak, D. Sethi, S. Pradhan, P. Sahu

Field experiments were conducted at a farmer's field in Bhakarsahi (Balipatna Tehsil, Khurda District, Odisha) and at the ICAR–IIWM research farm, Mendhasal, Khurda, to evaluate the performance of the IoT-based smart irrigation system. The experimental setup consisted of a drip irrigation system with two emitters (8 LPH per plant) installed on 16 mm laterals, positioned 25 cm from each plant, achieving a distribution uniformity of 95%. The crop selected was banana (variety: Grand Naine), planted at a spacing of 1.8 m × 1.8 m. The experiment was designed using a Randomized Block Design (RBD) with seven replications. Each replication included 32 plants, resulting in 224 plants per treatment and a total of 672 plants across all treatments. Three irrigation treatments were evaluated: T_1: IoT-based drip fertigation, T_2: Timer-based drip fertigation, and T_3: Farmer's conventional practice (ring basin irrigation), and each treatment was replicated seven times. An irrigation water saving of 21% was observed under the automatic drip system compared to the basin irrigation system. The total soluble solids (TSS) were slightly higher in the automatic drip system (15.5 °Brix) than in the basin irrigation system (14.7 °Brix). The titratable acidity was lower under the automatic drip system (0.15%) compared to the basin irrigation system (0.18%). Similarly, the pulp pH was 5.2 under the automatic drip system and 5.5 under the basin irrigation system. The yield was also higher under the automatic drip system (59.3 t/ha) compared to the basin irrigation system (52.4 t/ha).

WEATHER REPORT

The average maximum and minimum temperatures were 31.82°C and 21.36°C, respectively. The highest maximum temperature of 37.98°C was recorded during Standard Meteorological Week (SMW) 19, while the lowest minimum temperature of 11.86°C was observed during SMW 50. The average maximum and minimum relative humidity were 93.65% and 59.13%, respectively. The highest relative humidity of 95.99% was recorded during SMW 36, whereas the lowest minimum relative humidity of 27.07% was observed during SMW 10. The average solar radiation value was 15.35 hours, with the highest value of 23.02 hours recorded during SMW 19. The total rainfall received between 1 January 2025 and 31 December 2025 was 1588.8 mm, with the highest weekly rainfall of 153.0 mm recorded during SMW 26.

The average soil maximum temperature at 5 cm depth was 39.13 ^{0}C, with the highest temperature of 53.29 ^{0}C recorded during SMW 14, while the lowest temperature of 28.77 ^{0}C was observed during SMW 51. The average soil minimum temperature at 5 cm depth was 24.22 ^{0}C, with the highest temperature of 29.83 ^{0}C recorded during SMW 20, whereas the lowest temperature of 15.58 ^{0}C was observed during SMW 3. The average soil maximum temperature at 10 cm depth was 34.26 ^{0}C, with the highest temperature of 42.89 ^{0}C recorded during SMW 14, while the lowest temperature of 25.52 ^{0}C was observed during SMW 51. The average soil minimum temperature at 10 cm depth was 25.95 ^{0}C, with the highest temperature of 31.63^{0}C recorded during SMW 20, whereas the lowest temperature of 18.20^{0}C was observed during SMW 2. Overall, soil temperature at 5 cm depth showed greater fluctuations compared to 10 cm depth, indicating that deeper soil layers maintained relatively more stable thermal conditions throughout the year (Fig. 18).

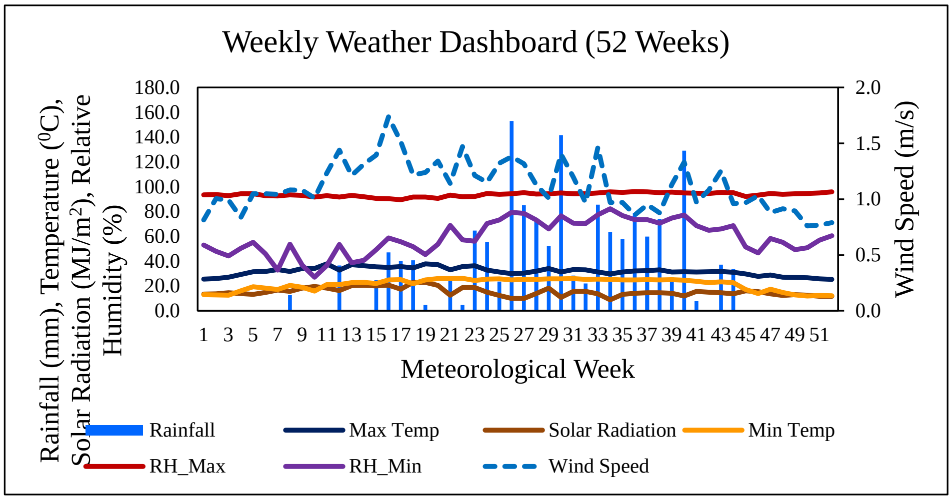


Fig. 18: Weekly weather during year 2025

Agro-Advisory Services

Comprehensive weather-based agro-advisories have been systematically prepared and disseminated to the farming community across Odisha on a fortnightly basis. These advisories integrate the 15-day extended range weather forecast issued by the India Meteorological Department (IMD) with scientifically curated, crop-specific farm management recommendations. The guidance encompasses critical aspects such as water resource management, judicious irrigation scheduling, balanced fertilizer application and nutrient management, integrated pest management, and disease surveillance and control. Special emphasis is placed on major regional crops including rice, vegetables, pulses, sugarcane, and oilseeds, enabling farmers to make informed, climate-resilient agricultural decisions and optimize productivity. The advisories are disseminated widely through the Institute's official website and various digital outreach platforms, including Twitter and Facebook, ensuring timely and broader access to critical farm advisory services.

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2. Mohanty, R.K., Ankhila, R.H., Mishra, S.K., Sahu, P., Dash, H.K., Sethi, D., Panda, P.K. and Sarangi, A. (2025). Strategies for promoting start-ups in the water sector. Policy Brief-05, ICAR-IIWM, 36p.
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2. Jena, R.K., Roy, P.D., Jha, A., Moharana, P.C., Sharma, G.K., and Panigrahi, K.K. (2025). Optimising agricultural sustainability through land suitability analysis: insights from Kolasib district, Mizoram. Food and Scientific Reports, 6(1):27-32.
3. Mohanty, S., Sandal, S. K., Rautaray, S. K. and Sarangi, A. (2025). Drip fertigation for enhancing crop and water productivity. Indian Farming, 75(5): 17-20.
4. Panda, P. K. (2025). *Dhana Riaati Anadhana Fasalaku Rugna Kariba*. Editorial article published in Samaja Newspaper, 96(179): p6.

5. Panda, P. K. (2025). *Keun Gacha Lagaibaa o Kaahinki*. Editorial article published in Dharitri Newspaper, 52(27): p6.

6. Panda, P. K. (2025). *Krushi Labha Brudhi Pain Masala Khetraku Pradhanya*. Editorial article published in Prameya Newspaper, 15(25): p8.

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9. Panda, P.K. and Sarangi, A. (2025). *Himakhanda Sangrakhyanare Jala Surakhya*. Editorial article published in Dharitri Newspaper, 51(116): p6.

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11. Satapathy, B.S., Pradhan, S., Mishra, S.K., Jena, S.K., Jena, R.K., Panda, D.K. and Rautaray, S.K. (2025). Good Agricultural practices for foxtail millet to enhance farm income in tribal areas of Odisha. Sabujeema, 2(4): 63-70.

12. Sucharita, S., Rautaray S.K. and Satapathy B. S. (2025). Role of mulching in climate-smart regenerative agriculture. Indian Farming, 75(5): 13-16.

Book/Book chapter

1. Bandyopadhyay, K.K., Pradhan, S and Sarangi, A. (2025). "Modelling Soil Water Balance and Root Water Uptake in Advances" in P.P. Maity, D. Bhaduri, K.K. Bandyopadhyay, J. Mukherjee and S.N. Pillai (eds.), "Advances in Monitoring Soil Health and Plant Growth for Better Agriculture", Professional Prints, New York, USA pp. 99-112.

2. Bandyopadhyay, K.K., Pradhan, S. and Sarangi, A. (2025) Use of Modern Tools and Techniques in Soil Physics Research to Meet the Challenges for Sustainable Agri-food System and Environmental Protection. Souvenir. In: National Seminar on Smart Technologies for Sustainable Agriculture and Environment, 22-23 February 2024, ICAR-CRIDA, Hyderabad.

3. Bijlwan, A., Ranjan, R., Kumar, M., Jha, A. (2025). Climate Change: Projections and Its Possible Impact on Soybean. In: Singh, K.P., Singh, N.K., T, A. (eds) Soybean Production Technology. Springer, Singapore.

4. Jena, S.K. 2025. Management of surface water resources in coastal region using geoinformatics. Souvenir of the 14th National Symposium on Coastal Agriculture (NSCA 2025): "Harnessing Fragile Coastal Ecosystem for Food and Environmental Security". Burman, D., T.D., Mallick, S., Devika, S., mandal, U.K., Bhutia, R.N., Mandal, K.G., Mahanta, K.K., Raut, S., Saha, R., and Das, A.K. (Eds.). ISCAR, WB. pp: 47-53.

5. Jena. S.K. 2025. Empowering farmwomen with rain water harvesting: A climate change adaptation strategy in the book "Women Empowerment through Climate-Resilient Agricultural Technologies for Sustainable Food Systems" edited by Tania Seth, N. Balasubramani, Arpita Mohapatra, and Mridula Devi. 2025. ICAR-CIWA, Bhubaneswar and MANAGE, Hyderabad. pp:48.54. ISBN Number: 978-81-985291-0-7.

6. Panigrahi, P., Pradhan, S. and Sarangi, A. (2025). Sub-surface Drip Irrigation (SSDI) for enhancing Water Productivity and Profit in Irrigated Commands" in S.S. Dash, P.K. Parhi, B. Sarangi, M.K. Dash and C. Pattnaik (eds.), 64th Annual Technical Session Sustainable Advancements in Engineering", Media Press, Bhubaneswar pp. 74-79.

7. Sahu, P. and Mishra, S. (2024). Empowering farm women with advanced water management technologies in horticultural crops. In Book: Gender-sensitive Agri-Horti based Diemensions for addressing Livelihood, Nutrition and Entrepreneurship (E-Book). ICAR-Central Institute for Women in Agriculture, Bhubaneswar. pp: 85-92 (ISBN: 978-81-944268-5-1)

8. Sethi, D., Mohanty, S., Mohapatra, K.K., Das, R., Padhan, K., Sahu, S.G., Kusumavathi, K., Panda, N., Rautaray, S.K. and Pattanayak, S.K. (2025). Harnessing the Potential of Biofertilizers: A Sustainable Approach for Agriculture. pp199-232. In: Shaaban, M. (eds) Soils and Sustainable Agriculture. Frontier Studies in Soil Science. Springer, Cham.

RESEARCH PROJECTS

COMPLETED PROJECTS (during 01.01.2025 to 31.12.2025)

Sl. No.	Project Code	Project Title	PI Name
1.	NRMA/IIWM/SIL/2021/001/00203	Study of seawater intrusion dynamics and development of management strategy in a coastal aquifer of eastern India	Dr. S. Mohanty
2.	NRMA/IIWM/SIL/2021/003/00205	Development of package and practices for reducing hexavalent chromium in soil plant continuum	Dr. Dibakar Ghosh
3.	NRMA/IIWM/SIL/2021/004/00206	Developing efficient water management strategies using resource conservation technologies in maize-sunflower cropping system	Dr. Sanatan Pradhan
4.	NRMA/IIWM/SIL/2021/005/00207	Estimation of water footprint at regional scale for sustainable water management	Dr. R.K. Jena
5.	NRMA/IIWM/SIL/2021/006/00208	Adoption and impact assessment of micro-irrigation in India with emphasis on community scale micro irrigation	Dr. D. Sethi
6.	NRMA/IIWM/SIL/2021/009/00211	Socio-economic evaluation of solar irrigation and its impact on farmers livelihood in Eastern India	Dr. Ankhila R.H.
7.	NRMA/IIWM/SIL/2021/010/00212	Water demand estimation in a canal command area using machine Learning	Er. Ajit Kr. Nayak
8.	NRMA/IIWM/SIL/2022/002/00214	Technological options and policy guidelines for risk management in water quality	Dr. Dibakar Ghosh/ Dr. M. Raychaudhuri

ONGOING RESEARCH PROJECTS (during 01.01.2025 to 31.12.2025)

Sl. No.	Project Code	Project Title	PI Name
1.	NRMA/IIWM/SIL/2021/002/00204	Water management and production practices of dragon fruit under protected cultivation	Dr. Prativa Sahu
2.	NRMA/IIWM/SIL/2021/007/00209	Evaluating sub surface drip irrigation in maize based cropping sequence	Dr. P. Panigrahi
3.	NRMA/IIWM/SIL/2021/008/00210	Irrigation management under conservation agriculture for improving water productivity in intensive rice based cropping systems of Eastern India	Dr. S. Pradhan
4.	NRMA/IIWM/SIL/2022/001/00213	Natural Farming: Impact on Crop and Water Productivity under different Irrigation Systems	Dr. A.K. Thakur
5.	NRMA/IIWM/SIL/2022/003/00215	Crop planning under climate change scenario in Mahanadi and Godavari basin	Dr. Ankita Jha
6.	NRMA/IIWM/SIL/2022/004/00216	Periphyton-based Carp-SIS Polyculture system: Effects on Zoo technical and production Performance	Dr. R.K. Mohanty
7.	NRMA/IIWM/SIL/2022/005/00217	Catchment command characterization and Evaluation of Rainwater Harvesting Structures in a Treated Watershed	Dr. B.K. Sethy
8.	NRMA/IIWM/SIL/2022/006/00218	Water Productivity and Economic Efficiency of Groundwater use in different geo-hydrologic regions of eastern India	Dr. H.K. Dash

9.	NRMA/IIWM/SIL/ 2023/001/00219	Efficient Water Management Strategies for higher water productivity and crop yield of millet production system	Dr. B.S. Satapathy
10.	NRMA/IIWM/SIL/ 2023/ 002/00220	Development of semi-interpenetrating polymer Network (Semi-IPN) based product/slow-release fertilizer for enhancing water productivity and nutrient use efficiency	Dr. Ashis Maity
11.	NRMA/IIWM/SIL/ 2024/001/00221	Sensor-based irrigation under conservation agriculture for enhancing water and nitrogen use efficiency and soil health of rice-groundnut cropping system	Dr. K.K. Bandyopa-dhyay
12.	NRMA/IIWM/SIL/ 2024/002/00222	Impact assessment of agricultural water management technologies for wider adoption	Dr. S.K. Mishra
13.	NRMA/IIWM/SIL/ 2025/001/00223	Development of Irrigation scheduling information system	Dr. Ashok Kr. Nayak
14.	NRMA/IIWM/SIL/ 2025/002/00224	Effect of water management and nano-fertilizer on water productivity and nitrogen use efficiency in rice-rice crop-ping system	Dr. Sanatan Pradhan
15.	NRMA/IIWM/SIL/ 2025/003/00225	Automation of irrigation method using IoT enabled evap-orimeter	Er. Ajit Kr. Nayak

Externally Funded Research Projects (2025)

Title	Budget (Rs. in lakh)	Duration	PC/PI/CCPI	Sponsored by
All India Coordinated Research Project on Irrigation Water Management	2226.00	2025-2026	Dr. A. Sarangi, PC	ICAR, New Delhi
Agri-Consortia Research Platform on Water	914.48	2021-2026	Dr. S.K. Jena, PC	ICAR, New Delhi
Theme-1: Development and Management of Surface Water Resources and Soil Moisture in different agro-ecological regions of India using Geoinformatics and Nano Technology	225.00	2021-2026	Dr. S.K. Jena, PI	Agri-CRP on Water, ICAR, New Delhi
Theme-2: Automated Canal Irrigation System for Efficient and Smart Irrigation Water Management	271.79	2021-2026	Dr. R.K. Panda PI	Agri-CRP on Water, ICAR, New Delhi
Theme-3: Improving groundwater sustainability through analyzing groundwater-energy nexus	36.70	2021-2026	Dr. R.R. Sethi PI	Agri-CRP on Water, ICAR, New Delhi
Theme-4: IoT Enabled Sensor Based Smart Irrigation Management System	57.88	2021-2026	Er. Ajit Kr. Nayak, PI	Agri-CRP on Water, ICAR, New Delhi
ICAR Network Project on Precision Agriculture: Precision water and nutrient use in mandate crops for improving the input use efficiency and profitability (NePPA)	236.00	01.10.2021 to 31.03.2026	Dr. S.K. Rautaray, PI	ICAR, New Delhi

Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARD)	605.34	2022-2026	Dr. S.K. Jena	Govt. of Odisha
Pilot field demonstration of IoT enabled digital water measuring device and soil moisture sensing system for irrigation scheduling in the Canal Commands of Odisha	18.70	2024-2026	Dr. K.K. Bandyopadhyay	Dept. of Water Resources, CAD-PIM, Govt. of Odisha
Reducing GHG emission in irrigated crops through micro-irrigation in different agro-ecological regions of India	62.00 / annum	2024-2027	Dr. K.K. Bandyopadhyay	Carbon Cell-NRM Division, Dept. of Agriculture & Farmers' Welfare, Govt. of India
Managing Irrigation Systems for Optimizing Water Productivity and Improving Resilience Using Advance Tools	Rs.157.56 (IIWM-93.06 + Rahuri 64.50) lakhs	2023-2027	Dr. K.K. Bandyopadhyay	IWMI, Colombo under ICAR-IWMI joint work plan
Increasing agricultural resilience through Agricultural Disaster Risk Management Strategy in India (INTEGRATE)	72.00	2023-2026	Dr. S.K. Jena	IWMI, Colombo under ICAR-IWMI joint work plan
Development of Polymer bio-mineral composite for improving water productivity, nutrient use efficiency and environmental sustainability	27.052	2024-2027	Dr. Ashis Maity	DST (SERB), Govt. of India under CRG funding
Sustainable Groundwater Management through artificial recharge for enhancing crop productivity in Nayagarh (East and South Eastern region of Odisha)	130.67	2023-2026	Dr. R.R. Sethi	Dept. of Agriculture & Farmers' Empowerment, Govt. of Odisha under RKVY-RAFTAAR
Demonstration of Hydroponic based Vertical Farming for high value Horticultural Crops	24.98	2024-2026	Dr. Prativa Sahu	Director of Horticulture, Govt. of Odisha, Bhubaneswar
Sensor Based Integrated Vertical Farming for Horticultural Crops and Aquaponic System	39.39851	2023-2026	Dr. Prativa Sahu	National Agricultural Science Fund (NASF), ICAR
Development of Model Climate Resilient Agricultural Ecosystems in Vulnerable Rainfed Blocks (Badamba, Narasinghpur) of Odisha	240.88	May 2025 to April 2028	Dr. D.K. Panda	Dept. of Agriculture & Farmers' Empowerment, Govt. of Odisha under RKVY-DPR, Govt. of Odisha
Network Project on "Effect of Liquid Fermented Organic Manure (LFOM) on crop productivity and soil health in selected Agro-Ecological Zones of India"	Rs.93.25	2025-2028	Dr. Ashis Maity	ICAR through IISS, Bhopal

Enhancing Water and Livelihoods security and Improving Water Productivity in Tribal dominated paddy Rainfed agro-ecosystem of Odisha (Farmer's FIRST Program)	07.75	2025-2026	Dr. S.K. Mishra	ICAR, New Delhi
Piloting Water Management Technologies for Enhancing Farm Productivity and Income (SCSP)	25.00	2025-2026	Dr. B.K. Sethi	ICAR, New Delhi
Enhancing Land and Water Productivity through Integrated Farming System (Scheduled Tribe Component Project)(STSP/TSP)	10.00	2025-2026	Dr. R.K. Panda	ICAR, New Delhi

Consultancy Projects

Impact Assessment of Millet Cultivation for Climate Resilience and Water Footprint Reduction in Odisha	20.01	2024-2025 (18 months)	Dr. B.S. Satapathy	Nabakrushna Choudhury Centre for Development Studies (NCDS), Govt. of Odisha
Evaluation of Water Use Efficiency of Upper Kolab Major Irrigation Project, Koraput, Odisha	29.465	18 months (March, 2024 to August, 2025-extended upto June, 2026)	Dr. A.K. Thakur	CWC, Ministry of Jal Shakti, Govt. of Indis
Evaluation of Water Use Efficiency of Satiguda Medium Irrigation Project, Malkangiri district, Odisha	23.15	18 months (March, 2024 to August, 2025-extended upto June, 2026)	Er. Ajit Kr. Nayak	CWC, Ministry of Jal Shakti, Govt. of Indis

AWARDS, HONOURS, RECOGNITIONS

1. Dr. B.S. Satpathy delivered a talk as guest speaker on 'Soil health, nutrient, disease and pest management in organic farming' at the office of Chief District Agricultural Officer, Jagatsingpur, Odisha training programme for extension officers under Organic and Natural Farming organized by RC of Organic and Natural Farming, Bhubaneswar, Odisha on January 02, 2025.
2. Dr. Prativa Sahu acted as a Judge for the Annual Flower Garden Competitions 2025 at various locations in Bhubaneswar on January 02, 2025 and Annual Flower Show on January 07, 2025 organized at Botanic Garden, RPRC, Bhubaneswar.
3. Dr. Prativa Sahu delivered lecture as resource person on "Digital farming Techniques, Hydroponic-based vertical Farming, Precision Agriculture" in a 3-days residential Capacity Building Program on 'Gender Sensitive Nutri-Smart Organic Agri-Practices and digital Innovations for profitable Agri-preneurship" held during January 6-8, 2025 at ICAR-CIWA, Bhubaneswar sponsored by National Commission on Women (NCW), Govt. of India, New Delhi.
4. Dr. S.K. Jena delivered lecture on "Horticulture and agro-forestry based watershed management" in the Training and Capacity building Programme for horticulture officers and horticulture extension officers and farmers on January 14, 2025.
5. Dr. Prativa Sahu served as member of Technical Committee and Rapporteur of National Conference on "Seed Chain Management in Eastern & Northeastern Hill Region: Challenges and Opportunities" at ICAR-IIHR-CHES, Bhubaneswar during January 21-22, 2025.
6. Dr. Ranu Rani Sethi received Odisha Women Award in Odisha Women's Conclave 2024-25 organized by Ever Green Forum on January 27, 2025.
7. Dr. Ankita Jha delivered lecture on 'Geospatial technology as a tool to access the suitability of fruit tree species in wastelands' during the training on Enhancing Productivity in Horticultural Crops through Water Management Technologies" for Horticulture Officers of Odisha at ICAR-IIWM, Bhubaneswar on January 28, 2025.
8. Dr. S.K. Jena delivered lecture on "Empowering farmwomen with rainwater harvesting: A climate change adaptation strategy"during the training program on "Women Empowerment through Climate-Resilient Agricultural Technologies for Sustainable Food Systems" at ICAR-CIWA, BBSR in collaboration with MANAGE, Hyderabad during February 03-07, 2025.
9. Dr. S.K. Jena delivered a lecture on "Tools and Techniques for Estimation of Groundwater Availability and Recharge" in the Training programme on "Conjunctive Water Use and Agricultural Water Productivity Under Changing Climate" sponsored by Ministry of Jal Shakti, Govt. of India during February 18-20, 2025 at ICAR-IIWM, Bhubaneswar.
10. Dr. S.K. Mishra, Principal Scientists and PI of the Project received the 'Best Presentation Award' during the 'Zonal Review Workshop of Farmer FIRST Programme' from the Director, ICAR-ATARI, Kolkata on February 21, 2025.
11. ICAR-IIWM IBFI Project adopted farmer Sri RadhashyamBishwal of Kanas block in Puri district was honoured with "IARI Fellow Farmer Award 2025" by Honorable Union Minister for Agriculture and Farmers' Welfare, Govt. India during the "*Pusa Krishi Vigyan Mela*" organized at ICAR-IARI, New Delhi during February 22-24, 2025.
12. ICAR-IIWM Farmer FIRST Project adopted farm woman Smt. Gitanjali Naik of Jamuda village in Saharpada block of Keonjhar district, Odisha was honoured with the "IARI Innovative Farmer Award 2025" by Honorable Union Minister for Agriculture and Farmers' Welfare, Govt. India during the "*Pusa Krishi Vigyan Mela*" organized at ICAR-IARI, New Delhi during February 22-24, 2025.
13. Dr B. S. Satpathy delivered a talk as lead speaker on 'Farming and Cropping System' at the National Workshop/Seminar on Innovation in regenerative Agriculture for higher Production and Profitability at ICAR-NRRI Cuttack on February 27, 2025.
14. Dr. R.K. Jena delivered a lead talk on "Soil Survey and its advancement using Geospatial techniques in the Workshop on "Agroforestry for Carbon Markets: Unlocking Economical Value through Ecosystem Services" held at OUAT, Bhubaneswar on February 27, 2025.
15. Dr. B.S. Satpathy participated as an expert member in the *Kishan Gosthi* at the National Workshop /Seminar on Innovation in regenerative Agriculture for higher Production and Profitability at ICAR-NRRI Cuttack on February 27, 2025.
16. Dr. S.K. Jena delivered lead lecture on "Management of surface water resources in coastal region using geoinformatics" in the 14th National Symposium on

Coastal Agriculture (NSCA 2025): "Harnessing Fragile Coastal Ecosystem for Food and Environmental Security" held at ICAR-CRIJAF, Barrackpore (WB) during February 28- March 3, 2025.

17. Dr. P.K. Panda delivered a lead talk on "Smart Water and Nutrient Management Practices to Enhance Productivity and Farm Profit" in the National Seminar on Management for Climate Resilient Sustainable Food Production System at OUAT, Bhubaneswar on March 7, 2025.
18. Dr. Prativa Sahu awarded with BEST ORAL presentation entitled "Effect of liquid fertilizer and aquaponics system on different types of lettuce in hydroponic-based vertical farming system" in Global Conference: "Innovation to Impact" held at ICAR-CIWA, Bhubaneswar during March 8-10, 2025.
19. Dr. Prativa Sahu served as Rapporteur of technical session on Horticulture in the Global Conference: 'Innovation to Impact" held at ICAR-CIWA, Bhubaneswar during March 8-10, 2025.
20. Best M.Sc. Thesis Award: Ms. Ravita received Best Thesis Award for her work under the guidance of Dr. Ankita Jha by the AEEFWS Society at the ICAR-HESA conference during April 18-210, 2025.
21. Dr. P.K. Panda acted as Chief speaker on Golden Jubilee celebration of PM Shri Panchasakha High School, Kamakhyanagar, Dhenkanal, Odisha on April 27, 2025.
22. Dr P. Panigrahi, Dr. S. Pradhan, and Dr. A. Sarangi received R C Patra Memorial Award of Institution of Engineers (India) on May 11, 2025.
23. Dr. P.K. Panda acted as Chief Speaker (World Environment Day) at Chandradeipur, Pipili organized by Pipili Sankrutika Parishadon June 5, 2025.
24. Dr. K.K. Bandyopadhyay delivered a talk on "Ban on single use of plastic" on the World Environment Day at ICAR-IIWM on June 5, 2025.
25. Shri Manas Kumar Das, a progressive and adopted farmer from Haridamada village, Khordha district was honoured with the 'Best Farmer Award 2025' at ICAR-NAARM, Hyderabad during its 50th Foundation Day celebration on September 1, 2025.
26. Dr. R.K. Jena awarded with BEST ORAL presentation entitled "Spatio-temporal estimation of water footprint of millets in Odisha" in National Conference on 'System of Crop Intensification for Climate-smart, Water and Nutrient-efficient Agriculture' organized by ISWAM, Odisha Chapter and ICAR-IIWM, Bhubaneswar during September 4-5, 2025.
27. Dr. R.K. Jena awarded with BEST ORAL presentation entitled "Spatio-temporal estimation of water footprint for the *kharif* paddy at the regional scale" in International Conference on Sustainable Environments for Agriculture, Biodiversity, Technology and Market for Next Generations at Himachal Pradesh University, Shimla during September 13-14, 2025.
28. Three adopted FFP farmers, namely, Shri Tutu Das, Shri Parikhita Das and Shri Krushna Chandra Pradhan were honoured with the 'Soil Health Champion Award 2025' during World Soil Day celebration on December 5, 2025 at ICAR-IIWM Bhubaneswar for their exemplary adoption of climate-resilient farming practices promoting soil health of mother Earth.
29. Shri Radhashaym Biswal, a progressive and adopted farmer from Kanas block of Puri district was honoured with IARI-Fellow Farmer Award 2025 during the "IARI Innovative Farmers Meet" held at ICAR-IARI, Delhi during December 23-24, 2025.
30. Dr S.K. Jena acted as Member of Executive Council of Indian Society of Coastal Agricultural Research, Canning Town, West Bengal during (2021-2025)
31. Dr R.R. Sethi acted as Member of Executive Council of Soil Conservation Cosiety of India during 2025-26.

Mr. Manas Kumar Das being felicitated as Best Farmer during 50th Foundation Day celebration of ICAR–NAARM, Hyderabad

Three awardee farmers being felicitated during the World Soil Day celebration

32. Dr S. K. Jena acted as member of the National Level Technical committee (NLTC) for development of National guidelines for watershed management constituted by DoLR, Govt. of India.
33. Dr. S. K. Jena acted as Member of the committee for "Periodic review of assessment and mapping of waterlogged area of Major and Medium irrigation projects in India" (Nominated by Government of India, Ministry of Jal Shakti).
34. Dr. S.K. Jena acted as Expert Member of the FAD 17/ Panel 8 "Panel to develop standards for management of PPIN" nominated by Bureau of Indian Standards.
35. Dr. S. K. Jena acted as Member of the Expert committee to simplify LRI and Hydrology under REWARD.

IARI-Fellow Farmer Awardee 2025-Mr. Radhashyam Biswal, adopted farmer under INTEGRATE project

Radio/TV Talk

- Dr. S.K. Mishra, Principal Scientist & Nodal Officer, VKSA Programme delivered a radio talk on '*Viksit Krushi Sankalp Abhiyan*', which was aired by All India Radio, Berhampur on June 1, 2025.
- Dr. B.S. Satapathy, Senior Scientist & Team Leader (Ganjam-A), VKSA Team delivered a radio talk on 'Modern Farming Technologies for *Kharif* Crops' during *Viksit Krushi Sankalp Abhiyan*, which was aired by All India Radio, Berhampur on June 3, 2025.
- Dr. Ashis Maity, Principal Scientist & Team Leader (Ganjam-B), VKSA Team delivered a radio talk on '*Viksit Krushi Sankalp Abhiyan*', which was aired by All India Radio, Berhampur on June 12, 2025.
- Dr. Prativa Sahu, Scientist delivered an expert talk on "Importance of Horticulture in *Viksit Krishi Sankalp Abhiyan*" at All India Radio, Puri on June 08, 2025.
- Dr. Prativa Sahu, Scientist participated as Expert in Krushi Darshan Phone in Live programme on "Dragon fruit cultivation" at Doordarshan Kendra, Bhubaneswar on August 01, 2025 at 06.00 PM.
- Dr. Prativa Sahu, Scientist participated in Radio Talk as expert on "Enhancing horticultural productivity through hydroponic and aquaponics system" at All India Radio, Puri, Odisha on September 22, 2025 which was broadcasted on October 12, 2025 at 7.30PM.
- Dr. P. K. Panda, Principal Scientists of the institute delivered an expert talk on *"Paribesa Surakhya re Jaibika Krushira Bhumika"* in All India Radio, Puri on 17.12.25.
- Dr. A. Sarangi, Director and Dr. P. K. Panda, Principal Scientist of the institute acted as an expert for the discussion on *"Gabesanagararu Kheta, Jalabayu Paribartan ebam Dharanakhyama Krushi"* in All India Radio, Puri on 05.06.25
- Dr. P. K. Panda, Principal Scientists of the institute delivered an expert talk on *"Sustha Jiban Pain Jal Jivan Mission"* in All India Radio, Cuttack on 23.09.25.
- Dr. P. K. Panda, Principal Scientists of the institute delivered an expert talk on *"Dhana Fasala re Jala Parichalana"* in All India Radio, Cuttack on 29.08.25.
- Dr. P. K. Panda, Principal Scientists of the institute delivered an expert talk on *"Jalabayu Paribartana O Krushi Upare Ehara Prabhaba"* in All India Radio, Cuttack on 17.01.25.
- Dr. P. K. Panda, Principal Scientists of the institute delivered an expert talk on *"Odisha re Krushi Bikasha Pain Abasyaka Padakhepa"* in All India Radio, Jeypore on 17.01.25.
- Dr. P. K. Panda and Dr. S. K. Rautaray, Principal Scientists of the institute delivered TV talk on *"Grama o Saharanchalre Jalara Abhabikaran Rokiba Pain Barsajal Sangrakhyanra Abasyakata* in DD Odia on 5th May,2025.
- Dr. P. K. Panda, Principal Scientists of the institute participated as expert in the discussion on *Mahanadi Jala Parichalanara Bivinna Diga* in News 18 Odia channel on 5th Jan, 2026.

RESEARCH MANAGEMENT MEETINGS

Institute Research Council (IRC) Meeting

The Institute Research Council (IRC) Meeting of ICAR-IIWM, Bhubaneswar was held on 09.01.2025 under the Chairmanship of Dr. A. Sarangi, Director. The scientists having externally funded projects presented the research achievements of their respective projects in the meeting. Total 10 nos. of externally funded projects were reviewed in the meeting. The IRC meeting was ended with vote of thanks to the Chair. On the 2nd day of the meeting, the research achievements of 7 nos. of externally funded projects, 3 nos. of ongoing Institute research projects and 4 nos. of new research projects were presented in the meeting. Dr. P.K. Mishra, former Director, ICAR-IISWC, Dehradun was present in the meeting as Expert Member. Dr. Mishra reviewed the progress of the research projects presented by the scientists, appreciated the work done by them and offered his valuable suggestions. The IRC meeting was ended with vote of thanks to the Chair.

The second Institute Research Council (IRC) Meeting of ICAR-IIWM, Bhubaneswar was held during 21-23 July, 2025 under the Chairmanship of Dr. A. Sarangi, Director. In the first day the experts were Dr. L.M. Garanayak, Dr. Chandranath Chatterjee and in the third day the expert was Dr. P.K. Mishra, Former Director ICAR-IISWC, Dehradun and Dr.D.K. Singh, Professor, Division of Agricultural Engineering, IARI, New Delhi. The scientists having in-house projects presented the research achievements of their respective projects in the meeting. In this meeting total 20 projects were presented. In the third day, three mega projects from canal water management programme, Rainwater management programme and Groundwater management Programme were presented. All the experts reviewed the progress of the research projects presented by the scientists, appreciated the work done by them and offered their valuable suggestions. The IRC meeting ended with vote of thanks to the Chair.

Institute Research Council (IRC) Meeting of ICAR-IIWM, Bhubaneswar

Research Advisory Committee Meeting of ICAR-IIWM held during 25-26 February 2025

The third meeting of 9th Research Advisory Committee (RAC) of ICAR-IIWM was held during 25-26 February 2025. Renowned Expert in Agricultural Water Management of the country Dr. Alok Kumar Sikka, who is also IWMI Indian Country Representative and Former DDG (NRM) presided over the meeting as the Chairman, RAC. Besides him, ADG (SWM), ICAR Dr. A. Velmurugan and other Members of RAC also attended the RAC Meeting. Members Dr. B. S. Yadav, Dr. S. K. Pattanaik and Dr. Amit Kar attended the meeting physically, whereas Member Dr. N. S. Raghuwanshi attended the meeting in virtual mode. Initially, Director, ICAR-IIWM welcomed the delegates and made a brief presentation on the achievement of the institute during last one year. This was followed by remarks of Chairman and Members, RAC. Dr. S. Mohanty, Principal Scientist and Member Secretary presented the Action Taken Report on the Recommendations of the last RAC, which was accepted by the house. This was followed by Program level presentation of significant research achievements by respective Program Leaders. Finally, there was discussion and concluding remarks by Chairman and Members of RAC. In the concluding remarks, the Chairman and Members expressed satisfaction over the research work undertaken by ICAR-IIWM. The meeting ended with vote of thanks by Member Secretary Dr. S. Mohanty.

On 26th February, Members Dr. B. S. Yadav, Dr. S. K. Pattanaik and Dr. Amit Kar visited the Canal automation Project site at Darpanarayanpur MIP in Nayagad district of Odisha. They were accompanied by RAC Member Secretary Dr. S. Mohanty along with Dr. K. K. Bandopadhyay and Dr. A. K. Nayak, principal scientists of the institute. The Members interacted with farmers and office bearers of Water User Association (WUA); and expressed their satisfaction pertaining to the work undertaken at Canal automation Project site.

9th Research Advisory Committee (RAC) meeting of ICAR-IIWM

Institute Management Committee (IMC) Meeting

The 24th Institute Management Committee (IMC) meeting of ICAR-IIWM, Bhubaneswar was held of 17.11.2025 under the Chairmanship of Dr. A. Sarangi, Director, ICAR-IIWM. After presenting the Institute's accomplishments before the Committee, Dr. Sarangi brought up the agenda issues for discussion. Many important decisions with respect to ongoing CPWD work, procurement of capital items including miscellaneous items were taken in this meeting. The meeting ended with vote of thanks to the Chair.

24th Institute Management Committee (IMC) meeting of ICAR-IIWM

Annual Workshop of AICRP on Irrigation Water Management conducted at ICAR-IIWM during 14-17 July 2025

The Annual Workshop of AICRP on Irrigation Water Management was organized at ICAR-Indian Institute of Water Management, Bhubaneswar during 14-17 July 2025 through video conferencing. Honorable Deputy Director General (NRM), ICAR Dr. A. K. Nayak graced Inaugural Function of the Workshop physically as Chief Guest and addressed the delegates. Dr. A. Sarangi, Director, ICAR-IIWM delivered the welcome address and opening remarks, whereas Dr. S. Mohanty, Principal Scientist briefly presented the activities of the AICRP on IWM. During the four day period, research achievements of the 26 AICRP centers for the year 2024-2025 were presented by the respective Chief Scientists in seven Technical Sessions. New research proposals were also presented during the presentation. Three eminent experts in the field of irrigation water management, namely Dr. S. D. Gorantiwar, Dr. L. M. Gadnayak, and Dr. K. K. Rout chaired different technical sessions. The experts provided corrective suggestions for the improvement of research programs. The Plenary Session of the Annual Workshop was held on 17th July evening. Respected Assistant Director General (SWM), Dr. A. Velmurugan graced the occasion as Chief Guest and addressed the delegates. Dr. A. Sarangi, Director, ICAR-IIWM delivered the concluding remarks. The 4-day program was organized by Dr. S. Mohanty, Principal Scientist and In-charge, AICRP on IWM.

Annual Workshop of AICRP on Irrigation Water Management

ICAR-IIWM organized National Brainstorming Session

ICAR-IIWM conducted a 'National Brainstorming Workshop on "Groundwater and the water-food-energy nexus- Challenges and Opportunities' on 22 March, 2025 with four technical sessions. Dr. A.K. Nayak, Director, ICAR-Central Rice Research Institute, Cuttack was the Chief guest on this occasion. The guests of honour were Dr. A. Velmurugan, ADG (SWM), ICAR, New Delhi, Dr. B.K. Sahoo, Regional Director, CGWB, SER, Bhubaneswar and Er. Padma Dorjee, Chief Engineer, POMIO, CWC, New Delhi.

National Brainstorming Workshop on "Groundwater and the water-food-energy nexus- Challenges and Opportunities

Total 19 keynote speakers delivered their lecture under the themes namely groundwater status and management, conjunctive and sustainable groundwater utilization for enhancing agricultural water productivity, groundwater-food-energy nexus and groundwater quality, water governance and policy. Experts from ICAR-IIWM, ICAR-NIAP, International Water Management Institute (IWMI), Indian Institute of Science (IISc), Indian Institute of Technology (IIT, Kharagpur & IIT, Guwahati), Central Ground Water Board (CGWB), North Eastern Regional Institute of Water and Land Management (NERIWALM), State Agricultural Universities (SAUs) like OUAT, MPKV, PAU, TNAU, JAU joined in this event. Thefour themes under this brain storming session were viz., (i) Groundwater Status and Management in different regions of India; (ii) Conjunctive and Sustainable Groundwater Utilization for Enhancing Agricultural Water Productivity; (iii) Groundwater-Food-Energy Nexus and (iv) Groundwater Quality, Water Governance & Policy.

Consultative Review Meeting of Agri - CRP on Water (Theme II)

The Annual Review Workshop of Agri-Consortia Research Platform on Water was held on 11th August 2025 at ICAR–Indian Institute of Water Management (ICAR-IIWM), Bhubaneswar, in hybrid mode. The meeting was chaired by Dr. A.K. Nayak, DDG (NRM), ICAR, with Professor (Dr.) Sekhar Muddu, IISc, Bengaluru as an expert member for evaluation of project achievements. Dr. A. Velmurugan, ADG (SWM) and Dr. A. Islam, Principal Scientist, NRM Division, ICAR, New Delhi attended the meeting (online). The meeting was also attended by Dr. A. Sarangi, Director, ICAR-IIWM, Dr. Susanta Kumar Jena (Principal Scientists and Coordinator, Agri-CRP on Water), along with Principal Investigators (PIs) and Co-Principal Investigators (Co-PIs) from different centers of Agri-CRP on Water programme. Dr. A. Sarangi, Director, ICAR-IIWM, presented a brief achievement of the Agri-CRP on Water. The Annual Report of Agri-CRP on Water for 2024, one mobile application, and four technical documents were released by the Honorable DDG (NRM), Dr. A.K. Nayak. Dr. S.K. Jena made the consolidated presentation of achievements under all the four themes followed by detail presentations by the PIs of different centre.

CONFERENCE AND MEETING ATTENDED

Official	Name of the conference/ meetings/ workshop/ symposium/ seminar	Organized by	Period
Dr. S. K. Jena Dr. K.K. Bandyopadhyay	Foreign aided project review meeting	ICAR-RCER, Patna	January 04-05, 2025
Dr. S. K. Jena	Attended the MoU signing meeting for Rubber dam technology commercialization with FORECH, New Delhi.	ICAR-CIRCOT, Mumba	January 06, 2025
Dr. S. K. Jena Dr. K.K. Bandyopadhyay	State level technical committee meeting for review of consultancy project on ecosystem services	DSCWD, *Krishi Bhawan*, BBSR	January 07, 2025
Dr. S. K. Jena	Golden Jubilee celebration	ICAR- RC NEHR, Barapani, Meghalaya	January 9-10 2025
Dr. R. K. Panda	Final QRT review meeting	ICAR, New Delhi	January 13, 2025
Dr. S. K. Jena Dr. D.C. Sahoo	National Workshop on "Advance & Applications of Crop Models for Climate smart Agriculture"	Skisha O Anusandhan, BBSR	January 16, 2025
Dr. R.K. Jena	i) Pre-Conference Workshop on 'Evaluating Digital Soil Maps by their Patterns' ii) Workshop on 'Digital Soil Mapping using GEE'.	ICAR-NBSS & LUP, Bangalore	January 20, 2025
Dr. R.K. Jena	3rd Joint workshop of the IUSS Working Groups Digital Soil Mapping band GlobalSoilMap	ICAR-NBSS & LUP, Bangalore	January 21-24, 2025
Dr. S. K. Jena	International Conference on "Sustainable Food - Water -Energy - Mechanization -Nexus and Whole Grain"	TNAU, Kumulur, Tamil Nadu	January 27-28, 2025
Dr. S. K. Jena	2nd International Conference on "Rainfed Agriculture: Building Pathways for Resilience & Sustainable Livelihoods"	ICAR-CRIDA, Hyderabad	January 29-31, 2025
Dr. S. K. Jena	4th National Level Technical Committee (NLTC) meeting	NASC, Delhi	February 17, 2025
Dr. R. K. Panda Dr. S. K. Jena Er. Ashis Jadhav	Training on "Conjunctive Water use and Agricultural Productivity" by Ministry of *Jal Shakti*	ICAR-IIWM, BBSR	February 18-20, 2025
Dr. Ankita Jha	XVII NAAS Agricultural Science Congress on "Frontier Sciences and Technologies in Agriculture"	G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, India.	February 20-22, 2025
Dr. S.K. Mishra Dr. B.S. Satapathy Dr. P. Sahu Dr. S. Mohanty Dr. H.K. Dash Dr. R.K. Jena Dr. D. Sethi	Zonal Review Workshop of Farmer FIRST Programme (*Virtual*)	ICAR-ATARI, Kolkata	February 21, 2025

Dr. S. Pradhan	Training program on "Introduction to Carbon Neutral Assessment"	Kerala State Council for Science Technology and Environment, Thriuvananthapuram	February 24-25, 2025
Dr S. K. Jena	14th National Symposium on Coastal Agriculture (NSCA 2025): "Harnessing Fragile Coastal Ecosystem for Food and Environmental Security"	ICAR-CRIJAF, Barrackpore, West Bengal	February 28-March 3, 2025
Dr. S. K. Rautaray Dr. O. P. Verma Dr. B. S Satapathy	National Seminar on "Resource management for climate resilience sustainable food production system"	Indian Society of Agronomy (Odisha Chapter) OUAT, BBSR	March 6-7, 2025
Dr.AshisMaity Dr. PrativaSahu	Global conference on "Innovation to Impact: Gender transformative approach for sustainable Agri-food system"	RAGA & ICAR-CIWA, BBSR	March 8-10, 2025
All Scientists	Celebration of World Water Day	ICAR-IIWM, BBSR	March 22, 2025
Dr. R. K. Panda	Visit of Engineers Team from DoWR, Tamil Nadu to Darpanarayanpur, Nayagarh	ICAR-IIWM, BBSR	April 11, 2025
Dr. D. K. Panda	Brainstorming workshop for the collaborative project on "Integrated Resource Management for Ecological Restoration of Iron Ore Mining-Affected Areas in Keonjhar District, Odisha"	ICAR-IIWM, BBSR	April 24, 2025
Dr. S.K. Mishra Dr. B.S. Satapathy	Rice Field Days and Crop Cutting Experiment program under Farmer FIRST	Haridamada, Khordha	May 12-16, 2025
All Scientists	Celebration of 38th Foundation Day	ICAR-IIWM, BBSR	May 13, 2025
Dr. D. C. Sahoo	Meeting on finalization of draft National Technical Guidelines (NTG) for improved watershed management	National Rainfed Area Authority at Krishi Bhawan, BBSR	May 21, 2025
Dr. R. K. Panda Dr. K.K. Bandyopadhyay	State level workshop meeting for launch of CGIAR climate action science	IWMI, New Delhi at BBSR	May 14, 2025
Dr. K.K. Bandyopadhyay	Review meeting of IWMI-MIS Project	ICAR-IIWM, BBSR	May 15, 2025
Dr. R. K. Panda	Bureau of Indian Standard on "Surface and sub-surface drainage system review meeting (8th meeting of FAD 17/Panel 3)"	ICAR-IIWM, BBSR	May 27, 2025
All Scientists	Celebration of World Environment Day	ICAR-IIWM, BBSR	June 5, 2025
Dr. R. K. Panda	Interstate Farmers exposure visit from Jharkhand	ICAR-IIWM, BBSR	June 9, 2025
Dr. R. K. Panda	Akhila Odisha Sanyukta Hindi Karyasala	Institute of Physics, BBSR	June 11, 2025
Er. Ajit Kumar Nayak	ICID-CIID, Platinum Jubilee	ICID, New Delhi	June 24-25, 2025
Dr. K.K. Bandyopadhyay	XXXIV Management Development Programme on Leadership Development (a Pre-RMP Programme)	ICAR-NAARM, Hyderabad	June 16-27, 2025

Dr. Ankhila R.H.	'Training on 'Tools and Techniques for Advanced Analytics in Social Science Research'	Division of Agricultural Economics, ICAR-IARI New -Delhi in collaboration with IFPRI and AERA-India.	July 7- 18, 2025
All Scientists	Annual Workshop of the 'AICRP on Irrigation Water Management' (Virtual mode)	ICAR-IIWM, Bhubaneswar	July 14-17, 2025
All Scientists	ICAR Foundation Day Celebration Programme (Virtual mode)	ICAR, New Delhi	July 16, 2025
All Scientists	Annual Institute Research Council (IRC) Meeting	ICAR-IIWM, Bhubaneswar	July 21-23, 2025
All Scientists	PM Kissan Samman Nidhi 20th Instalment Distribution Programme by Hon'ble PM	Varanasi	August 2, 2025
Dr. S.K. Jena	Meeting of Hydrology Expert Group constituted for simplification of existing procedures and hydrology methodologies in REWARD	CoE WM, GKVK, UAS, Bengaluru	August 7, 2025
Dr. R.K. Panda Dr. S.K. Rautaray Dr. K.K. Bandyopadhyaya Dr. S. Mohanty Dr. A.K. Thakur Dr. P. Panigrahi	Brainstorming Workshop on 'Transforming Food, Land and Water Systems to Combat the Climate Crisis'	ICAR-IIWM, Bhubaneswar	August 12, 2025
Dr. S. K. Jena	Consultative Workshop On 'Climate Resilient Transformation of Food, Land and Water System in Odisha'	ICAR-IIWM, Bhubaneswar.	August 12, 2025
Dr. S. K. Jena	User consultation workshop on 'Sukharakshak AI for Drought Management in India'	ICAR-CRIDA, Hyderabad	August 13, 2025
Dr. S. K. Jena	Meeting of Hydrology Expert Group constituted for simplification of existing procedure and hydrology methodology in REWARD.	CoE WM, GKVK, UAS, Bengaluru	August 20-21, 2025
Dr. S. K. Jena	ICAR- National Space Day and participated in the deliberations on 'Research and Development in Space Technology for Agricultural Transformation'	NASC, ICAR, New Delhi	August 23, 2025
Dr. S. K. Jena	National Consultation Workshop on NTG For Improved Watershed Management.	ICAR, New Delhi	August 28-29, 2025
All Scientists	National Conference on 'System of Crop Intensification for Climate-smart, Water and Nutrient-efficient Agriculture'	ISWAM, Odisha Chapter and ICAR-IIWM, Bhubaneswar	September 4-5, 2025
Dr. R.K. Jena	International Conference on Sustainable Environments for Agriculture, Biodiversity, Technology and Market for Next Generations.	Himachal Pradesh University, Shimla	September 13-14, 2025

Dr. R. K. Panda	6th Regional Consultative meeting on Ease of doing R&D	NITI Aayog at CSIR-IICT, Hyderabad	September 10-11, 2025
Dr. S.K. Mishra Dr. Ankhila R. Handral	Stakeholders' Workshop on "Gendered Analysis of Rice Crop Loss Burden: Stakeholder Dialogue & Learning Exchange for Collaborative Reflection"	CABI International, New Delhi and ICAR-CRRI, Cuttack	September 26, 2025
All Scientists	Field IRC Meeting at Institute Research Farm, Mendhasal	ICAR-IIWM, Bhubaneswar	October 24, 2025
Dr. S. K. Jena Dr. K.K. Bandyopandhyaya	Foreign Aided Project Review Meetingat ICAR-NIASM, Baramati	NRM Division, ICAR	November 03-04, 2025
Dr. S. K. Jena	CRP on Water-Theme-4	MPKV, Rahuri	November 05, 2025.
Dr. S. K. Jena	Development of National Technical Guidelines for Watershed Management	NRAA, New Delhi	November 07, 2025
Dr. B. S. Satapathy	International Symposium on 'Shree Anna and Women Farmer 2025 at Lokseva Bhawan, Bhubaneswar, Odisha	Agriculture Department, Government of Odisha	November 10-11, 2025
Dr. K.K. Bandyopandhyaya	Annual Convention of the Indian Society of Soil Science at TNAU, Coimbatore	Indian Society of Soil Science	November 18-21, 2025
Dr. B. S. Satapathy Dr. S. Pradhan Dr. D. Ghosh	Sixth International Agronomy Congress on 'Re-envisioning Agronomy for Smart Agri-food Systems and Environmental Stewardship'	Indian Society of Agronomy, New Delhi	November 24–26, 2025
All Scientists	Review of progress on follow up work plan on the ATR of the *Kharif 2025* VKSA programme by the Secretary, DARE & DG, ICAR	ICAR, New Delhi (*virtual*)	November 26, 2025
Dr. S. K. Jena	International Conference on Watershed Resilience: Integrating Science, Sustainability, and Society	CoE WM, UAS, Bengaluru	November 26-28, 2025
All Scientists	Celebration of World Soil Day	ICAR-IIWM, Bhubaneswar	December 5, 2025
All Scientists	Scientists-DG Interaction Meeting by the Secretary, DARE & DG, ICAR	ICAR, New Delhi (*virtual*)	December 8, 2025
Dr. K.K. Bandyopadhyaya	Training programme on "Meta-Analysis"	NAARM, Hyderabad	December 8-12, 2025
Dr. S. K. Jena Dr. D. C. Sahoo Dr. R. R. Sethi	National Workshop on "Innovations in Land Resource Inventory and Hydrology for Comprehensive Watershed Planning and Development Through REWARD"	REWARD (Hydrology and LRI), OUAT	December 19-20, 2025
Dr. S.K. Mishra	34^{th} Dr Gopinath Sahu Memorial Lecture	ARRW, ICAR-CRRI, Cuttack	December 29, 2025

TRAINING PROGRAMS ORGANIZED

Sl. No	Subject	Place	Period	Participants
1	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Odagaon, Dist. Nayagarh	Rabara	January 3, 2025	Total=33 Woman=9
2	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Odagaon, Dist. Nayagarh	Badaput	January 3, 2025	Total=42 Woman=27
3	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Kumbhikela	January 6, 2025	Total=32 Woman=18
4	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Baijhari	January 7, 2025	Total=28 Woman=14
5	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Bhagamunda	January 7, 2025	Total=30 Woman=9
6	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Odagaon, Dist. Nayagarh	Jaringi	January 15, 2025	Total=36 Woman=26
7	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Odagaon, Dist. Nayagarh	Sardhapur	January 15, 2025	Total=32 Woman=16
8	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Sundarkumpa	January 16, 2025	Total=34 Woman=6
9	One day exposure cum visit program for the farmers of Niali, Salepur and Nischintakoili blocks of Cuttack district, Odisha under MIDH program	ICAR-IIWM, Bhubaneswar	January 17, 2025	Total=86
10	Training on "Pani ki Pathsala" for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Banigochha	January 20, 2025	Total=104 Woman=37
11	Training on "Pani ki Pathsala" for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Burupal	January 20, 2025	Total=72 Woman=15
12	Training on "Pani ki Pathsala" for committee members, farmers & WDTs of micro- watersheds cluster of Odagaon, Dist. Nayagarh	Odagaon	January 21, 2025	Total=37 Woman=30

13	Training on "Pani ki Pathsala" for committee members, farmers & WDTs of Brajarajpur, Dist. Nayagarh	Nayagarh	January 22, 2025	Total=48 Woman=30
14	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Kuradhinisa	January 28, 2025	Total=32 Woman=10
15	Training on planning and execution of SWC and DLT measures for committee members, farmers & WDTs of micro- watersheds cluster of Daspalla, Dist. Nayagarh	Baijhari	January 29, 2025	Total=45 Woman=0
16	Field day program on groundwater recharge impact on agriculture under RKVY-GWR project	Gopalipada, Khandapada	January 23, 2025	Total=109 Women=69
17	Training cum awareness program on "Importance of groundwater recharge structures on agriculture"under RKVY-GWR project	Raghunathpur, Khandapada	February 14, 2025	Total=156 Women=80
18	Farmer's exposure visit program under RKVY-GWR project	ICAR-IIWM, Bhubaneswar	February 21, 2025	Total=50
19	One day Farmer's training cum demonstration program on "Impact of groundwater recharge on crop and water productivity" under RKVY-GWR project	Kusumitara, Khandapada	March 19, 2025	Total=159
20	National Brainstorming workshop on "Groundwater and the water-food-energy-nexus – Challenges and opportunities"	ICAR-IIWM Bhubaneswar	March 22, 2025	Total=127 Women=14
21	One day Farmer's training under TSP	Chougaon, Koraput	April 23, 2025	Total=104
22	One day Farmer's training under TSP	Charagaon, Koraput	April 24, 2025	Total=97
23	Farmers' training on "Integrated water resources management for enhancing crop and water productivity" under RKVY-GWR project	KVK, Nayagarh	July 4, 2025	Total=50 Woman=1
24	Farmer-scientist interaction meeting for distribution of coconut plant saplings for development of IFS system under RKVY-GWR project	Barapalli, Nayagarh	July 25, 2025	Total=50
25	Integrated water resources management for enhancing crop and water productivity under RKVY-GWR project	KVK, Nayagarh	August 1, 2025	Total=50 Women=7
26	Field day on Crop Diversion under RKVY-GWR project	Sajanapada, Nayagarh	September 08, 2025	Women=25
27	Planning and design of Soil and water conservation interventions in watershed management	ICAR-IIWM Bhubaneswar	September 18-20, 2025	Total=29 Women=10
28	One day training-cum-awareness programme on "Sustainable groundwater management for enhancing crop productivity" under RKVY-GWR project	Sikharpur, Khandapada	October 10, 2025	Total=153 Women=61
29	Awareness program on Sustainable groundwater management (For school children) under RKVY-GWR project	Sajanapada, Nayagarh	October 30, 2025	Total=150
30	Training on "Groundwater recharge and its impact on agricultural productivity" under RKVY-GWR project	Sajanapada, Nayagarh	November 21, 2025	Total =150 Women =81

31	Training on "Productive use of recharged ground-water for crop diversification and livelihood im-provement" under RKVY-GWR project	Raghunathpur, Nayagarh	December 17, 2025	Total =158 Women=106
32	Farmers' Training-cum-Scientist interaction work-shop on "Post-flood Management in Ghaghra River Basin of India" under INTEGRATE project	CharohaSirapar, Basti, Uttar Pradesh	December 03, 2025	Total=110 Women=4
33	Farmers Training-cum-Scientist interaction work-shop with the inputs distribution to the selected beneficiaries in the flood affected, Basti, Uttar Pradesh in the Ghaghra River Basin	Basti, Uttar Pradesh	November 16, 2025	Total= 54 Woman=1
34	Celebration of VB G Ram G: National Farmers Day 2025	Rabara, Odaga-on	December 23, 2025	Total= 102 Woman=31
35	Conjunctive Water Use and Agricultural Water Pro-ductivity under Changing Climate	ICAR-IIWM Bhu-baneswar	18-20 Febru-ary, 2025	Total: 24 par-ticipants

PROGRAMS /MEETINGS ORGANIZED

ICAR-IIWM Observed WORLD WATER DAY

ICAR-Indian Institute of Water Management, Bhubaneswar, celebrated World Water Day 2025 with the theme "***Glacier Preservation***" on 22.03.2025. Dr. A. Sarangi, Director, ICAR-IIWM, Bhubaneswar gave the welcome address and presented the salient achievements of the Institute. The chief guest of the event was Dr. A.K. Nayak, Director, ICAR-CRRI, Cuttack and Guests of Honours were Dr. A. Velmurugan, ADG (SWM), NRM, ICAR and Dr. B.K. Sahoo, Regional Director, CGWB, SER, Bhubaneswar; Er. Padma Dorje, Chief Engineer, POMIO, Central Water Commission, New Delhi delivered the World Water Day lecture. The chief guest emphasized on climate change which causes glacier melt down which ultimately due to greenhouse gas emissions from unsustainable agricultural practices. The future research should focus on preservation of water resources in terms of quality and quantity in line with achieving sustainable developmental goals. On the occasion, ICAR-IIWM's publications were released by the dignitaries. Five nos. of Progressive farmers from the adopted villages were awarded for their significant achievements in agricultural water management and the school students were awarded for their speech on world water day.

Celebration of World Water Day

Viksit Krishi Sankalp Abhiyan (VKSA) Organized

Under the exemplary leadership of Prime Minister Shri Narendra Modi, aimed at enhancing agricultural status for a Developed India (*Viksit Bharat*) by 2047, the Union Minister of Agriculture and Farmers Welfare, Shri Shivraj Singh Chouhan Ji inaugurated the *Viksit Krishi Sankalp Abhiyan* (VKSA) – 2025 on 29 May 2025 at Sakhigopal, Puri, Odisha. The goal of this 15-day country wide pre-kharif agricultural campaign was to bridge the knowledge gap between grassroots farming and scientific research. During this campaign scientists from ICAR-Indian Institute of Water Management in collaboration with KVKs and line departments of Government of Odisha organized the campaign with 180 VKSA Interaction meetings benefiting 81,141 farmers and farmwomen from all blocks of three districts (Balasore, Ganjam and Nayagarh) of Odisha. Throughout this campaign, all teams informed farmers about various agricultural schemes introduced by both the Central and State Governments, disseminated diverse technologies and techniques to enhance productivity, profitability, and sustainability, and gathered information concerning major farmer concerns, innovative practices employed by farmers, and grassroots-level feedback to inform future agricultural research, with particular emphasis on location-specific requirements and the effective dissemination of different technologies. Besides farmers, scientists and officers, all these meetings were attended by state level Ministers, local MPs, MLAs, and PRI members. Nine '*Krishi Raths*' (three in each district) fitted with A-V aids were also moving along with the scientist teams spreading pertinent agricultural information and technologies.

Glimpses of VKSA Interaction meetings including participation of VVIPs, distribution of soil health cards and moving of *Krishi Raths* across the districts

ICAR-IIWM Celebrated World Environment Day

ICAR-IIWM celebrated World Environment Day with the Chairmanship of Dr. A. Sarangi, Director, IIWM. In this meeting Dr. K.K. Bandyopadhyay, Principal Scientist made a presentation on the theme of this meeting "Ending Plastic Pollution". The meeting ended with the vote of thanks to the Director and the participants.

Celebration of International Day of Yoga (IDY)

The 11th International Yoga Day, themed "Yoga for Self and Society," was celebrated at the Institute on June 21, 2025. Dr. A. Sarangi, Director, inaugurated the event, emphasizing the importance of mental and physical fitness for enhancing productivity and work efficiency. Yoga Guru Shri Manoj Kumar Rout stressed the benefits of yoga for all age groups, from school children to retirees, to maintain overall health. The event included a yoga practice session where staff, scholars, and family members performed various Asanas and Pranayams. Dr. S.K. Mishra, Principal Scientist, served as the Convener of the event.

ICAR- IIWM Celebrated Independence Day

The 79th Independence Day was celebrated on 15th August, 1947 at ICAR-IIWM, Bhubaneswar. After hoisting the National flag, the National Anthem was recited by all the staff members of ICAR-IIWM, Bhubaneswar. Then Dr. A. Sarangi, Director, ICAR-IIWM highlighted the theme of this year's Independence Day "Naya Bharat" (New India). Aligned with the national mission of achieving a developed and self-reliant nation by 2047, the theme focused on a bold, prosperous, and secure India. He urged all the staff members to work unitedly to fulfill the mandate of the Institute to meet the National Goal.

ICAR-IIWM Organized National Conference on System of Crop Intensification

ICAR-IIWM, Bhubaneswar, jointly with the Indian Society of Water Management (Odisha Chapter), organized a 'National Conference on System of Crop Intensification for Climate-Smart, Water and Nutrient-Efficient Agriculture' during 4-5 September, 2025. More than 200 participants from research organizations, universities, state government departments, civil society organizations, NGOs, and farmers from across the country participated in the conference. This conference was organized by Dr. A.K. Thakur, Principal Scientist of the Institute.

ICAR-IIWM Celebrated Vigilance Awareness Week

Director ICAR-IIWM administered integrity pledge on inaugural day to all staff on the occasion of "Vigilance Awareness Week" celebration during October 27 to November 2, 2025. On occasion of Vigilance Awareness Week, ICAR-IIWM organized Vigilance Awareness Gramshabha at Belera villege, Salepur block, Cuttack on October 29, 2025 in presence of village Sarpanch and 72 participants. On October 30, 2025, a guest lecture by Dr. S.K. Das, Chief Finance Officer of ICAR-NIASM, Baramati, Maharashtra was organized on "Vigilance: Our Shared Responsibility" at ICAR-IIWM. More than 50 participants attended the seminar.

Celebration of *Rashtriya Ekta Diwas* at ICAR-IIWM

Rashtriya Ekta Diwas was celebrated at ICAR-IIWM, Bhubaneswar on 31st October 2025 to commemorate the Birth Anniversary of Sardar Vallabhbhai Patel. The programme started at 10:00 AM in the Conference Hall of ICAR-IIWM. Banner highlighting the life, vision, and contributions of Sardar Vallabhbhai Patel was displayed in the conference hall.

ICAR-IIWM Celebrated National Constitution Day 2025

ICAR–Indian Institute of Water Management (IIWM), Bhubaneswar celebrated National Constitution Day on 26 November 2025 with great enthusiasm and active participation from all staff members. The event aimed to reaffirm the institute's commitment to the core constitutional values of justice, liberty, equality, and fraternity. As part of the nationwide observance, IIWM organized a series of activities emphasizing awareness, pride, and collective responsibility towards the Constitution of India. The programme commenced with the administration of the Preamble to the Constitution as a pledge, led by Dr. K. K. Bandyopadhyay, Programme Leader, Canal Water Management, ICAR-IIWM. Staff members participated wholeheartedly and took the pledge with a renewed sense of national pride. To promote inclusivity and encourage participation in regional languages, staff also took the pledge through constitution75.com and MyGov.in in their respective mother tongues. The digital certificates received from these platforms were shared in the institute's official WhatsApp group, reflecting the collective spirit and commitment of the staff. To highlight the significance of the day, the institute displayed informative banners at strategic locations, including the main gate, entrance gate, and conference hall. These banners spread awareness about the importance of the Constitution and enriched the overall ambience of the celebrations. A key highlight of the programme was the Speech Competition held on the theme "*Hamara Samvidhan – Hamara Swabhiman*." Staff members enthusiastically participated, delivering insightful and inspiring speeches that reflected on the vision of the Constitution, the role of citizens in upholding democratic values, and the pride associated with being part of the world's largest democracy. The competition encouraged intellectual engagement and provided a platform for expressing perspectives on constitutional ideals and civic responsibility. Following the competition, the winners were announced and cash rewards were presented as a token of appreciation. The Director of ICAR-IIWM, Dr. Arjamadutta Sarangi, graced the occasion and distributed prizes to all the winners, acknowledging their efforts and encouraging continued participation in such national observance events. The judges who evaluated the competition were also felicitated for their valuable contribution to maintaining fairness and quality in the assessments. The activities and highlights of the day were actively shared across the institute's official social media platforms, ensuring wider outreach and engagement with stakeholders and the public. The entire programme was smoothly coordinated by Dr. R. K. Jena, Dr. Ankita Jha, Dr. Ankhila R. H., and Er. Asish M. Jadhav, Scientists of the institute, who meticulously organized the activities and ensured the successful conduct of the National Constitution Day 2025 celebrations at ICAR-IIWM. The observance of National Constitution Day at the institute fostered a deeper understanding of constitutional values and strengthened the collective resolve of the staff to contribute responsibly toward nation-building. The event concluded on a positive note, reinforcing the importance of the Constitution as the guiding force for democratic governance and institutional integrity.

ICAR-IIWM Celebrated WORLD SOIL DAY

The World Soil Day 2025 celebration was organized at ICAR-IIWM, Bhubaneswar, Odisha, on December 5, 2025 with the theme "*Healthy Soils for Healthy Cities*". The Chief Guest for the occasion was Dr. A. K. Nayak, DDG (NRM), ICAR, New Delhi, and the Guest of Honour was Dr. A. Velmurugan, ADG (Soil and Water Management). Due to other commitments, the HDDG could not attend the event in person; however,

the ADG Dr. A. Velmurugan participated virtually. Dr. B. S. Das, Professor, IIT Kharagpur, delivered a special lecture on the theme of World Soil Day, also in virtual mode. The meeting started with ICAR song. Nearly 150 persons including scientists and staff of IIWM and students from three different schools i.e. Saraswati Shisu Mandir and Vivekanand Shiksa Sansthan, Bhubaneswar along with their teachers attended this program. In this program 22progressive farmers including 5 female farmers from different parts of Odisha participated as special invitee.

The programme began with the invocation of the ICAR song, followed by the symbolic watering of a plant to mark the inauguration of World Soil Day. At the outset, the Director and other dignitaries were formally welcomed by Dr. K.K. Bandyopadhyay, Program Leader and Chairman of the organizing committee, IIWM. This was followed by a presentation by Dr. Bandyopadhyay on the significance of World Soil Day. Dr. A. Sarangi, Director, ICAR-IIWM welcomed the participants and highlighted the significant achievements of the Institute on agricultural water management. Dr. B.S. Das, Professor, Department of Agriculture and Food Engineering, IIT, Kharagpur delivered a talk on the world soil day theme "***Healthy Soils for Healthy Cities***". In his address, Dr. Das highlighted that nearly 60% of global soils are either degraded or being used unsustainably. Dr. Das explained that urban soils play a critical role by supporting food production, filtering water, storing carbon, regulating temperature, and sustaining biodiversity. He noted that the theme of World Soil Day calls for transformative actions to reimagine urban landscapes through their soils, ensuring that both people and nature can thrive together, ultimately contributing to the development of healthy, green cities. He also pointed out that the expansion of built-up areas leads to biodiversity loss, reduced agricultural production, increased pollution, and restrictions on natural energy and material flows within ecosystems. In conclusion, he advocated the use of DRS–DSM–HRS approaches for sustainable urban landscape planning and management. Dr. A. Velmurugan, ADG (Soil and Water Management), ICAR gave his remarks on deep interdependence between soil and water management and urged that they should be managed in holistic manner. He emphasized the role of soil health in the One health concept. He also told that in the FAO summit of soil scientists, Soil drought has been highlighted as a major problem.

A farmers-scientists interaction meeting was held under the chairmanship of Dr. S.K. Mishra, Programme

Leader, On-farm Technology Dissemination, ICAR-IIWM, Bhubaneswar. Then speech and painting competition was held among the students on the World Soil Day theme.These activities were followed by a visit to the advanced soil and plant science laboratories at IIWM, where students had the opportunity to explore cutting-edge research and technologies. The farmers visited the Institute's Technology Park, where they were introduced to innovative technologies aimed at improving farming practices. The progressive farmers were felicitated and the students who won prizes in different competitions were rewarded on this occasion. The meeting ended with vote of thanks to the chief guest and all the participants followed by recitation of National Anthem.

ICAR-IIWM Celebrated National Farmers' Day

ICAR-IIWM, Bhubaneswar celebrated the National Farmers' Day (*Rashtriya Kisan Diwas*) on December 23, 2025 in four project locations remembering India's fifth Prime Minister Shri Choudhary Charan Singh Ji on his birth anniversary and to remember his incredible contributions to the welfare of farming community. A total of 637 farmers, farm women and other stakeholders including 301 women attended the programmes. The programme condected in *Belera* village of Salipur block in Cuttack district, Odisha was graced by Prof. Aurobinda Routray and Prof. Mamata Jenamani from IIT Khargpur as the Chief Guest and the Guest of Honour, respectively. Speaking on the occasion, Director of the Institute Dr. Arjamadutta Sarangi informed the participants about the provisions of the New Act, *Viskshit Bharat-Guarantee for Rozgar and Ajeevika Mission* (GRAMIN) called VB-G RAM G and its positive features over MGNREGS. In a similar programme held at Rabara village, Odagaon block, Nayagarh district, Odisha, more than 100 farmers including 31 women farmers from Rabara Panchayat and adjoining villages of Odagaon block participated in the programme. Under RKVY project, a total of 158 women farmers who attended programme were sensitized about the important provisions of New Act, *Vikshit Bharat*-G RAM G, at Sajanapada, Nayagarh, Odisha. In Badamba, Narasinghpur of Cuttack, Odisha, the similar event was conducted for 160 farmers and farm women. Farmers also witnessed the address by Sh. Shivraj Singh Chouhan, Hon'ble Union Minister for Agriculture & Farmers Welfare, who highlighted salient features of the VB G RAM G Act, 2025.

EXHIBITIONS / STUDENT PROGRAM / MOUs SIGNED/DEPUTATION

Participation in Exhibitions

ICAR-IIWM participated and displayed its technologies in the following exhibitions.

Sl.	Event	Place	Date
1.	National Conference on 'Seed Chain Management in Eastern & North Eastern Hill Region: Challenges and Opportunities'	ICAR-IIHR-CHES, Bhubaneswar	21-22 January, 2025
2.	State level Agriculture Fair - 'Krushi Odisha 2025'	Baramunda, Bhubaneswar	3-5 January, 2025
3.	Kisan Mela and Exhibition on Freshwater Aquaculture	ICAR-CIFA, Bhubaneswar	29 January, 2025
4.	'Eastern Zone Regional Agriculture Fair 2025'	ICAR-CRRI, Cuttack	27 February - 1 March, 2025
5.	3rd Utkal Krishi Mela 2025	CUTM, Paralakhemundi, Gajapati	7-8 April, 2025
6.	38th Foundation Day of ICAR-IIWM	ICAR-IIWM, Bhubaneswar	13 May, 2025
7.	National Seminar 2025 on 'Extension Education Strategies and Digital Agriculture: Experiences and Sustainable Pathways"	OUAT, Bhubaneswar	20-22 June, 2025
8.	24th Foundation Day of ICAR-NIFMD, Bhubaneswar	ICAR-NIFMD, Bhubaneswar	July 5, 2025
9.	National Conference on 'System of Crop Intensification' jointly organized by ICAR-IIWM and Indian Society of Water Management (Odisha Chapter), Bhubaneswar.	ICAR-IIWM, Bhubaneswar	4-5 September, 2025


Participation ICAR-IIWM in the Exhibition at 'Krushi Odisha', Bhubaneswar


Participation ICAR-IIWM in the Exhibition at ICAR-CHES, Bhubaneswar

Student program

Three months Students' Internship Programmeunder RAWE

Three months Unit Attachment Programme" (UAP) / **Internship Programme** was organized for ten 4th year B.Sc. (Hons.) Agriculture students from the Institute of Agricultural Sciences, SOA University, Bhubaneswar at ICAR-IIWM during 15th September - 15th December, 2025. During the programme, they acquired new knowledge and skills in agricultural sector beyond routine course syllabus including hands-on-experiences in start-ups, agri-preneurship, organic & natural farming practices and precision farming technologies. Under the **'Agro-Industrial Visits',** the interns were exposed to a few reputed public and private organisations like, ICAR-CRRI, Cuttack; ICAR-CIWA, ICAR-IIHR-CHES, ICAR-CTCRI RS and ICAR-DPR RS at Bhubaneswar; ICAR-IIWM Research Farm at Mendhasal and Institute Technology Park; Odisha State Seed Corporation Ltd, Bhubaneswar; OMFED Milk Processing Plant, Cuttack; PasupatiAgro-Vet Pvt. Ltd, Cuttack; 'EkamraUdyan' Horticultural Garden, Bhubaneswar; and Odisha State Tribal Museum & SCSTRTI, Bhubaneswar besides farmers' field visit and active participation in organizing farmers' training, drone training and capacity building programmes. Dr. S.K. Mishra, Dr. PrativaSahu, Dr. H.K. Dash, Dr. S.K. Karna, MsIshaAnindita Sahoo and Mr. B.K. Pradhan coordinated this three-month programme.

Certificates being distributed to the student interns by the Director of the Institute

Group Photo of the student interns with the Course Directors and Coordinators

Agro-inductrial visit to ICAR-CRRI, Cuttack

Agro-inductrial visit to ICAR-CTCRI, Bhubaneswar

Hands-on training on Use of Drones in Agriculture

Experiential learning cum diagnostic visit of student interns to farmers' fields

MoUs Signed by ICAR-IIWM

ICAR-IIWM, Bhubaneswar signed MoU with different organizations

Sl. No.	Name of the other party/ Institute entered MoU with ICAR-IIWM	Name of collaborating institute(s) of ICAR	Activities undertaken under the MoU	MoU Signed on
1	IIT Bhubaneswar Research and Entrepreneurship Park, Bhubaneswar	ICAR-Indian Institute of Water Management, Bhubaneswar	To optimize the robustness and scalability of IoT-enabled sensors and devices developed at ICAR-IIWM for fine tuning and commercialization of the product by start-ups	8-8-2025 Valid for the entire duration of the project period and/ or till the achievement of objectives/deliverables of the project.
2	PRAGATI, Koraput (NGO)	ICAR-Indian Institute of Water Management, Bhubaneswar	Participatory land and water resources development and management for improved rural livelihood support through profitable agriculture and allied activities in Koraput district of Odisha by coordinated efforts of ICAR-IIWM and PRAGATI, Koraput in community organization and capacity building, technological intervention and demonstration for the development of the farming	11.11.2025 Valid for a period of two years from the date of signing

Attended ICID 4th World Irrigation Forum (WIF4) and 76th IEC meeting during 7-13, September, 2025 at Kualampur, Malaysia

SWACHH BHARAT ABHIYAN

ICAR-IIWM undertook a number of activities during Swachhata Hi Seva (SHS) 2025 campaign which was celebrated during 17th September and 2nd October, 2025. On the first day of SHS programme, i.e., on 17th September, 2025, Dr Arjamadutta Sarangi, Director, ICAR-IIWM administered *Swachhta Pledge* to all the staff and students of the institute and spoke on the theme of SHS Campaign, i.e., Swachhotsav. Banners were displayed near the main gate, entrance of office building and in the meeting rooms of the institute. The inaugural meeting was followed by a plantation programme 'Ek Ped Maa Ke Naam' in which Director and other scientists of the institute planted saplings in the campus. On 19.9.2025, a *Swachhata Ki Pathshaala* (Swachhata Class) was organized for the school children of Government High School, Rail Vihar, Chandrasekharpur, Bhubaneswar in which various aspects of cleanliness, sanitation, and hygiene practices, plastic pollution, environment-friendly waste management at household and community level, water conservation and plantation for environment were discussed.More than 100 enthusiastic Class-VIII students participated in the *swachhata* sensitization and awareness programme. On 20.9.2025, essay and drawing competitions were organized on the theme '*Swachh Bharat Mission and its impact on Health, Environment and Society*' among students of Government High School, Chandrasekhapur (Phase-1). Total 40 students participated in the event.

Considering the critical importance of social security and welfare schemes of central government for the poor on one hand and their lack of awareness about such schemes on the other, a workshop on 'linking poor to Government Welfare Schemes' was organized on the Day-6 of SHS 2025 programme (i.e. 22.9.2025) with support from State Bank of India (SBI). A team of officers led by Shri Dillip Kumar Nayak, Chief Manager (Value Added) were the resource persons in the workshop. Topics such as central govt. social security schemes such as insurance and pension schemes, eligibility criteria, maturity period, premium involved, benefits to insurer and family under different situations were discussed.

On 26.9.2025, a Health Check-up & Cancer Awareness Camp was organized at ICAR-IIWM in which more seventy persons including scientists and staff of the institute, Safai Mitras, field workers and project staff attended. The event was organized in collaboration with Bagchi Sri Shankar Cancer Centre and Research Institute (BSSCCRI), Madanpur, Bhubaneswar. At the beginning, Dr. Abhishek Dandapat in his presentation 'Cancer Awareness, Prevention and Treatment' discussed different types of cancer, signs & symptoms, associated risk factors, benefits of early detection, available vaccines against certain types of cancer, treatment methods available in Odisha and other parts of the country and the role of food & nutrition and healthy lifestyle in reducing risk of cancer. After the presentation, a health camp was organized by the team of doctors and staff. Based on the observations, treatments were suggested. More than 75 participants attended the Health Check-up & Cancer Awareness Camp.

A programme on safety of *Safai Mitras* was held on 29.9.2025 (Day-13) wherein, the Director of the Institute Dr. Arjamadutta Sarangi distributed PPE kits including face shields, gumboots, protective gears such as hand sanitizer, face masks, hand wash liquid, rubber gloves, protective eye wear, towels, aprons, multifunctional electric cleaning brush etc. to over twenty sanitation workers/garden maintenance staff/housekeeping staff of the Institute in order to safeguard them from occupational hazards, improve

Swachhta pledge administered by Director

Swachhta ki Pathsala

Health check-up camp

Distribution of PPE kits

their work efficiency as well as for maintenance of personal hygiene. On the last day of the campaign, aprogramme was organized to sensitize sanitation workers, field workers and other staff of the institute on various government social security schemes and savings schemes of banks. A team of bank officials led by Ms. Trinita Pradhan, Branch manager, State Bank of India, Rail Vihar, Bhubaneswar sensitized the participants and interacted with the participants about different social security and income generating schemes such as Ayushman Bharat, PMJJBY, PMSBY, APY, PM Mudra Yojana etc. and explained in detail the provisions of these schemes, benefits and terms & conditions. The team also clarified the doubts of participants regarding different term insurance and pension schemes of the government. In addition to the above-mentioned events, two cleanliness programmes were organized in the IIWM campus while three swachhataprogrammes were organized at village level. The SBA team of ICAR-IIWM organized and coordinated the day-wise activities.

ICAR-IIWM also observed *SwachhtaPakhwada* during 16-31 December 2025. During the *Pakhwada*, eight events were organized in the villages dominated by farmers belonging to Scheduled Castes (SCs), Scheduled Tribes (STs), women, and three programmes were organized in schools. Topics such as progress under Swachha Bharat Abhiyan in terms of its health and environmental benefits; safe disposal and management of wastes; plastic use and its adverse impact on environment and soil and water; recycling of waste-water; management of crop residues and other wastes, water conservation & management for creating wealth and spirituality &swachhta for mental peace. On 23rd December, 2025, ICAR-IIWM, Bhubaneswar observed the National Farmers' Day (*Rashtriya Kisan Diwas*) at four project locations remembering India's fifth Prime Minister Shri Choudhary Charan Singh on his birth anniversary and to remember his incredible contributions to the welfare of farming community. A total of 637 farmers, farmwomen and other stakeholders including 301women attended the programmes.

The programme in *Belera* village of Salipur block in Cuttack district, Odisha was graced by Prof. AurobindaRoutray and Prof. Mamata Jenamani from IIT Khargpur as the Chief Guest and the Guest of Honour, respectively. In their address they emphasised the importance of adopting organic and natural farming practices for improving access to safe food and contributing to sustainable agriculture. Speaking on the occasion, Director of the Institute Dr Arjamadutta Sarangi informed the participants about the provisions of the new Act, Viksit Bharat-Guarantee for Rozgar and Ajeevika Mission (Gramin) called VB-G RAM G and its positive features over MGNREGS. He also highlighted focussed areas of work in the ambit of Natural Resource Management such as rainwater conservation and its sustainable use that are critical for increasing crop and water productivity. Among others, Sri Ashok Kumar Bhuyan, Sarpanch, Purunahat GP; Sri Ch. Pramod Kumar Routray, Sarpanch, Sudukhanda; Sri Kamalakanta Nayak, Ex-Sarpanch, Rotilo GP; Sri Girish Chnadra Swain, Representative PS Member; Sri Ranjan Kumar Baral, Representative PS Member; SmtDiptirekha Mallik, Ward Member. Principal Scientists from ICAR-IIWM Dr. H. K. Dash, Dr. S. K. Mishra, Dr. P. K. Panda and Dr. B. K. Sethy coordinated the event. Dr S. K. Karna and Mr S. Sahoo assisted in organizing the programme. Ten progressive farmers and farmwomen were felicitated on the occasion by the guests for their notable work in agriculture.

In a similar programme held atRabara village, Odagaon block, Nayagarh district, Odisha, more than 100 farmers including 31 women farmers from Rabara Panchayat and adjoining villages of Odagaon block participated in the programme. Dr. S.K. Jena, Principal Scientist and his REWARD team members coordinated the programme.

In the '*Rashtriya Kisan Divas*' programme organized at Baghera village, Nayagarh under RKVY, 158 women farmers who attended programme were sensitized about the important provisions of new Act, Vikshit Bharat-G RAM G and promise that it holds for water resource development. The programme was coordinated by Principal Scientists; Dr, R. R. Sethi and Dr. O. P Verma.

In Badamba, Narasinghpur of Cuttack district of Odisha, the event was attended by 160 farmers and farmwomen. Experts of the programme discussed scientific management of *rabi* crops and efficient use of groundwater resources with the farmers, Farmers were also informed about new Act that replaced MGNREGA and its positive features. Dr. D. K. Panda, Principal scientist coordinated the event.

Farmers also witnessed the address by Hon'ble Union Minister for Agriculture & Farmers Welfare, Shri Shivraj Singh Chouhan who highlighted salient features of the G RAM G Act 2025. Further he appreciated the farmers' efforts towards Viksit Bharat Abhiyan. Copies of salient features of the new Act were distributed amongst participating farmers and farmwomen, and flex banners highlighting the key aspects of the Act were displayed for creating awareness.

On the concluding function of *Pakhwada* organized on 31st December 2025, Shri Sukanta Kumar Panigrahi, Hon'ble MP (*Lok Sabha*), Kandhamal graced the occasion as Chief Guest. In his address, Shri Sukanta Kumar Panigrahi, Hon'ble MP(LS) stressed the importance of Jan Bhagidari (People's participation) in the movement in order to realize the dream of Hon'ble Prime Minister. He also discussed the urgent need for better management of crop residues not only for creating wealth but also for creating a clean environment and reducing the risks of climate change. He urged the participants to make swachhta a way of life and work towards creating an inclusive society and Viksit Bharat 2047. The Chief Guest also felicitated winners of Essay Competition 'Swachha Bharat Abhiyan: Impact on Health & Environment'. Earlier, the Chief Guest accompanied by the Director and staff planted a sapling in the campus. Director, Dr. Arjamadutta Sarangi in his welcome address briefly discussed the approach, outreach and focus of ICAR-IIWM in organizing different Swachhta campaigns. Dr H.K. Dash, Chairman, SBA Committee gave a brief account of activities undertaken during the fortnight long SwachhataPakhwada. A total of 1553 persons participated in the fortnight long *Swachhata Campaign* s organized by ICAR-IIWM.

Kisan Diwas Celebration at Rabara, Odagaon, Nayagarh

Felicitation of farmers and farmwomen

GENDER RESEARCH AND EXTENSION

ICAR–IIWM, Bhubaneswar has undertaken a series of initiatives across different districts of Odisha under major programmes such as FARMER FIRST, SCSP, TSP, and RKVY, with a strong focus on empowering farm women. Women empowerment has emerged as a key outcome of these agricultural development efforts, particularly under the *Rashtriya Krishi Vikas Yojana* (RKVY), which promotes inclusive growth, livelihood diversification, and agri-entrepreneurship. Regular capacity-building programmes, exposure visits, training on crop diversification, and events such as *Kisan Diwas* celebrations have further strengthened awareness, skills, and confidence among farm women. This includes mobilization of women farmers through Self-Help Groups (SHGs), demonstration of high-value crops under improved irrigation systems, and promotion of recharge-based groundwater management. These interventions have significantly enhanced women's participation in agriculture by improving farm productivity and income, while also strengthening their decision-making ability, leadership qualities, and collective action. As a result, many women have transitioned from subsistence-level involvement to income-oriented farming, leading to greater financial independence and improved social recognition within their communities.

A notable outcome of these interventions has been the successful conversion of previously fallow land into productive, income-generating agricultural systems through recharge-supported irrigation under RKVY-GWR project. The cultivated area expanded from 0.5 acre in the first year to 1.0 acre in the second year, resulting in stabilized and scaled-up production. This expansion led to a substantial increase in net seasonal income, rising from ₹76,500 in Year-1 to ₹2.19 lakh in Year-2. The system demonstrated high water productivity (2.9–3.1 kg m^{-3}), reflecting efficient utilization of irrigation water, and very high energy productivity (₹1,738–2,216 per kWh), indicating strong economic returns per unit of energy consumed. Additionally, the intervention maintained a low seasonal carbon footprint (55–110 kg CO_2), highlighting its environmental sustainability. Beyond economic gains, the initiative contributed to a significant reduction in seasonal migration and enhanced the financial independence of women farmers, thereby strengthening their role in household and farm-level decision-making.


Kisan Diwas Celebration under RKVY-GWR

Women participation and gender equity under millet systems

An impact assessment of millet cultivation in Odisha highlighted the critical role of women in promoting climate-resilient agriculture and reducing water footprint. The analysis revealed that women contribute nearly 70% of the total labour involved in millet production systems. Their participation is particularly dominant in operations such as seed treatment, nursery raising, transplanting, weeding, harvesting, and value addition. While men are primarily involved in mechanized activities such as land preparation and application of inputs, women play a central role in both production and post-harvest management. Women members of households and SHGs are actively engaged in preparation of bio-stimulants, processing of millet grains, and development of value-added food products, thereby contributing to household income and nutritional security. The findings also indicate a growing trend of gender equity in millet-based value chains, supported by initiatives under state and national programmes. Women's active involvement in production, value addition, and local marketing has not only generated employment opportunities but also strengthened their socio-economic status. Overall, millet cultivation has emerged as an effective pathway for empowering rural women by enhancing livelihood opportunities, promoting sustainable agriculture, and ensuring inclusive development.

Distribution of work force involved in finger millet production system

Particulars of operation	Work done by (%)	
	Women	Men
Nursery bed and main field preparation	20	80
Seed treatment, sowing, aftercare of nursery	90	10
Uprooting of seedlings and transplanting	90	10
Application of manures and fertilizers and irrigation water	40	60
Weeding and intercultural operation	70	30
Application of pesticides and bio-stimulants etc.	10	90
Harvesting	90	10
Drying, threshing, cleaning, processing and bagging	40	60
Value addition	100	0
Marketing	20	80
Over all field work involvement	70	30

RAJBHASHA ACTIVITIES

Organization of Hindi Workshops (January – March 2025 Quarter)

A Hindi workshop was organized on February 27, 2026, for the financial year 2025-26 at ICAR-Indian Institute of Water Management (IIWM), Bhubaneswar. The main theme was "Working Easily in Indian Languages using Artificial Intelligence (AI) Tools." The workshop was chaired by Dr. R.K. Panda, Director (In-charge), as nominated by the Honorable Director. Approximately 13 officers and staff members participated in this workshop. Mr. Hariram Pansari, Retired Manager (Official Language), NALCO, delivered the lecture. He shared insights on performing daily office tasks using computers and online platforms, providing information on Anuvadini, Bhashini, Google Translate, ChatGPT, and other AI-based translation tools. Guidance was also provided on how to use these tools for noting in e-Office.

Organization of Hindi Workshops (April – June 2025 Quarter)

A Hindi workshop was held on May 16, 2025, at ICAR-IIWM, Bhubaneswar. The core theme was "Official Language Rules, Acts, Hindi Education, and the Noting & Drafting Incentive Scheme." The session was chaired by Dr. R.K. Panda, Director (In-charge). About 12 officers and employees attended. The keynote lecture was delivered by Mr. Ram Dayal Sharma, Joint Director (Official Language), ICAR, New Delhi. He presented practical online solutions with examples for various Hindi-related challenges faced in daily office work. He also highlighted the economic significance of Hindi and its importance in national development, urging staff to maximize the use of the Official Language in office work.

Organization of Hindi Workshops (July – September 2025 Quarter)

On September 22, 2025, a Hindi workshop was organized at ICAR-IIWM, Bhubaneswar. Dr. Arjamadutta Sarangi, Director, ICAR-IIWM, welcomed the Official Language Consultant, Mr. Hariram Pansari, with a bouquet. Following the welcome address by the Hindi Officer, the workshop commenced with the theme "Kanthasth Version 2 – Memory-Based Translation Software." The workshop was chaired by the Director, and approximately 26 personnel participated in the workshop. Mr. Hariram Pansari discussed Kanthasth Version 2 and Bharati Translation, explaining their application in official work. Various officers raised queries, which were resolved through practical demonstrations. The Director noted that these tools are highly useful and advised everyone to utilize them.

Organization of Hindi Workshops (October – December 2025 Quarter)

A Hindi workshop was conducted on December 18, 2025, focusing on "Noting, Drafting, and Letter Writing." Dr. R.K. Panda, Director (In-charge), chaired the session. Eighteen officials and staff members participated in this workshop. Dr. R.K. Dubey, PGT (Hindi), Kendriya Vidyalaya Sangathan, Bhubaneswar, delivered a lecture. He briefed the participants on the types, objectives, and importance of noting and drafting, along with various techniques for effective letter writing.

Celebration of Hindi Pakhwada (Fortnight), 2025

As in previous years, Hindi Diwas (Pakhwada) – 2025 was celebrated at ICAR-IIWM from September 15 to September 29, 2025, under the able leadership of Dr. Arjamadutta Sarangi, Director, ICAR-IIWM. Dr. O.P. Verma, Hindi Officer (In-charge), welcomed the dignitaries with bouquets and expressed gratitude to all participating officers and staff. The ceremony was inaugurated by the dignitaries by watering a plant.

On this occasion, Director Dr. Arjamadutta Sarangi's dedication to the Official Language inspired the staff. He remarked that it is a day of great pride as we celebrate our official language, which not only unites us but also establishes India's identity on the international stage. He encouraged everyone to work more in Hindi so that the technical advancements made by the institute can reach the general public of India. Dr. R.K. Panda, Director (In-charge), advised that all files across sections should include Hindi notes and emphasized periodic Hindi training for staff.

Competitions held during the fortnight included:

- Hindi Debate, Speech, and Essay Writing.
- Hindi Noting and Drafting.
- Hindi Typing.
- Online Hindi Workshop.

The Director distributed certificates and cash prizes to the winners. The event concluded with a vote of thanks by Mr. Kamlesh Kumar Sharma, Senior Technical Assistant (Official Language).

Organization of Quarterly Meetings (Year 2025)

Quarterly meetings of the Departmental Official Language Implementation Committee are held four times a year (once every quarter). These meetings aim to review the progress of the Official Language and resolve issues hindering its growth in daily office tasks. Discussions include compliance with Section 3/3 of the Official Language Act, correspondence in Hindi, replies to Hindi letters, Hindi noting, training, Unicode facilities, and annual program targets. For the financial year 2025-26, meetings were held on July 18, 2025, October 29, 2025, and January 27, 2026.

PERSONNEL

As on 31-12-2025

Dr. Arjamadutta Sarangi	Director

SCIENTIFIC	
Dr. R.K. Panda	Principal Scientist (S&WC Engg.)
Dr. S.K. Rautaray	Principal Scientist (Agronomy)
Dr. S.K. Jena	Principal Scientist (S&WC Engg.)
Dr. K.K Bandyopadhyay	Principal Scientist (Soil Physics and S&WC)
Dr. R.K. Mohanty	Principal Scientist (Aquaculture)
Dr. S. K. Mishra	Principal Scientist (Agricultural Extension)
Dr. H.K. Dash	Principal Scientist (Agricultural Economics)
Dr. P.K. Panda	Principal Scientist (Agronomy)
Dr. A.K. Thakur	Principal Scientist (Plant Physiology)
Dr. S. Mohanty	Principal Scientist (S&WC Engg.)
Dr. D.K. Panda	Principal Scientist (Agricultural Statistics)
Dr. D. C. Sahoo	Principal Scientist (L&WME)
Dr. B. K. Sethy	Principal Scientist (L&WME)
Dr. R. R. Sethi	Principal Scientist (S&WC Engg.)
Dr. Ashok K. Nayak	Principal Scientist (Computer Applications)
Dr. P. Panigrahi	Principal Scientist (S&WC Engg.)
Dr. Ashis Maity	Principal Scientist (Soil Science)
Dr. O.P. Verma	Principal Scientist (Agronomy)
Dr. Sanatan Pradhan	Principal Scientist (Soil Physics and S&WC)
Dr. Sridhar Patra	Principal Scientist (L& WME)
Dr. B. S. Satapathy	Senior Scientist (Agronomy)
Dr. D. Ghosh	Senior Scientist (Agronomy)
Dr. R. K. Jena	Senior Scientist (Agronomy)
Dr. D. Sethi	Scientist (Veterinary Extension)
Er. Ajit K. Nayak	Scientist (L& WME)
Dr. P. Sahu	Scientist (Fruit Science)
Dr. A. Jha	Scientist (Agricultural Meteorology)
Mr. Partha Deb Roy[##]	Scientist (Soil Science)
Dr. Ankhila R. Handral	Scientist (Agricultural Economics)
Mr. B. Behera[##]	Scientist (Agronomy)

Mr. A. Madhukar Jadhav	Scientist (Electronics & Instrumentation)
Dr. Mamta Bisht	Scientist (EVS)
Dr. Mohammed Shafeeq P M	Scientist (Soil Science)
Dr. Ranabir Chakraborty[##]	Scientist (Agricultural Physics)

Study leave

TECHNICAL	
Mr. Chhote Lal	Asst. Chief Technical Officer (Farm)
Mr. B.K. Acharya	Technical Officer (Farm)
Mr. S. Lenka	Technical Officer (Lab)
Mr. P. Barda	Technical Officer (Estate)
Dr. Subodha Kumar Karna	Senior Technical Assistant (Lab)
Mr. Kamlesh Kumar Sharma	Senior Technical Assistant (Hindi Translator)
Mr. A. Parida	Senior Technician (Farm)
Mr. Anand Gaurav	Technician
ADMINISTRATION	
Mr. S.K. Jena	Administrative Officer
Mr. Janardan Biswal	Senior Finance & Accounts Officer
Mr. J. Nayak	Asst. Administrative Officer
Mr. R.K. Dalai	Asst. Administrative Officer
Mrs. M. Padhi	Private Secretary
Mr. Trilochan Rout	Private Secretary
Mr. A.K. Pradhan	Assistant
Mr. N.K. Mallick	Assistant
Ms. Pooja Uppal	Assistant
Ms. Deblina Chakraborty	Assistant
Mr. C.R. Khuntia	Upper Division Clerk
Mr. B.S. Upadhyaya	Upper Division Clerk
Mr. S.C. Das	Upper Division Clerk
SUPPORTING	
Mr. Sanatan Das	Skilled Support Staff
Mr. B.N. Nayak	Skilled Support Staff
Mr. S.K. Panda	Skilled Support Staff
Mr. B. Dutta	Skilled Support Staff
Mrs. Sanghamitra Singh	Skilled Support Staff

JOINING, PROMOTION AND SUPERANNUATION

- Dr. Mamta Bisht (Environmental Science), Dr. Mohammed Shafeeq P. M. (Agricultural Physics), and Dr. Ranabir Chakraborty (Soil Science) joined ICAR-Indian Institute of Water Management on 07 July 2025 (F/N).

Dr. Mamta Bisht
Scientist

Dr. Mohammed Shafeeq PM
Scientist

Dr. Ranabir Chakraborty
Scientist

- Dr. Subodha Kumar Karna promoted as Senior Technical Assistant on July 9, 2025 w.e.f., October 29, 2023.
- Mr. Kamlesh Kumar Sharma promoted as Senior Technical Assistant on July 9, 2025 w.e.f., October 29, 2023.

Dr. SUBODHA KUMAR KARNA
Senior Technical Assistant
(Laboratory)

Mr. KAMLESH KUMAR SHARMA
Senior Technical Assistant
(Hindi Translator)

- Dr. Prabhakar Nanda, Principal Scientist superannuated on July 31, 2025.
- Mrs. Sunanda Naik, Chief Technical Officer superannuated on September 30, 2025.