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भाकृ अनुप
ICAR

ICAR-IIWM News

भाकृअनुप–भा.ज.प्र.सं. समाचार

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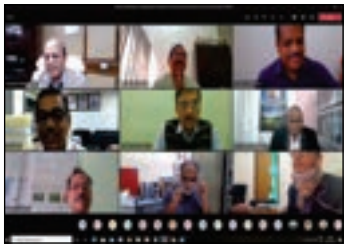
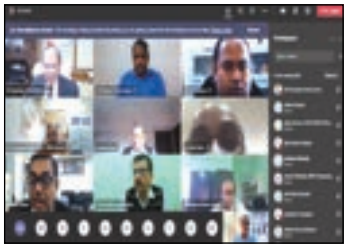
In this issue





DIRECTOR'S COLUMN

Canal Automation-Need of the Hour to Augment Water Productivity in Canal Command

India ranks first in the world in terms of irrigated area, with approximately 68.4 million ha. However, water use efficiency in irrigated agriculture is very low, approximately 40 percent for surface irrigation and 60 percent for groundwater irrigation. According to the Food and Agriculture Organization (FAO), the overall water use efficiency for irrigated agriculture in developing countries is about 38 percent. Numerous impediments in canal irrigation systems create hindrances in achieving its goal. To name a few prominent hurdles are lack of proper operation and maintenance, inadequate distribution system, incomplete command area development works, change in cropping pattern, and diversion of irrigated land to other purposes. Under this backdrop, an automated irrigation system with an improved irrigation allocation, distribution, and delivery mechanism is presumed to be a better proposition in the canal irrigated ecosystem. By automating the flow delivery in canals, the wastage of water can be prevented and the required amount of water can be delivered to the crop field.

The main objective of canal automation is to measure, control and monitor the distribution of the water to the areas according to their requirement and water availability in the reservoir. Floods are also avoided as the reservoir and canal gates are operated automatically in synchronization when the level changes. Presently, in the Indian context manual control is employed to control most of the gates of the dams and canals. When they are automated, the water release can more efficiently be controlled and managed. The gates are operated automatically by using a geared motor. When the discharge changes, the gates are operated automatically in Supervisory Control and Data Acquisition (SCADA) system with advanced control logic.

Canal automation in India has been initiated much late. One important canal automation was initiated in Narayanpur Left Bank Canal in Karnataka state during 2014. The pioneering system comprised SCADA-based automation from Dam to farmer delivery outlets supported by a robust data communication system, GIS-based Irrigation Network Management Information System (INMIS), and farmer information system.

To regulate the canal supply, it is very important to know the Spatio-temporal water demand for the command area based on the crop configuration. Once the water demand is known over space and time (through a hydrologic module), one can easily regulate the canal according to the demand. A canal hydraulic model is required to be put in place to simulate the flow along with the canal system vis. a vis.

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the canal gate opening to match with the demand. In this context, a reservoir balancing module becomes an essential component to know the exact amount of water that can be released from the reservoir in each irrigation period of a cropping season. Subsequently, the development of a Decision Support System (DSS) shall be required for various scenarios on real time basis, which will be supported through the above major modules. After the integration of all the developed modules, the input from these modules will be provided to the real-time SCADA system of the canal. A hardware component (automated gates) will be embedded in the above system for the exact amount of water release as per demand. A KiOSK may be developed to know the exact farmer's irrigation requirement and accordingly, the release of water through the canal becomes handy.

Thus, it is imperative to plan for canal automation, which shall be a prudent proposition to enhance equity in water availability all along the canal system based on the crop requirement. This can address other inherent issues like crop diversification and enhanced water productivity in irrigated ecosystems.

RESEARCH ACHIEVEMENTS

Enhancing Farm Income through Land Shaping in Coastal Waterlogged Areas of Odisha

Socio-economic survey of the farmers in coastal waterlogged areas at Baghadi and Hatiapal village of Jagatsinghpur district of Odisha revealed that most of the farmers having small landholdings. They usually grow paddy with very low productivity (1.34 t ha^{-1}) and get a net return of about ₹4021 per ha (2017-18). To improve the income of farmers, a group of scientists from ICAR-IIWM, Bhubaneswar conducted experiments at the farmer's field. Land modifications were done in the lowland rice fields and two types of models were evaluated.

In the first model (Raised bed and pond system), one-third area of the downside of the plot was excavated to make a small farm pond of 2-m depth (Fig. 1). The soil excavated from the pond was used for making a raised bed in one-third of the field in the upstream side and embankment around the pond. The remaining 1/3rd area (middle portion) was undisturbed for the cultivation of lowland rice as usual. On the raised beds, amaranths, green chili, brinjal, bottle gourd, ridge gourd, cabbage, bitter gourd, and okra were cultivated. Also, pisciculture was practiced in the farm pond.

In the second model, i.e., Alternate raised bed and furrow and aquaculture in an agroforestry system, there were 6 furrows and 7 raised broad beds surrounded by two rows of agroforestry plantation on three sides, one lateral furrow joining the 6 furrows, and a refuge pond (Fig. 2). Broad beds (5.5 m at base and 5.0 m at top) were arranged in an alternate pattern with furrows. Furrows were 3 m wide at ground level and 2 m at the base with a depth of 1 m from surface level. At the downside of the beds and furrows, all the furrows were connected to a lateral furrow of 45.5 m length and 5 m width at the downslope side. The lateral furrow was connected to a water harvesting farm pond (20 x 15 m) which served as a refuge for fish culture.

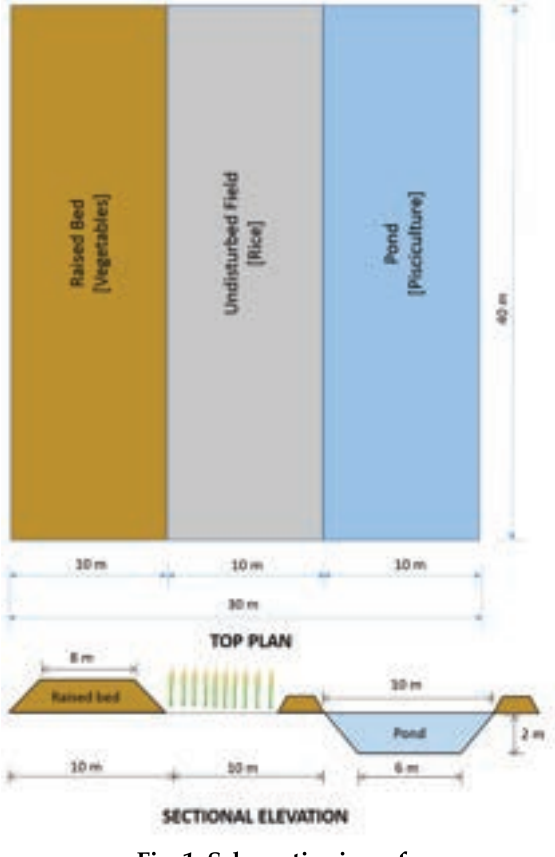


Fig. 1. Schematic view of "Raised bed and pond system"

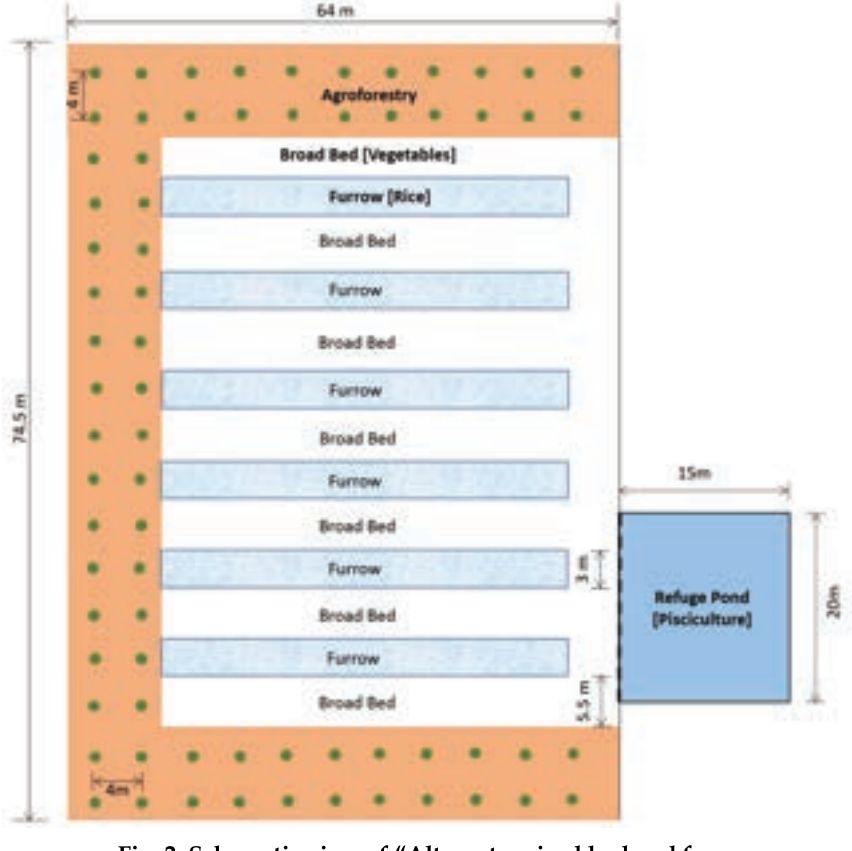


Fig. 2. Schematic view of "Alternate raised bed and furrow and aquaculture in an agroforestry system"

It is observed that as compared to the conventional system of lowland rice cultivation, both the land modification systems resulted in increasing farm income and employment generation. Among the two systems of land modification, model 2, i.e. 'Alternate raised bed and furrow and aquaculture in an agroforestry system' was found more beneficial with a higher net return of ₹1.68 lakh ha^{-1} as compared to model 1 (₹ 0.5 lakh ha^{-1}). These returns were noted after considering the annual cost of land modification.

In addition to the economic benefits, agroecological benefits were also noted in model 2, *viz*., biodiversity in terms of birds (Egret, Stork, Ibis, Heron, Darter, and Kingfisher), earthworms and agroforestry species (*Casuarina, Eucalyptus,* and Bamboo). A large number of aquatic and semiaquatic birds of different types were observed to take shelter from evening to morning on the agroforestry plants. Suitable agroforestry species such as bamboo and *Casuarina* in the system are also useful as windbreaker in cyclone-prone coastal areas. Soil salinity was reduced in raised bed areas and helped in crop diversification. From this study, suitable crops identified for growing on raised beds (Fig. 3) include nursery crops of cabbage and knol khol, *Amaranth* (green vegetable), brinjal, tomato, ridge gourd, bitter gourd, okra, etc.

Fig. 3. Suitable vegetable crops for the raised beds

S.K. Rautaray, S. Roy Chowdhury, R.K. Mohanty, N. Manikandan, S. Mohanty and O.P. Verma

Impacts of Land-atmosphere Interactions on Dry-hot Episodes in India

Recently, the land-atmosphere coupling has been identified to be raising the temperatures and thus dryness in many parts of the world. Since, India stands out as one of the global hot spots of soil moisture-temperature coupling, we hypothesize that such interaction will enhance the future agricultural water requirements in the context of repeated monsoon rainfall failure. The process of land-atmosphere coupling in India starts fundamentally with the monsoon rainfall in June that dissipates the reigning high summer temperatures. Whereas, the subsequent rainfalls during the peak months of July and August strengthens the interaction between evaporation and soil moisture to drive the rainfall variability, particularly over the monsoon-dominated transitional regime of central India. This coupling between soil moisture and rainfall ensures evaporative cooling, failure of which amplifies temperatures because of reduction in latent heat flux. The preliminary analysis indicates that in central India the coupling strength has been significantly high in years characterized with long and repeated break spells. Thus, central India is considered to be the 'transitional regime' where seasonal and diurnal moisture variability directly drives the evaporation rate. Whereas, northwest India represents the 'dry regime' where moisture availability is limited and thus characterized by no or only very small evapotranspiration. It is well known that the drying phase began in the mid-1980s, as a result of which the rainfall-dependent canal irrigated area decreased that initiated the groundwater revolution in India. However, the nationally averaged monsoon rainfall hardly exhibits any conspicuous pattern, obvious from the contrasting regional tendency depicted in the spatial distribution of trends (Fig. 4a). Noteworthy, however, is the drop in rainfall in the agriculturally productive Indo-Gangetic Plain of northern and central India. In turn, the summer is warming at a faster rate, covering about 92% of the landmass (Fig. 4b). About 35% of the geography has witnessed statistically significant (p<=0.05) rises in maximum temperature.

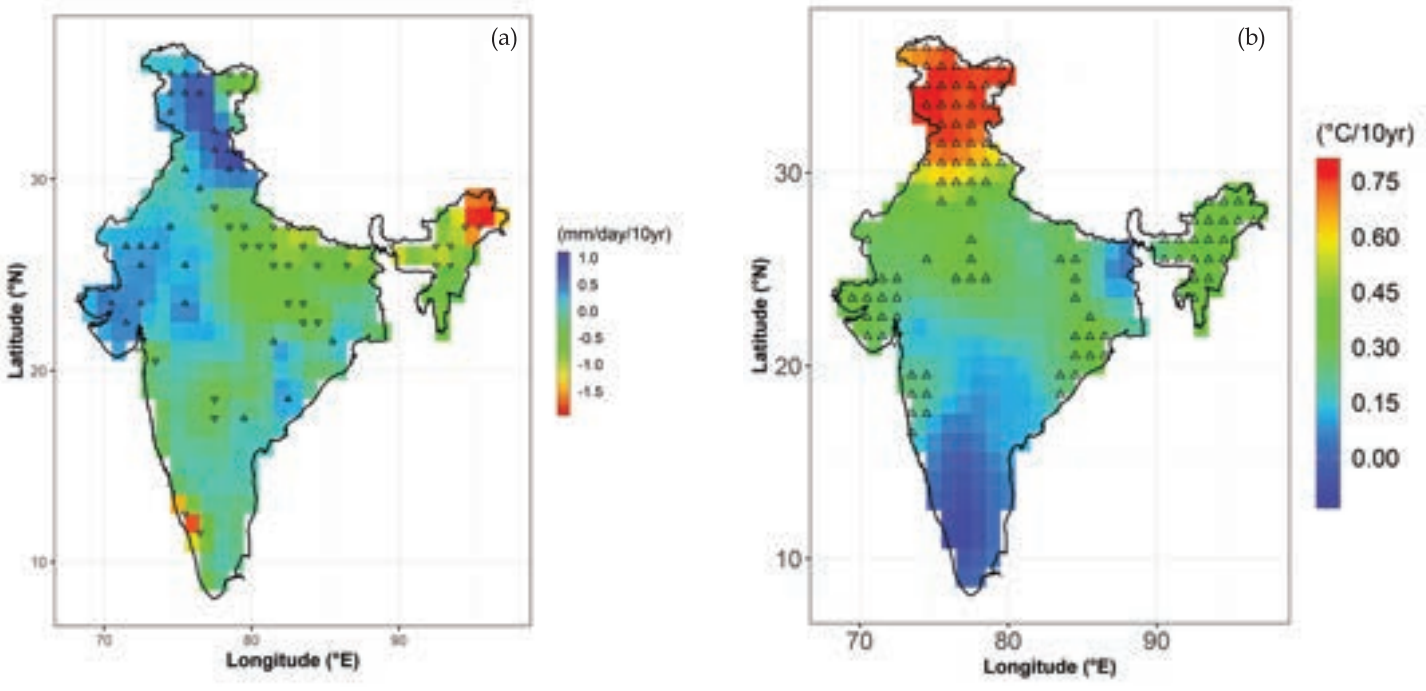


Fig. 4. Spatial depiction of the monsoon rainfall (%) trends (a) and its correspondence with the summer maximum temperatures (b)

The strength of the land-atmosphere coupling has been assessed using the correlation analysis, which supports the hypothesized mechanism as 76% of the country has shown an inverse relationship between rainfall and temperatures. It is important to point out that India experienced twelve of the fifteen hottest years since the beginning of the twenty-first century, especially started with the 2002 record-breaking drought. We relate the extreme temperature matrices, such as the summer mean of maximum temperature (TX), hot days (HD) and heatwave duration (HWD) with the land evaporation (Evap) and terrestrial water storage (TWS) in two contrasting moisture regimes, the moisture-limited northwest India and the core monsoon rainfall dominated central India. Results indicate that in dry northwest India the heat indices are relatively better correlated than central India. We find the inverse relationship (i.e., negative correlation coefficient) between land evaporation and temperatures suggests a role of soil moisture to facilitate the evaporation process, lack of which leads to high atmospheric demand of water and thus heating of land.

This is supported by TWS, exhibiting a relatively stronger effect in central India. Whereas land evaporation regulates better the heat extremes in northwest India. This could be the main reason for agriculture failure in 2002. Alongside the rainfall failure, temperature anomalies in several parts exceeded 5°C during July 2002 and thus the high atmospheric demands coinciding with the critical stage of crop growth caused heavy damage. In general, the disproportionately high temperatures observed particularly during drought years point to mechanisms other than the mean warming from rises in greenhouses gases.

This could be due to changes in dynamics and thermodynamics on and above the surface. Although, it is widely believed that global warming is the main reason, the relatively stronger coupling during 2002-2016 is indicative of the feedback mechanism in amplifying the temperatures and thus, imposing additional stress on water resources.

D.K. Panda and S. Pradhan

SCIENCE

Cultivated Land Utilization Index vis-à-vis Cropping Intensity for Crop Diversification and Water Resource Management

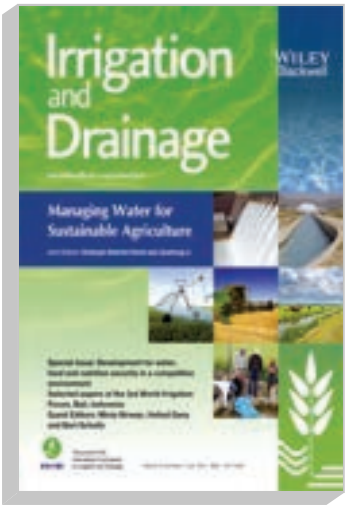
Land, water, and solar radiation are the core natural resources essential for successful crop production. Efficient use of these resources in crop production is the need of the hour to meet the food demand of the ever-increasing population in India. In this context, cropping intensity (ratio of gross cropped area to net cropped area) is a widely used indicator of land utilization for future agricultural water management and crop diversification planning.

Scientists of ICAR-IIWM, Bhubaneswar estimated the cultivated land utilization index (CLUI) for all the districts of Odisha, India during 2013-14. The average state CLUI value (0.585) indicated the scope of improving resource utilization, though 67% of the net cropped area is sown twice. All the districts of the state were classified under four scenarios with various combinations of cropping intensity and CLUI. Growing long-duration crop

varieties under conditions of ample water availability and, more short-duration less water-requiring crops under limited water supply will improve resource utilization. The results pave the way for the analysis of CLUI at a national level for efficient resource utilization by formulating cropping patterns based on water availability.

Adapted from Brahmanand, P. S., Behera, B., Srivastava, S.K., Singandhupe, R.B., and Mishra, A. (2021). Cultivated land utilization index vis-à-vis cropping intensity for crop diversification and water resource management in Odisha, India. Current Science, 120(7): 1217-1224. View the full article online at https://doi: 10.18520/cs/v120/i7/1217-1224

Techno-economic Feasibility of Year-round Use of Drip Irrigation in a Rice-based Cropping System



Water scarcity is one of the major factors affecting productivity and profitability in the rice-based cropping system in eastern India. Drip irrigation (DI) has been found as a potential water-saving technique producing higher yields in different crops. However, the studies on the response of rice-based cropping systems using drip irrigation are limited. Scientists from ICAR-IIWM, Bhubaneswar studied the water use, yield, and profitability in three cropping sequences (rice–capsicum-baby corn, rice-rice-baby corn, and rice-rice) grown under drip irrigation (DRI) layout were compared with that in a rice-rice system under surface irrigation (SI) in a rice-dominated region of eastern India. The DRI could save 37% of irrigation water without affecting the yield in rice compared with SI. The DRI in the rice-capsicum-baby corn cropping system produced 4.63-times higher yield (rice equivalent yield, 48.2 t ha^{-1}) using 59% less water (7570 m^3 ha^{-1}), resulting in 11-times higher water productivity (8.72 kg rice m^{-3} water), 7.63-times higher annual net income (₹435 000 ha^{-1}) and 18-times higher economic water productivity (₹78.7 m^{-3} water) with a benefit-cost ratio of 2.87 compared with the rice-rice cropping system under SI. The use of DRI in a multi-cropping sequence is recommended for higher water productivity and net profit in rice-based cropping systems in irrigated commands.

Adapted from Panigrahi, P., Panda, R.K., Rautaray, S.K., Raychaudhury, S., Thakur, A.K., and Mishra, A. (2021). Techno-economic feasibility of year-round use of drip irrigation in a rice-based cropping system Irrigation and Drainage, View the full article online at https://doi.org/10.1002/ird.2612

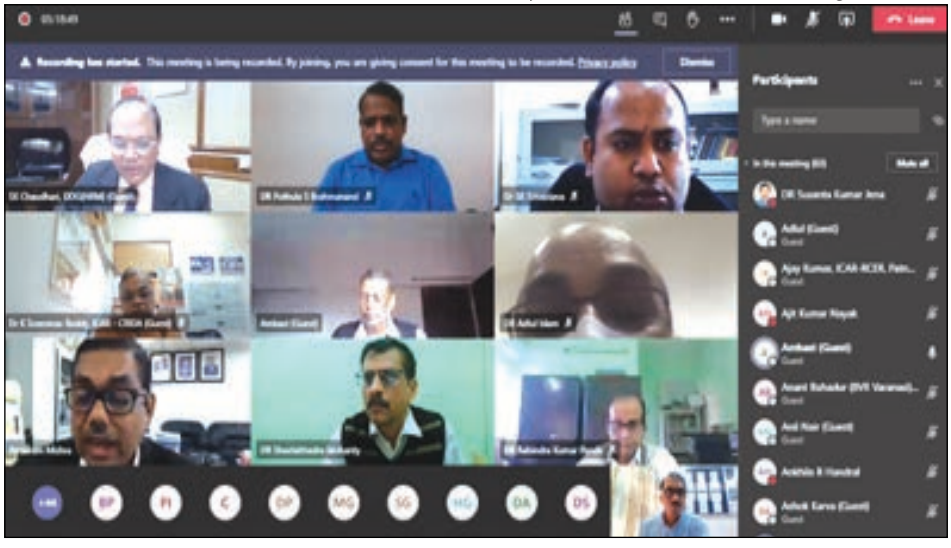
RESEARCH MEETINGS

Agri-Consortia Research Platform on Water Project Meeting

ICAR-IIWM organized two days review meeting in virtual mode for Agri-CRP on Water during January 4-5, 2021. The meeting was presided by Dr. Atmaram Mishra, Director of the Institute. Two technical experts were nominated by ICAR to evaluate the proposals namely Dr. S.K. Ambast, Principal Scientist and Former Director of ICAR-IIWM, Bhubaneswar, and Dr. S.K. Gupta, Former, PC, ICAR-CSSRI, Karnal. Initially, Dr. S.K. Chaudhari, DDG (NRM) gave remarks and future research guidance. Dr. Adlul Islam, ADG (S&WM) emphasized that new proposal should contain the automation of rubber dam, canal automation, sensor-based irrigation scheduling, the impact of climate change in groundwater recharge, and other groundwater studies.

On the first day of the meeting, presentations were made on themes- (i) Development and Management of Surface Water Resources in Different Agroecological Regions of India using Geoinformatics, Robotics and Nano Technology; (ii) Automated Canal Irrigation System for Efficient and Smart Irrigation Water Management; and (iii) Strategies for Sustainable Groundwater Management in India. On January 5, 2021, presentations were on the theme – IoT Enabled Sensor-Based Smart Irrigation Management System.

Another virtual meeting for Agri-CRP on Water under the chairmanship of Dr. S.K. Chaudhari, DDG (NRM), ICAR, New Delhi was held on February 15, 2021 for the refinement of the research proposals, and several improvements were suggested by the experts. Dr. S.K. Jena, Principal Scientist & Co-ordinator of the Agri-CRP on Water Project coordinated these meetings.



EVENTS, NEWS & CELEBRATIONS

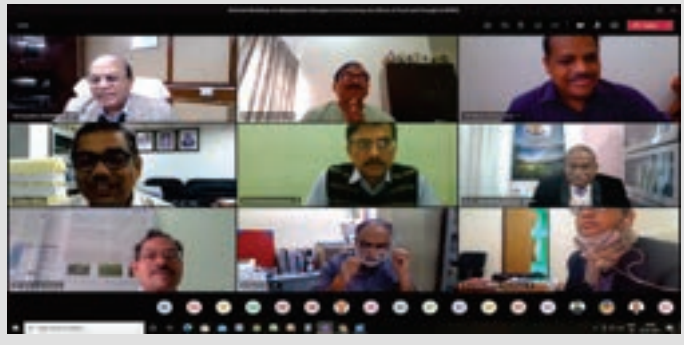
Visit of Additional Secretary, DARE & Secretary, ICAR

Shri Sanjay Kumar Singh, Additional Secretary, DARE & Secretary, ICAR visited ICAR-IIWM for the review meeting of ongoing research, administrative and financial progress of Bhubaneswar based ICAR institutes on March 19, 2021. He graced the review meeting as Chief Guest and stressed the need for integrating advanced tools of the Internet of Things (IoT), Artificial Intelligence and precision irrigation and precision nutrient application with water management, aquaculture, and gender-friendly technologies for their better acceptability by private industry and large scale adoption at farmers' fields. While interacting with the Directors, Heads, Administrative Officers, and Finance & Accounts Officers of the above-mentioned institutes regarding the research, administrative and financial progress, Chief Guest emphasized further strengthening AICRP on Irrigation Water Management and AICRP on Women in Agriculture by employing and developing advanced tools of irrigation, and drudgery reduction in the agricultural sector. He also suggested the urgent need for embodying proven ICAR technologies on water management and freshwater aquaculture with government schemes like *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY), *Pradhan Mantri Matsya Sampada Yojana* (PMMSY), etc. Shri Singh released the research publications of ICAR-IIWM on 'Automatic drip irrigation and fertigation in banana' and 'Water management in shrimp monoculture and carp polyculture'.

Republic Day Celebration

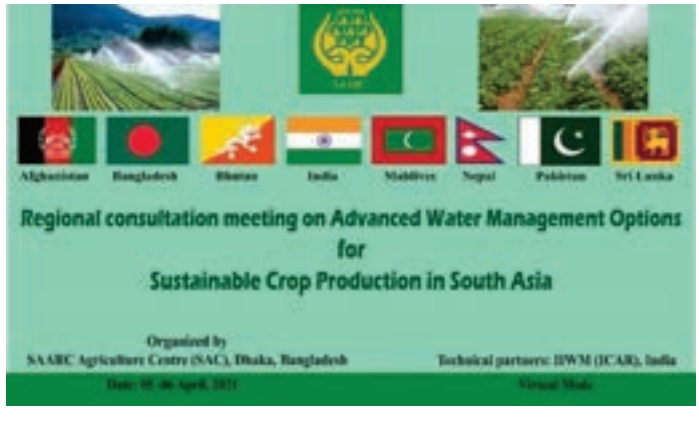
The 72nd Republic Day of the country was celebrated on January 26, 2021 by the Institute. On this occasion, the national flag was hoisted by the Dr. Atmaram Mishra, Chief Guest & Director of the institute. He addressed the staff and family members of the Institute with encouraging words and urged upon the need for hard work and dedication by the staff for the welfare of the farming community, and to make the institute as well as the country proud.

ICAR-IIWM Organized a National Workshop



ICAR-IIWM organized a one-day National Workshop on 'Management Strategies for Overcoming the Effects of Flood and Drought in Bihar' in virtual mode on January 28, 2021. A total of 44 scientists participated in the workshop. Dr. S.K. Chaudhari, DDG (NRM), ICAR chaired the workshop and delivered the inaugural address. He advised preparing a recommendation to be useful for overcoming the problems related to flood and drought in Bihar. Dr. R.C. Srivastava, Vice-Chancellor, Dr RPCAU, Pusa graced the occasion and addressed the participants. Resource persons from ICAR-RCER, Patna, ICAR-IIFSR, Modipurm, NICRA, Hyderabad, Bihar Agriculture University, Bhagalpur, Dr RPCAU, Samastipur, and ICAR-IIWM presented various aspects on flood and drought including occurrence, characterization, dynamics, management and adaptation strategies, contingency measures, cropping systems, water management options, and policy issues. Director, ICAR-IIWM, and Convener of the Workshop, Dr. A. Mishra summarized the workshop and provided the concluding remarks. This workshop was organized by Dr. S.K. Rautaray, Principal Scientist, ICAR-IIWM, Bhubaneswar.

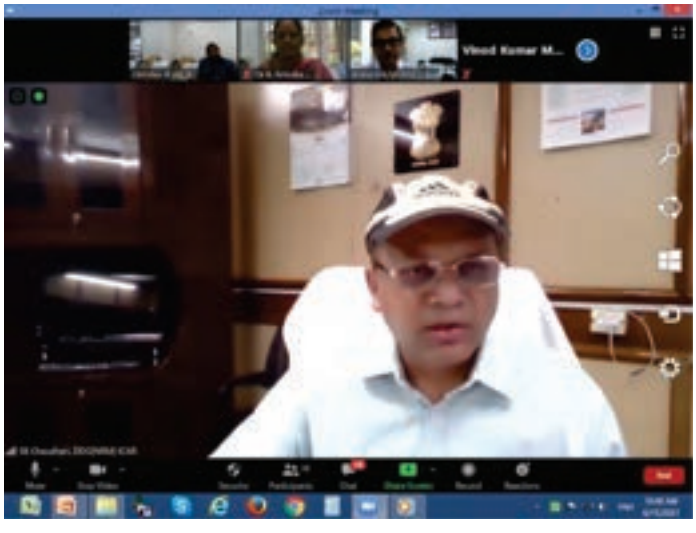
Organized Regional Consultation Meeting of SAARC Agriculture Council



A Regional Consultation Meeting on 'Advanced Water Management Options for Sustainable Crop Production in South Asia' was organized by the South Asian Association for Regional Cooperation (SAARC) Agriculture Council (SAC), Dhaka during April 5-6, 2021 in virtual mode. ICAR-Indian Institute of Water Management, Bhubaneswar acted as technical partner of this meeting in which fourteen country experts from seven member states of SAARC i.e. India, Bangladesh, Bhutan, Pakistan, Sri Lanka, Nepal, and Afghanistan participated. Dr. Md. Baktear Hossian, Director, SAC, and Dr. Sreekanth Attaluri, Senior Program Specialist (Crops) & Coordinator, SAC welcomed the guests, country experts, and other delegates.

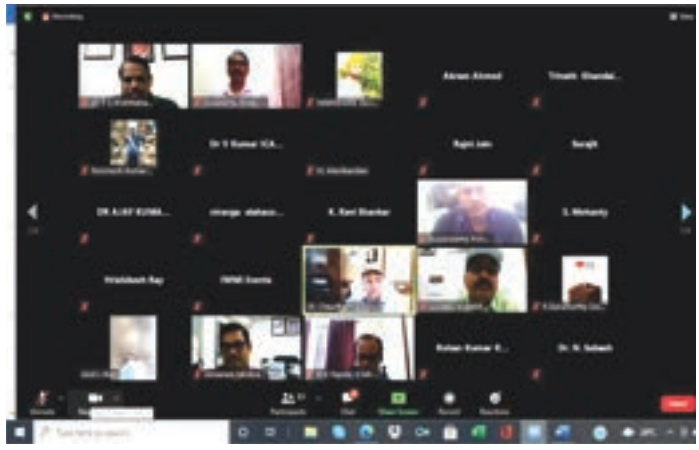
Dr. S.K. Chaudhari, DDG (NRM), ICAR graced the inaugural session as Special Guest and he emphasized the need for strengthening research efforts on canal automation, conjunctive use of surface and groundwater, crop diversification in water-scarce areas, IOT based micro-irrigation system and evolving techniques to reduce the greenhouse gas emission and water and energy footprints. Dr. A. Mishra, Director, and Dr. P.S. Brahmanand, Principal Scientist, ICAR-IIWM have been nominated as experts by ICAR to represent India in this meeting. The Country status papers of all seven nations including India were presented during the first and second technical sessions and the recommendations were discussed in detail and finalized during the third technical session.

Virtual Collaborative Training Organized by ICAR-IIWM and MANAGE



A 4-days training on 'Advanced Techniques of Water Conservation and Management for Sustainable Crop Productivity in Watersheds' was organized in virtual mode during June 15-18, 2021 by ICAR-IIWM, Bhubaneswar, and National Institute of Agricultural Extension Management (MANAGE), Hyderabad. The inaugural program of the training was graced by the Chief Guest, Dr. S.K. Chaudhari, DDG (NRM), ICAR. He emphasized the need to strengthen the research efforts on advanced water management techniques in tune with the objectives of national flagship programs like *Pradhan Mantri Krishi Sinchayee Yojana* (PMKSY) for enhancing the crop productivity in watersheds. The national status of water resources, challenges and strategies and several advanced water management techniques like ICAR-Flexi rubber check dams, two-stage rainwater conservation technique, estimation of crop water requirement and design of optimal cropping pattern, criteria for selection of suitable sites in watersheds, drought management strategies, water-saving techniques in rice, engineering and agronomic interventions for soil and water conservation, groundwater recharging and modeling and its sustainable utilization, solar-powered micro-irrigation systems, utilization of poor quality irrigation water, aquaculture based integrated farming systems and participatory water resource management were elaborately covered in this training program. Dr. A. Mishra, Director, ICAR-IIWM & Program Director, and Dr. P.S. Brahmanand, Principal Scientist, ICAR-IIWM, and Dr. B. Renuka Rani, Deputy Director (NRM), MANAGE coordinated this training program. Around 46 trainees comprising of scientists, faculty, subject matter specialists of ICAR, SAUs, functionaries of Central and State Governments, agri-entrepreneurs, progressive farmers, and scholars from 17 Indian States participated in the training.

Organized Collaborative Training Program by ICAR-IIWM and IWMI



A 2-days collaborative training program on 'Enhancing Agricultural Resilience through Index-based Flood Insurance and Post-flood Management Interventions in India' was organized during June 29-30, 2021 in virtual mode by ICAR-Indian Institute of Water Management (IIWM), Bhubaneswar, and International Water Management Institute (IWMI), New Delhi. Eight lectures and two practical sessions were presented during the training on various aspects of flood management like challenges of flood disaster and strategies, integrated flood risk management, flood risk assessment, remote sensing and GIS tools for flood mapping, rapid response mapping, use of disruptive technologies for operational flood mapping, growth stage-wise yield loss curves of rice, index-based flood insurance (IBFI), post-flood management and bundling solutions of index insurance with climate information and seed systems to manage agricultural risks, etc.

The Chief Guest of the valedictory session, Dr. S.K. Chaudhari, DDG (NRM), ICAR emphasized the need to identify the seriously flood-prone regions of different states of India like Bihar, Odisha, Assam, Uttar Pradesh, West Bengal and to integrate the structural and non-structural measures of flood management for ecological restoration, to upscale the proven technologies like sub-surface water harvesting structures and bio-drainage with Casuarina sp. and to further strengthen the research efforts on dynamic post-

flood management options. The Program Coordinators, Dr. P.S. Brahmanand, Principal Scientist, ICAR-IIWM, and Dr. Giriraj Amarnath, Research Group Leader, Water Risks to Development and Resilience, IWMI briefed about the proceedings of the training program. Around 105 trainees comprising of scientists, faculty, subject matter specialists of ICAR, SAUs, functionaries of Central and State Governments, agri-entrepreneurs, progressive farmers, and scholars from 15 States participated in the training.

Virtual Meeting on 'Balanced Use of Fertilizers'

A meeting on 'Balanced use of fertilizers' was organized virtually on June 18, 2021 at ICAR-IIWM, Bhubaneswar. The meeting was graced by Dr. N. Chattopadhyay, Former Deputy Director General of Meteorology, Agricultural Meteorology Division, GoI; Dr. A.K. Yadav, Former Director, National of Organic Farming, GoI, and Dr. S.K. Das, Former Chief Soil Survey Officer, Soil and Land Use Survey of India, GoI. In the meeting, the importance of restoring soil health, four R approach in fertilizer application, significance of soil health card, and drip-fertigation were discussed. The use of bio-fertilizers, liquid organic fertilizers, and bio-stimulants was emphasized to sustain soil health vis-à-vis productivity. During the interaction with the farmers, they have stressed on non-availability of fertilizers including organics, slow-action on soil health card-related activities, and soil pollution in mining areas. Forty-two participants including scientists, technical, students, farmers-entrepreneurs, and farmers from Joypur Patna, Kaliapani (Sukinda), Bolgarh (Khorda) attended the meeting.

ICAR-IIWM Observed International Women's Day

ICAR-IIWM celebrated International Women's Day by organizing a farmers-scientists interaction meet at Puriajor village, Sukinda block in Jajpur district on March 8, 2020. Sixty farm women covering six villages Viz. Puriajor, Kakuna, Saruabill, Bhimtangar, Mahulkhal and Kalarangiata from two gram panchayat (Ransol and Kanasa) participated in the meeting. Dr. Madhumita Das, Principal Scientist of the institute briefed about the significance of the day. Dr. P.S. Brahamanand, Principal Scientist delivered the success story of the women farmers across the country. Smt. Gitanjali Mohanto, a progressive farmer and social worker expressed her journey for the upliftment of women in society. Women participants were also encouraged to share their experience for maintaining their livelihood and related attributes. Focusing on the possibility of getting bore well in this area Dr. R. Sethi, Principal scientist, IIWM, Bhubaneswar explained the scheme of the state government on the issue and its critical requisites for getting its benefit by the farming community. Successful women farmers were felicitated during the meeting.

Organized Farmers' Awareness Campaigns

Two Farmer's Awareness Campaigns were organized on post-flood crop management interventions at IBFI project sites at Srimakundpur village of Kanas block, Puri district of Odisha on January 6, 2021 and March 10, 2021. About 40 farmers were explained about some promising crop management interventions under the post-flood phase like over-aged rice seedlings, a community nursery, etc. for enhancing agricultural resilience.

Organized Farmers Training

About 25 farmers from BCT-Krishi Vignana Kendra, Visakhapatnam, Andhra Pradesh visited ICAR-IIWM during their exposure visit on March 24, 2021. Dr. P.S. Brahmanand, Principal Scientist, and Dr. R.K. Mohanty, Principal Scientist trained the farmers on 'Advanced Water Management and

Aquaculture Practices for Sustainable Food and Nutritional Security' during this program.

ICAR-IIWM Celebrated World Water Day

ICAR-IIWM celebrated World Water Day on March 22, 2021. Dr. P.K. Mishra, Former Director, ICAR-IISWC, Dehradun graced the occasion as chief guest and delivered a lecture on 'Valuing Water: IPBES Way of Nature's Contribution to People'. He presented on 'Valuing of Water under Inter-governmental Platform on Biodiversity and Ecosystem Services' and emphasized the inter-relationship between economy, ecology, and society to understand the real value of water. Dr. P.K. Mohapatra, Regional Director, South-eastern Region, CGWB, Bhubaneswar, and Chief Speaker of the function talked about 'Groundwater Scenario in Odisha'. Dr. A. Mishra, Director of the institute presided over the meeting and delivered the welcome address. The program was coordinated by Dr. S. Mohanty, Principal Scientist of the institute.

Celebration of International Day of Yoga

The International Day of Yoga was celebrated at the Institute on June 21, 2021 in virtual mode. The theme of this year's yoga days was 'Yoga for Wellbeing'. Two days of yoga practice were held on June 19 and June 20, 2021. Dr. Atmaram Mishra, Director, in his welcome address, sensitized the audience and emphasized that Yoga is the way to build the bridge between *Atma* and *Paramatma*. Mass yoga was performed in the morning on June 21, 2021 as per the Common Yoga Protocol (CYP), which was issued by the Ministry of Ayush, Government of India. In afternoon, a workshop on 'Yoga' was conducted. An online lecture on 'Yoga' was delivered by eminent Yoga expert Shri Sudhansu Adhikary, Odisha State Coordinator, Patanjali Yog Peeth, Khurda, Bhubaneswar, Odisha. He emphasized on improving our immunity system by practicing Pranayam, Asanas, and also some Ayurvedic homemade treatments. He stressed our wellbeing through diet and daily routine to reduce stress and live healthily. The program was organized by Dr. M. Raychaudhuri and Dr. S. Mohanty, Principal Scientists and Nodal Officers of the International Day of Yoga.

CAPACITY BUILDING & TRAININGS

Training and Capacity Building of ICAR Employees

Official & Designation	Subject	Organization	Period
Mr. Biswaranjan Behera, Scientist	Advances in Integrated Watershed Management for Rural Livelihood	ICAR-IISWC, RC, Udhagamandalam	December 28, 2020 – January 08, 2021
Dr. D. Sethi, Scientist	Automation in Micro-irrigation System	Junagadh Agricultural University	February 9-13, 2021
Dr. S. Mohanty, Principal Scientist Dr. R.R. Sethi, Principal Scientist Dr. O.P. Verma, Senior Scientist Dr. S. Pradhan, Senior Scientist	E-learning Capacity Building Program for Water Audit, Water Conservation and Management Technique	National Productivity Council, Jaipur	February 17-18, 2021
Dr. D. Sethi, Scientist	Basic Geo-informatics for Climate-Smart Agriculture	CAAST-CSAWM, MPKV, Rahuri	February 22-March 14, 2021
Dr. Prativa Sahu, Scientist	Health and Mental Well-being of ICAR- Staff for Enhancing Proficiency	ICAR-IIWBR, Karnal	February 25-27, 2021

Official & Designation	Subject	Organization	Period
Dr. R.K. Jena, Scientist	Geo-informatics in Agriculture using Open Source Data and Analysis Platforms	Division of Agricultural Physics, ICAR-IARI, New Delhi	March 1-5, 2021
Dr. S. Pradhan, Senior Scientist Dr. D. Sethi, Scientist Mr. Ajit K. Nayak, Scientist Mr. Biswaranjan Behera, Scientist	Automation of Canal with Modern Measurement Methods and Control Techniques	Canal Water & Power Research Station, Pune	May 27-28, 2021
Mr. Ajit K. Nayak, Scientist	Certificate Course on Google Earth Engine (GEE) with Python for Climate-Smart Agriculture	MPKV, Rahuri, Maharashtra	June 07-27, 2021
Mr. P. Deb Roy, Scientist	Training Program on 'Enhancing Agricultural Resilience through Index-based Flood Insurance and Post-flood Management Interventions in India'	ICAR-IIWM, Bhubaneswar and International Water Management Institute (IWMI), New Delhi	June 29-30, 2021

Training / Programs Organized by ICAR-IIWM

Subject	Place	Period	Participants
Training on 'Advanced Techniques of Water Conservation and Management for Sustainable Crop Productivity in Watersheds'	ICAR-IIWM, Bhubaneswar	June 15-18, 2021	46
Training on 'Enhancing Agricultural Resilience through Index-based Flood Insurance and Post-flood Management Interventions in India'	ICAR-IIWM, Bhubaneswar	June 29-30, 2021	105
Farmer's Awareness Campaigns	Srimakundpur village, Puri	January 6, 2021	40
Farmer's Awareness Campaigns	Srimakundpur village, Puri	March 10, 2021	40
Farmers Training	ICAR-IIWM, Bhubaneswar	March 24, 2021	25

Webinar / Programs / Virtual Meetings Attended by Employees

Officials	Name of the Conference / meeting / workshop / symposium / Seminar	Organized by	Period
Dr. Prativa Sahu	Webinar on 'Generic Online Training Course in Cyber Security'	Ministry of Electronics and Information Technology (MeitY), Government of India	January 05, 2021
Dr. A. Mishra	National Hydrologic Project Technical Expert Committee Meeting	Department of Water Resources, GoO	January 18, 2021
Dr. A. Mishra	ICAR Annual Governing Body Meeting	ICAR, New Delhi	January 27, 2021
All Scientists of ICAR-IIWM	National Workshop on 'Management Strategies for Overcoming the Effects of Flood and Drought in Bihar'	ICAR-IIWM, Bhubaneswar	January 28, 2021
Dr. Prativa Sahu	International Conference on 'Sustainable Water Resource (SWR-2021)'	Kalinga Institute of Industrial Technology, Bhubaneswar	January 29-February 01, 2021

Officials	Name of the Conference / meeting / workshop / symposium / Seminar	Organized by	Period
Dr. A. Mishra	CIMMYT Meeting	CIMMYT, New Delhi Center	February 01, 2021
Dr. A. Mishra	ICAR-CGIAR Meeting	ICAR, New Delhi	February 03-04, 2021
Dr. A. Mishra	NABARD-NRM Institutes Meeting	ICAR, New Delhi	February 04, 2021
Dr. A. Mishra	Inception Workshop on 'Enhancing Economic Water Productivity in Kukuri Irrigation Project, Maharashtra'	IWMI, New Delhi Center	February 12, 2021
Dr. A. Mishra	Meeting on Revised Guidelines for Water Auditing	CWC, New Delhi	February 16, 2021
Dr. A. Mishra	Regional Committee VI Meeting	ICAR, New Delhi	March 13, 2021
Dr. A. Mishra	Meeting with Saudi Arabia Officials for MOU Signing	ICAR, New Delhi	April 06, 2021
Dr. S.K. Rautaray	DP International Seminar Series on 'Water Food Energy Nexus: The Integrated Management for Efficient Use of Resources'	ANGRAU, Hyderabad	April 26, 2021
Dr. A. Mishra	RKVY Project Evaluation Committee Meeting	Government of Odisha	May 20-21, 2021
Dr. S.K. Rautaray	Webinar on 'Aquatic Weeds: Problems and their Management for Enhancing Water Productivity'	Indian Society of Weed Science and ICAR-DWR, Jabalpur	May 29, 2021
Dr. A. Mishra	Governing Council Meeting	WALMI, Cuttack	May 31, 2021
Dr. A. Mishra	Water-Energy Nexus Taskforce Meeting	NITI Aayog, New Delhi	June 03, 2021
Dr. S.K. Rautaray	Webinar on 'Agriculture Overcoming Natural Resource Limitations- The Israeli Success Story: What you can learn at GIMI'	Galilee International Management Institute, Israel	June 10, 2021
Dr. S.K. Rautaray	National Seminar on 'Promotion of Direct Seeded Rice (DSR): Prospects and Challenges during COVID-19'	ATARI, Ludhiana	June 12-13, 2021
Dr. S.K. Rautaray	DevRes 2021 'Advancing Sustainable Transformation'	Umea University, Swedish Res. Council, SLU, and SIDA	June 14-16, 2021
Dr. A. Mishra	Sensitization Workshop on 'Water Budgeting of Rajasthan'	MPUAT, Udaipur	June 21, 2021

Swachh Bharat Abhiyan

The Director and staff of ICAR-IIWM actively participated in the Shramdan, sanitation drive, and swachhata awareness programs under Swachh Bharat Abhiyan. Several sanitation drives against COVID-19 were organized in the main building & residential quarters of the institute. Total 210 persons (cumulative) involved in these six months' cleanliness and sanitation drives. Major activities in swachhata drive were maintenance and cleaning of the campus garden, orchard, parking space, campus road, office main building, and

guest house of the Institute. Beautification, landscaping, pruning old trees, cutting off weeds, cleaning of roads of office campus, and mowing the lawn were done in the institute main campus. Coupled with this, staff were also involved in cleaning their office room. Dr. Roomesh K. Jena, Scientist & Nodal Officer with the help of Mr. S.K. Karna, coordinated all activities.

AWARDS, HONOURS & RECOGNITIONS

- Dr. S.K. Rautaray, Principal Scientist acted as a panelist in the Technical Theme II Session V 'Farming system approach: rice-cum-fish culture & homestead production system including social forestry in International Symposium on Coastal Agriculture: Transforming Coastal Zone for Sustainable Food and Income Security on March 18, 2021.
- Dr. P.K. Panda, Principal Scientist been nominated as Member, Board of Studies of Sikhya O Anusandhan, Deemed University, Bhubaneswar.
- Dr. P.K. Panda, Principal Scientist was invited as Chief speaker at the World Water Day Function organized by Utkal University, Bhubaneswar on March 22, 2021.
- Dr. P.K. Panda, Principal Scientist was invited as Chief speaker in the Birth Anniversary Celebration of renowned Scientist Padma Bhusan Late Dr. Pranakrushna Parija by *Parija Smruti Sansad*, Bhubaneswar on April 1, 2021.
- Dr. P.K. Panda, Principal Scientist nominated as editor in the e-Planet International Journal.
- Dr. Prativa Sahu, Scientist nominated as editor of 'Krishi Science'- A monthly e-magazine for Agricultural Science.

DD Program / Radio Talk

- Dr. P.K. Panda, Principal Scientist participated as an expert in the discussion on '*Jala Sampadara Suparichalana'* at Doordarshan Kendra, Bhubaneswar on the eve of World Water Day (March 22, 2021).
- Dr. P.K. Panda, Principal Scientist participated as an expert in a discussion program on '*Tusarta Pruthibipain Jalasarakhyanara Abasyakata*' (There is a need for Water Conservation for the thirsty World) at All India Radio, Cuttack broadcasted on the occasion of World Water Day (March 22, 2021).
- Dr. P.K. Panda, Principal Scientist participated as an expert in the discussion on the 'Catch the Rain' Program of Prime Minister and *Jal Shakti Abhiyan* at All India Radio, Cuttack on March 28, 2021.

Joining, Promotion and Transfer

Dr. (Mrs.) Ankita Jha
Scientist (Agricultural Meteorology)

Mr. Rishi Kant Singh
Finance & Accounts Officer

Mr. B. S. Upadhyay
Lower Division Clerk

Dr. O.P. Verma
Scientist (Agronomy)

Mr. Vinod Sahu
Finance & Accounts Officer

Mr. Sunanda Kumar Sahu
Technical (Library)

- Dr. (Mrs.) Ankita Jha, Scientist (Agricultural Meteorology) joined ICAR-IIWM on January 21, 2021 (FN).
- Mr. Rishi Kant Singh, Finance & Accounts Officer, ICAR-CIFA, Bhubaneswar joined as FAO (Additional Charge) of the institute on March 02, 2021.
- Mr. B.S. Upadhyaya, Lower Division Clerk of the institute joined on May 23, 2021 after completing his lien period.
- Dr. O.P. Verma, Scientist (Agronomy) has been promoted to Senior Scientist through CAS w.e.f. January 7, 2017.
- Mr. Vinod Sahu, FAO of the institute transferred from the institute on March 1, 2021 and joined as FAO in ICAR-IIMR, Hyderabad.
- Mr. Sunanda Kumar Sahu, Technical (Library) resigned from the institute on February 18, 2021.