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DIRECTOR'S COLUMN |

Insolated Irrigation System (IIS): The Key to Agricultural and Ecosystem Sustenance



Since the mid-1980s, there has been a spectacular rise in electric power-driven groundwater irrigation in India, leading to acute shortages of electricity supply and thus prompting the necessity of renewable energy to address the much greater crisis of global warming. Under uncertainty of monsoon rainfall, the rainfed agriculture of India heavily relies upon irrigation from both surface and ground water sources. Now, the country extracts the world's largest volume of groundwater to irrigate over 39 million hectare area annually (more than double the surface water irrigated area). To this end, ~19 million wells are employed to draw groundwater. The consequent carbon footprint from diesel / thermoelectric power consumptions, varies from 16 to 24 million tonnes of carbon annually, provides a broad understanding about the atmospheric load of greenhouse gas and its contributions to warming. Although climatic reasons have initiated this process, the catalytic role that the state-bound policy decisions, particularly the free or subsidized electricity for irrigation, have played cannot be discounted. The staggering financial burden of power subsidy, along with the

multiple environmental concerns for example, the depletion of groundwater level and higher salinity in water in Punjab and Haryana, and arsenic problem in groundwater of West Bengal, has compelled many state governments to reform the existing policies.

The survey-based research undertaken by ICAR-IIWM to examine the socioeconomic response of farmers from three coastal states of Andhra Pradesh, Odisha and West Bengal, each adopting a unique groundwater policy, indicates that the paddy cultivation during summer season using flood irrigation exhausts a huge volume of groundwater compared to the economic returns from the crop, while the farmers are least aware about the future of this non-renewable resource.

Adoption of micro-irrigation technology is rare in these states. In fact, free electricity and common transformer in Andhra Pradesh or the groundwater marketing practiced in West Bengal leaves limited option for crop diversification or modification for water-saving technology. Consequently, the rising cost of metered electricity supply is the major woe for the farmers of West

Bengal, while the farmers as well as the policy makers of Andhra Pradesh have started realizing the future scope and limitation of free electricity (i.e., seven hours per day). In general, the situation is more critical in states subscribing subsidized power. Against this background, the implementation of incoming solar radiation powered (insolated) irrigation system appears not only to ensure groundwater sustainability and low-carbon agriculture but also to redeem the financial crisis of power subsidy in the long run.

Since its initial years of development, insolated irrigation system (IIS) has undergone several transformations, notably the price reduction of solar panels to make the system affordable for agricultural purposes. Still, the high capital cost of IIS is a critical factor to reckon with, given the economic standard of a large section of small and marginal farmers. However, the Government's support in this regard is noteworthy, for which the number of solar pumps has been increasing dramatically, from about 1000 in 2012-13 to more than 41000 in 2017 with the cumulated capacity of 1.5 lakhs. Indeed, it is important to standardize viable crop options and locations for large-scale adoption of IIS. Basically, the performance of solar pumps which is directly governed by solar radiation is not affected in summer season in many parts of the country due to intense and sufficient duration of sunshine during this period. In monsoon season too, a drought or dry spell invariably coincides with the clear sky with high radiation. IIS offers the scope for crop diversification and integration of micro-irrigation technology. In this respect, it is worthwhile to point out that the financial assistance to IIS in the water scarce state of Rajasthan has been tagged with the adoption of micro-irrigation technology. For high water requiring crop, like rice, it is perceived that IIS is unsuitable. But, the promising results from field experimental studies conducted at ICAR-IIWM regarding feasibility of sprinkler and drip irrigation in rice cultivation or in the system of rice intensification (SRI) method provides the coupling option with IIS. Nevertheless, IIS holds the key to tackle, at least in part, the future water and energy scarcity in agriculture, especially in response to warming-induced climate variability and population growth.

Concept : Dr. S.K. Ambast

Compiled, Edited and Layout Design :

Dr. A.K. Thakur, Dr. D.K. Panda, Dr. P. Panigrahi & Dr. O.P. Verma



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RESEARCH ACHIEVEMENTS

Soil Water Sensor-based Automated Drip Irrigation in Banana

Scientists from ICAR-IIWM conducted field study at our research farm at Mendhasal, Khurda, Odisha to evaluate the performance of automated drip irrigation (DI) system in banana (cv. Grand Nain). The plants were grown with plant to plant and row to row spacing of 1.5 m and 2 m, respectively. The texture of experimental soil was sandy loam with bulk density 1.5 g cm^{-3} . Automatic irrigation was scheduled using both soil water sensor and timer in banana. The irrigation treatments applied were: (i) soil water sensor based irrigation, (ii) timer based irrigation at 80% crop evapotranspiration (Etc) with 1 h interval thrice daily, (iii) timer based irrigation at 80% Etc with 2 h interval twice daily, (iv) timer based irrigation at 60% crop Etc with 1 h interval thrice daily, and (v) timer based irrigation at 60% crop Etc with 2 h interval twice daily. Soil water sensor based irrigation was fixed at 20% available soil water depletion in the top 0.3 m soil layer. The performance of automatic irrigation schedules was compared with manually operated DI in the crop. Irrigation was scheduled through drip system with two 4 litre per hour emitter discharge per plant fixed on 16 mm high density polyethylene lateral pipe and PVC sub-main and main pipe. The hydraulic performance of the DI was found satisfactory with coefficient of variation of 6% and distribution uniformity of 95%. The emitters were placed at 0.3 m away from plant stem. The water quantity applied under full irrigation (FI, 100% Etc) was estimated based on 100% class-A pan evaporation rate at the site.

Soil water dynamics study indicated that soil water content (SWC) under manually operated DI system (19.1-21.3%) was marginally higher (11-15%) than that under automatic irrigation schedules. The higher SWC in manual irrigation indicated the excess water application under the system which resulted deep percolation of water. The changes in available macronutrients (N, P and K) in the soil under various irrigation treatments improved under the experiment. The increase in nutrients amounts was higher under sensor based irrigation than that under other treatments. However, the effect of irrigation on P in soil was statistically insignificant ($P > 0.05$). Sensor based automated irrigation produced the higher concentrations of N (1.79-2.49%), P (0.12-0.19%) and K (1.25-1.58%) in leaves over that with manual irrigation (1.52% N, 0.16% P and 1.21% K).

The vegetative growth, fruit yield, fruit qualities (TSS: total soluble solids and acidity) and water productivity (WP) under different irrigation treatments is presented in Table 1. The maximum growth was observed with manually irrigated plants, whereas the minimum values were with irrigation at 60% Etc. The water applied under

automatic irrigation treatments was 490-670 mm compared with 820 mm in manually operated drip system. However, the sensor based irrigation produced 15% higher yield (69.84 t ha^{-1}) with better quality fruits (higher TSS and lower acidity), resulting in 40%

improvement in water productivity compared with manually operated irrigation. Overall, these results suggest for adoption of soil water sensor based automated drip irrigation in banana cultivation in eastern India and elsewhere with similar agro-climates of the study site.

Table 1 : Growth, yield, fruit quality and water productivity of banana under different irrigation treatments

Treatments	Water applied (mm)	Vegetative growth		Yield (t ha^{-1})	TSS ($^{\circ}$ Brix)	Acidity (%)	WP ($\text{kg ha}^{-1} \text{ mm}^{-1}$)
		Plant Height (m)	Canopy Diameter(m)				
I ₁ : Sensor-based irrigation at 20% ASWD	670 ^c	2.11 ^c	1.77 ^c	69.84 ^d	18.70 ^c	0.70 ^a	87.3 ^a
I ₂ : 1 h interval thrice daily at 80% E _t	660 ^b	1.97 ^b	1.65 ^b	63.57 ^c	18.84 ^d	0.72 ^a	78.5 ^b
I ₃ : 2 h interval twice daily at 80% E _t	660 ^b	1.92 ^b	1.60 ^b	62.88 ^c	18.71 ^c	0.75 ^b	77.6 ^b
I ₄ : 1 h interval thrice daily at 60% E _t	490 ^a	1.65 ^a	1.52 ^a	54.64 ^a	17.20 ^a	0.92 ^d	85.3 ^d
I ₅ : 2 h interval twice daily at 60% E _t	490 ^a	1.62 ^a	1.50 ^a	54.07 ^a	17.11 ^a	0.90 ^d	83.1 ^c
I ₆ : Manual irrigation	820 ^d	2.25 ^d	1.84 ^d	60.51 ^b	17.51 ^b	0.79 ^c	62.0 ^a

ASWD: Available soil water depletion; Data in a column with different letter are significantly different at $P < 0.05$



Automated drip irrigation in banana

Improving Productivity and Profit through Inter-cropping in Pre-bearing Mango Orchards under Drip Irrigation and Mulch

Long juvenile period (duration between planting to fruiting) is one of the major constraints in fruit production for small and medium farmers. Mango is the most important and widely grown fruit crop in India, covering an area of 2.26 million hectares with an annual production of 19.68 million tonnes. Eastern India is one of the potential zone for mango cultivation but having at least 3-4 years of juvenile period. The orchard growers are reluctant to invest money in establishing and maintenance of orchards due to longer payback period from the mango crop in the region. Under such scenario, growing of suitable intercrops in young mango orchards for initial period of planting are utmost essential. Keeping this in view, a study was carried out to evaluate the performance of pre-bearing mango plants along with different intercrops (papaya, pineapple and combination of both) under drip irrigation at ICAR-IIWM, Bhubaneswar during 2017-2018.

Different intercrops planted in the mango (cv. Amrapali) were (i) two rows of papaya (cv. Red Lady) in either side of mango plants, (ii) two paired rows of pineapple (cv. Queen) in either side of mango plants, and (iii) one row of papaya and one paired row of pineapple in either side of mango plants under drip irrigation with paddy straw mulch (SM) and without mulch. The water applied in mango, papaya and pineapple were 650 mm, 570 mm and 325 mm, respectively. Overall, the water used in

mango–papaya cropping system (1220 mm) was higher than that in mango–pineapple inter-cropping system (975 mm) (Table 2). The vegetative growth (plant height, canopy diameter and trunk girth) of mango plants were not affected significantly either by papaya or pineapple inter-cropping. Straw mulch enhanced the growth parameters of mango plants by 8-12%. Similarly, growth parameters of papaya and pineapple were not affected significantly either due to different inter-crops or due to straw mulch. The highest yield (17.48 t ha⁻¹) was

observed in mango–pineapple system with straw mulch. The water productivity followed similar trend varying between 0.7 to 2.1 kg m⁻³ under different cropping systems. The net profit from pineapple inter-cropped in mango was highest (₹ 140000 ha⁻¹) among different cropping systems. Overall, the results of the study highlight that pineapple inter-cropping in young mango orchard using drip irrigation and paddy straw mulch is a water saving and profitable practice and it may be adopted in mango orchards of eastern India.

Table 2 : Water used, yield/ pineapple equivalent yield (PEY) and water productivity (WP) of mango based inter-cropping system under drip irrigation and straw mulch (SM)

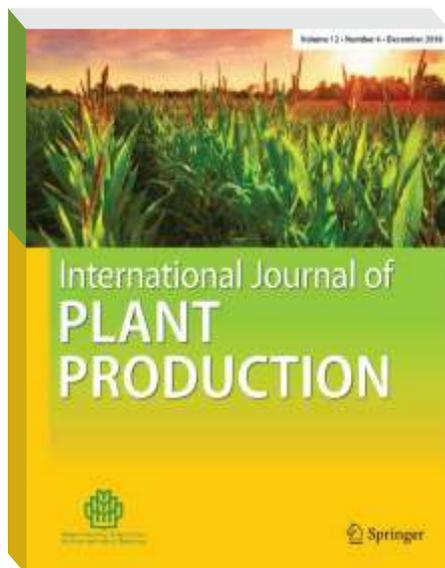
Treatments	Water used (mm)	Yield/PEY (t ha ⁻¹)	WP (kg m ⁻³)
T1 : Mango + Papaya + Pineapple	1545	11.24	0.727
T2 : Mango + Pineapple	975	17.14	1.758
T3 : Mango + Papaya	1220	5.34	0.438
T4 : Mango + Papaya + Pineapple + SM	1360	11.37	0.836
T5 : Mango + Pineapple + SM	828	17.48	2.111
T6 : Mango + Papaya + SM	1075	5.43	0.505
T7 : Mango + SM	572	-	-
T8 : Mango	650	-	-
CD (0.05)	-	1.08	0.86



Papaya and pineapple inter-cropped with mango under drip irrigation

SCIENCE |

Planting Techniques Influenced Potato Crop Growth, Water Use Efficiency and Yield-Evapotranspiration Relationship



Potato is an important food crop. In India, about one-third of its total production (48.0 million tonnes) come from eastern region comprising the states viz. West Bengal, Bihar, Jharkhand, Chattisgarh and Odisha. Production sustainability of this crop is imperative to meet its increasing demand. On the other hand, the most important input i.e., the fresh water for irrigation is scarce in many regions. Therefore, it is essential to save irrigation water, increase water use efficiency (WUE) and sustain tuber production under the tropical sub-humid conditions in eastern region. With this background, a multidisciplinary team of scientists at ICAR-IIWM, Bhubaneswar conducted field trials on different planting techniques and irrigation regimes for potato. It has been revealed that four irrigations would be essential at critical growth stages viz. vegetative, stolonization, tuberization and tuber bulking; potato paired-row method of planting at 75 x 20 cm spacing i.e., paired-

rows at 25 cm, plant-to-plant at 20 cm spacing and making double-row ridges with furrow distance of 75 cm, was similar to normal planting i.e., planting at 50 x 15 cm spacing and making ridges with single rows, 50 cm furrow distance.

There was no significant reduction in tuber yield (y) due to paired-row method, whereas a significant saving (~21%) in irrigation water, 8.2% increase in crop WUE and 21% increase in irrigation WUE could be achieved due to paired-row planting. Findings of our study have strong management and policy implications on water-saving surface irrigation to potato and also other furrow irrigated crops. From the quadratic y-ET relationship, potato ET of 348 mm would be required to achieve maximum WUE of 44.11 kg ha⁻¹ mm⁻¹ with furrow irrigated paired-row planting technique. The study will be an important reference with regard to saving of irrigation water for potato production.

Adapted from K.G. Mandal, A.K. Thakur and S. Mohanty 2018. Planting techniques and irrigation influenced crop growth, light interception and yield-evapotranspiration relationship of potato. *International Journal of Plant Production*, 12:285-296. View the full article online at <https://doi.org/10.1007/s42106-018-0026-y>

RESEARCH MEETINGS |

Review Meeting of 'Agri-Consortia Research Platform on Water' Project of ICAR

Dr. S.K. Chaudhari, ADG (S&WM), NRM, ICAR and Dr. S.K. Ambast, Director, ICAR-IIWM reviewed the progress and achievements of eight major themes under 'Agri-Consortia Research Platform on Water' project of ICAR during 2018-19 on December 7, 2018 at ICAR-IIWM, Bhubaneswar. The PIs and CCPIs of all the research projects from twenty five different Institutes/ Universities presented their technical and financial progress of the projects during first six months of FY 2018-2019 during this meeting. Dr. Chaudhari expressed satisfaction on performance of these projects and emphasized the need for further strengthening the research methodology with data recording and analysis to come up with new scientific information, protocols and guidelines in the field of agricultural water management. Dr. Ambast stressed on the better ways of presentation of the results and documentation of the information generated under different themes of the project. Dr. P. Panigrahi, Senior Scientist and Dy LCPC, CRP-Water coordinated this review meeting.



Institute Research Council (IRC) Meeting

2nd meeting of the Institute Research Council (IRC) was organized during October 30-31, 2018 at ICAR-IIWM under Chairmanship of Dr. S.K. Ambast, Director of the institute. Results and achievements of nine projects, viz. six projects under Agri-CRP on Water, AICRP on Irrigation Water Management and two institute ongoing projects were presented and discussed. Also, two new research project proposals were also presented and discussed during the meeting. Dr. S.K. Ambast, Director & Chairman, IRC concluded with remarks and encouraged scientists to continue good work as well as timely reporting and systematic record keeping. He also encouraged scientists for bringing externally funded projects. Dr. S.K. Jena, Principal Scientist & Member Secretary, IRC organized the meeting.



EVENTS, NEWS & CELEBRATIONS |

ICAR-IIWM Organized Trainings on 'Watershed Management and Land Use Planning'



Five 6-days training programs on 'Watershed Management and Land Use Planning' for 125 officials of different districts of West Bengal were organized at ICAR-IIWM, Bhubaneswar during July 23-28, 2018, August 6-

11, 2018, August 27- September 1, 2018, September 10-15, 2018, and September 22-29, 2018. These trainings were sponsored by Department of Panchayat and Rural Development, Government of West Bengal. During

trainings, vivid discussions were made on different aspects of soil and water conservation and management on watershed basis including watershed delineation, site selection and design of farm pond, check-dam, dug-well, contour bund, contour trenching, gully control structure, micro-catchment, use of software tool for computing water requirements, value addition by remote sensing and GIS for watershed management and land use planning, soil sustainability, farm mechanization, pond based farming, land shaping technique, community mobilization, impact assessment, costing and estimation of water harvesting structures etc.

Dr. T. Mohapatra, Hon'ble Secretary, DARE, GoI and DG, ICAR was the Chief-Guest in the valedictory function of the 2nd training program and distributed certificates for participants. In his valedictory address, Dr. Mohapatra urged the participants to apply the knowledge gained during training to the fields for increasing farmer's income. Dr. S.K. Ambast, Director, ICAR-IIWM, Bhubaneswar was the Course-Director and Dr. G. Kar, Principal Scientist and Dr. P. Panigrahi, Senior Scientist of the institute were the Course-Coordinators.

ICAR-IIWM Organized National Workshop

A national workshop on 'Sustainability of Indian Agriculture: Natural Resource Perspective with Special Reference to Water' was organized jointly by ICAR-Indian Institute of Water Management (IIWM), Bhubaneswar and ICAR-National Institute of Agricultural Economics and Policy Research (NIAP), New Delhi on October 11, 2018 at ICAR-IIWM. Shri Chhabilendra Roul, Hon'ble Special Secretary, DARE & Secretary, ICAR inaugurated the workshop and chaired the technical sessions and delivered a presentation on 'Sustainable Indicator Framework and Related Concepts' and highlighted about the need for identification of water-related indicators



which can be measured with high level of convenience and integrating the existing water indicators into a single composite index addressing both quantitative and qualitative aspects of water management in agricultural

sector. Dr. S.K. Chaudhari, ADG (S&WM) and Dr. Suresh Pal, Director, ICAR-NIAP gave brief background about the workshop. About 60 participants including invited speakers and delegates from NIH, HAU, PAU, MPKV, WTC,

NGWTRI, CWC, CGWB, ICAR-IISWC, ICAR-CRIDA, ICAR-CSSRI, ICAR-CIFA, ICAR-CIWA, ICAR-IIHR-CHES, ICAR-CARI and ICAR-CTCRI participated the workshop.

Institute Management Committee (IMC) Meeting

20th Institute Management Committee (IMC) was held on September 24, 2018 at ICAR-IIWM under the Chairmanship of Dr. S.K. Ambast, Director of the institute. Other members of IMC were—Dr. D. Sahoo, Director, WALMI, Cuttack; Prof. P.N. Jaadev, Dean, OUAT, Bhubaneswar; Er. Rabinarayan Mohapatra, Bhubaneswar; Er. Magan Lal Agrawal, Sambalpur; Dr. G. Ravindra Chary, ICAR-CRIDA, Hyderabad; Dr. A. Mishra, ICAR-IIWM, Bhubaneswar; Dr. A. Ghosh, ICAR-IARI, New Delhi and Shri S.K. Dash, FAO, ICAR-NRRI, Cuttack. Co-opted members of IMC were—Dr. M. Das, Dr. R.K. Panda and Dr. S. Roychowdhury from ICAR-IIWM, Bhubaneswar. Dr. P. Nanda, Dr. P. Panigrahi and Shri V.K. Sahoo of ICAR-IIWM were special invitee for IMC meeting. Shri S.K. Singh, AO, ICAR-IIWM was member-secretary of this meeting.

ICAR-IIWM Organized Farmer's Fair cum Farmers-Scientists Interaction Meet

A farmers' fair cum farmers-scientist's interaction meet on 'Climate Resilient Water Management Practices for Higher Farm Income in Hard Rock Areas' was organized by ICAR-IIWM, Bhubaneswar on November 9, 2018 at Parbatiya village, Dhenkna. The purpose of this meet was to disseminate the technologies of dug well based drip irrigation system and to sensitize wider group of farmers. The fair was attended by about 200 farmers from different villages and experts from ICAR-IIWM, Bhubaneswar, ICAR-NRRI, Cuttack and IIT, Bhubaneswar. Dr. G. Kar, Principal Scientist was organizing secretary and Dr. D.K. Panda and Dr. P.S. Brahmanand were the co-organizing secretaries for the program.



Another farmers' fair cum farmers-scientist's interaction meet on 'Climate Resilient Water Management Practices

for Higher Farm Income in Waterlogged Areas' was organized by ICAR-IIWM, Bhubaneswar on December 14,

2018 at Alisha village, Puri. The fair was attended by about 250 farmers from different villages of Puri district and experts from ICAR-IIWM, Bhubaneswar, ICAR-NRRI, Cuttack and IIT, Bhubaneswar. Chief-Guest of the program, Dr. H. Pathak, Director, ICAR-NRRI, Cuttack shared information about improved rice varieties and cultivation practices for waterlogged areas. Prof. U.C. Mohanty of IIT, Bhubaneswar highlighted that coastal areas are more vulnerable to multiple weather hazards and farmers should adopt climate-resilient agricultural technology for higher productivity and income. Dr. S.K. Ambast, Director of the Institute and Program Convener informed that farmers' income has increased 4-5 times after adopting the pond-based and land shaping technology, and appreciated those farmers who adopted the technology. He also assured to provide technical support to farmers related to water management to improve the farmer's income of the challenging ecosystem. Dr. G. Kar, Principal Scientist was organizing secretary and Dr. R.K. Panda and Dr. O.P. Verma were the co-organizing secretaries for the program.

ICAR-IIWM Organized Kisan Diwas

ICAR-IIWM organized 'Kisan Diwas cum Swachhta Awareness Campaign' at Sri Mukundpur village of Puri district, Odisha on the occasion of celebration of 'Swachhta Pakhwada' on December 23, 2018. The seeds of green gram, sunflower, brinjal, okra, ridge gourd and cucumber, and mango saplings were distributed to the beneficiary farmers as part of post-flood management interventions under ICAR-IIWM collaborative project (Index Based Flood Insurance). Farmers were made aware about the background and objectives of 'Swachha Bharat Abhiyan' and importance of 'Kisan Diwas'. An awareness campaign on 'Importance of cleanliness in keeping healthy society' was organized and villagers were made aware about the negative effects of obnoxious weed '*Parthenium* sp.', which causes respiratory and skin diseases, and were motivated to remove this weed from the village surroundings.



Kisan Diwas at Sri Mukundpur, Puri, Odisha

Insurance Payout Ceremony Organized

The insurance payout ceremony of ICAR & IWMI collaborative research project - Index Based Flood Insurance (IBFI) and post-disaster management to promote agriculture resilience in selected states in India, was organized at ICAR-RCER, Patna on December 27, 2018. The meeting was graced by Shri Vyas ji, Vice Chairman, Bihar Disaster Mitigation Authority, Patna as the Chief Guest and Dr. Rameshwar Singh, Vice-Chancellor, Bihar Veterinary University, Patna as the Guest of Honour. Dr. A.K. Sikka, India representative of IWMI, Sri Lanka and Dr. S.K. Ambast, Director, ICAR-IIWM, Bhubaneswar welcomed the delegates and farmers, and explained the importance of index based flood insurance. Dr. Giriraj Amarnath, Research Group Leader (Water Risks & Disasters), IWMI delivered a presentation on IBFI project and Dr. P.S. Brahmanand, Principal Scientist, ICAR-IIWM, briefed about the different activities with regard to post-flood management undertaken at Muzaffarpur, East Champaran districts of Bihar and Puri, Kendrapara of Odisha. The crop insurance was paid to 30 farmers out of qualified 170 farmers.



Independence Day Celebration

ICAR-IIWM celebrated 72nd Independence Day of the country on August 15, 2018 with patriotic fervor and gaiety. On this occasion, Director of the institute hoisted the National Flag and addressed the staff and family members of ICAR-IIWM. He urged the staff to make rational use of freedom of thought, expression and action to achieve the goal of the organization; and appealed not to become complacent on the achievements of the past. He emphasized to continue working with new enthusiasm for doubling the farmers' income through new innovations.

ICAR-IIWM Observed Vigilance Awareness Week-2018



Integrity Pledge by ICAR-IIWM Staff

ICAR-IIWM observed vigilance awareness week during October 29-November 3, 2018 with a focus on 'Eradicate Corruption - Build a New India'. Dr. S.K. Ambast, Director, administered the pledges to all the staff members of the institute. An elocution competition for students were organized. Lectures on vigilance were delivered by Shri

S.K. Das, FAO, ICAR-NRRI, Cuttack and Sri S.K. Singh, AO, ICAR-IIWM to the staff of ICAR-IIWM, Bhubaneswar. An 'Awareness Gram Sabha' was organized at Jagannathpur village, Kendrapara, Odisha and about thirty villagers participated. A seminar was delivered by Dr. S.K. Srivastava, Director (acting) & Vigilance Officer (VO), ICAR-CIWA, Bhubaneswar to the staff and school students and prizes were distributed. Dr. S. Roy Chowdhury, Principal Scientist and VO, ICAR-IIWM, Bhubaneswar coordinated these programs.

Hindi Pakhwada

ICAR-IIWM celebrated Hindi Pakhwada during September 14-28, 2018. During Pakhwada, various Hindi competitions were organized viz., Hindi to English translation, essay writing, speech in Hindi, Hindi path vachan, debate competition etc. Dr. S.K. Ambast, Director distributed prizes to the winners of the competition. Dr. O.P. Verma, Scientist organized this Pakhwada.



ICAR-IIWM Celebrated World Soil Day

ICAR-IIWM celebrated 'World Soil Day 2018' by organizing skill development program on 'Soil Sample Collection for Soil Testing' at Durgapur village, Khurda, Odisha on December 5, 2018. Our scientists distributed manual on 'Mrityika namuna sangraha ek sampurna bibarani' to the farmers. Nearly, 72 farmers attended this program.

ICAR-IIWM Played Key-role in *Krishi Kalyan Abhiyan* at Malkangiri, Odisha

Under '*Krishi Kalyan Abhiyan*' of Government of India, two teams of scientists of ICAR-IIWM, Bhubaneswar in collaboration with Krishi Vigyan Kendra (KVK), Malkangiri; state agriculture, horticulture and animal husbandry departments; and village Sarpanch organized two 2-days trainings covering eight villages of Malkangiri district of Odisha. Mini-kits of HYV seeds of pumpkin, okra, ridge gourd, cucumber and Amaranthus were distributed to 423 farm families. Scientists of ICAR-IIWM, Bhubaneswar also organized awareness and sensitization campaign on improved agro-techniques, training to the farmers for doubling farm income, 'Kisan

Gosthis', cultivation practices of rice and non-rice crop, aquaculture, soil fertility and health awareness, water saving technologies along with drip and sprinkler irrigation etc. KVK staff distributed waste decomposer

kits while state agriculture and horticulture department distributed pulse (black gram) / oilseed kits (Sesame), groundnut, green gram seeds and mango planting materials to the farmers, respectively.

Team	Team members from ICAR-IIWM	Villages covered	Number of beneficiary farm families	Duration
Team 1	Drs. M. Raychaudhuri, K.G. Mandal, R. Sethi, S. Pradhan and N. Manikandan	Sindhabela, Temurupali, Bijapadar and Kianga villages	200	July 1-2, 2018
Team 2	Drs. R.K. Panda, G. Kar, D.K. Panda and O.P. Verma	Salimi, Eraganda, Tamanpalli and Supulur villages	223	July 6-7, 2018



HRD, TRAININGS & CAPACITY BUILDING |

Farmer's Training under TSP

'Swachhata Abhiyan' was organized in Birjaberna village, Sundargarh on September 25, 2018, where tribal farmers including women participated actively. Next day, on September 26, 2018, a training program along with the scientists of the KVK & RRTTS, Kirei, Sundargarh was organized and they shared their experiences on 'Weed management and off-season vegetable cultivation' as well as on 'Meteorological happenings of the district and its impact on crop cultivation'. This training program was ended with a plantation drive and twenty tribal farmers of Purtiguda village of Rayagada district were provided with mango saplings for growing in their backyards under this project. Dr. R.K. Panda, Principal Scientist coordinated the program.



Farmer's Training under Farmer's FIRST Project

Three one-day farmer-training programs on 'Water Resource Management and Agricultural Diversification for Enhancing Water Productivity and Ensuring Livelihood of Farmers' were organized under Farmer's FIRST Project at Khuntapingu, Malarpada and Jamuda villages (Dist. Keonjhar) on October 23, 24 and 25, 2018, respectively. A total of 394 farmers including women farmers actively participated in the training programs. Scientists from ICAR-IIWM, district-level as well as block-level personnel of watershed, agriculture, veterinary, horticulture and fishery departments provided training to the farmers. Resource personnel delivered lectures to farmers on various aspects of agricultural water management to enhance water productivity. Emphasis was given on 'Per drop more crop and doubling farmer's income'. Also, success stories of farmers under this project were highlighted to encourage fellow farmers to adopt profitable vegetable cultivation. During training diseases affecting rice were diagnosed and remedial measures were suggested. ICAR-IIWM scientists also visited the beneficiary farmers group, who were provided power threshers. They interacted with the farmers about inputs given to them under the project and its objective to demonstrate ways to double farmers' income. Dr. P. Nanda, Principal Scientist and Dr. D. Sethi, Scientist coordinated the program.



HRD for ICAR-IIWM Staff

Following officials/ staff of ICAR-IIWM undergone these training programs:

Official	Subject	Organization	Period
Dr. O.P. Verma, Scientist	'Soil and Water Conservation Technologies for Ensuring Water Availability to Farmers'	IGKV, Raipur	August 24-31, 2018
Dr. A.K. Nayak, Principal Scientist	'Advances in Web and Mobile Application Development'	ICAR-NAARM, Hyderabad	October 5-10, 2018
Dr. M. Raychaudhuri, Principal Scientist	'MDP on Leadership Development'	ICAR-NAARM, Hyderabad	December 18-29, 2018

Swachha Bharat Abhiyan

The Director and staff of ICAR-IIWM, Bhubaneswar participated actively in Swachha Bharat Abhiyan and 37 number of cleanliness campaigns and 33 number of Swachhta awareness campaigns were conducted during July-December, 2018 in the Institute main campus, several other locations covering residential colonies, public places and villages. The Director, ICAR-IIWM administered Swachhta Shapath to all the officers and officials of the Institute on September 15, 2018, October 2, 2018 and December 16, 2018 during celebration of Swachhta Hi Sewa (September 15 - October 2, 2018) and Swachhta Pakhwada (December 16-31, 2018). Government e-Market (GeM) and ICAR-ERP has been fully implemented with updated versions at the institute during this period. Swachhta awareness drive-cum-cleanliness was conducted at Chandpalla village of Kendrapara district, Srimukundpur village of Puri district and Koraput, Odisha. Swachhta awareness drive cum cleanliness was conducted at Berjaberna tribal village of Sundargarh district of Odisha where farmers



participated. Some staff of ICAR-IIWM have participated in Swachhta activities at Bhubaneswar railway station. Awareness talks on 'Conversion of agricultural waste to wealth' and 'Application of bio-compost' were delivered to trainees of watershed management and land use planning training held during September 22-27, 2018. Similarly, awareness was created among school children and teachers on eradication of Parthenium and cleanliness of tube-wells under Swachha Bharat Abhiyan at Vivekananda Siksha Kendra, Bhubaneswar. A quiz competition was also organized amongst the school children and prizes were distributed to winners and participants. A lecture on 'Conversion of waste to wealth under Swachha Bharat Abhiyan' was delivered by Dr. P.S. Brahmanand, Principal Scientist & Nodal Officer.



Swachhta awareness program at ICAR-IIWM, Bhubaneswar

Mera Gaon-Mera Gaurav

Trainings and interaction meetings organized at adopted villages during July-December, 2018.

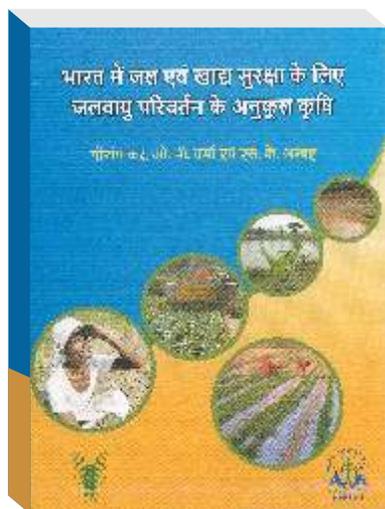
Details of program	Place and Date	No. of beneficiary
Farmers'-scientists' interaction meeting on fresh water aquaculture cultivation techniques	Hasim Nagar village July 20, 2018	20
Interaction meeting on problems in of kharif crops cultivation including rice crop; awareness towards harmful effects of Parthenium sp.	Madana, Jagannathpur, Patkura, Chandapalla and Naindipur villages July 25, 2018	10
Farmers'-scientists' interaction meeting	Bhakarsahi village August 24, 2018	40
Farmers'-scientists' interaction meeting on fertilizer scheduling of rice	Khadala village August 29, 2018	24
Awareness program on conservation and management of rainwater and use of farm equipment in rice cultivation	Gajamara village September 29, 2018	27
Management measures for control of pests and diseases of vegetable crops; sensitization about 'Swachhta Hi Sewa' to school children	Jagannathpur village September 29, 2018	08
Gram sabha meeting; awareness on improved water management practices; pests and diseases control management in rabi crops	Madana, Jagannathpur, Patakura, Chandapalla and Naindipur villages November 2, 2018	30
Farmers'-scientists' interaction meeting on kitchen gardening	Bindhapada village November 3, 2018	11
Farmer-Scientist interaction on rabi crop planning, soil testing and pisciculture	Saptasajyapada and Sadeiberini villages November 17, 2018	66
Farmer-Scientist's interaction on cultivation of kharif rice under waterlogged areas, poultry farming and problem of drinking water	Alisha Village December 1, 2018	19
Farmer-Scientist's interaction cum training (Farmers Fair) on problems related to cultivation of crops and climate-resilient water management practices in waterlogged areas; use of drum-seeder and development of pond-based agroforestry system etc.	Alisha Village December 14, 2018	200
Swachhta activities; a cleanliness cum sanitation drive; awareness campaign on 'Importance of swachhta in keeping healthy society'	Chandpalla village December 19, 2018	11
Discussion on land preparation, seed sowing and seedling making processes for rabi vegetables	Gajamara and Khalibandha villages December 22, 2018	51



AWARDS, HONOURS & RECOGNITIONS |

राजभाषा गौरव पुरस्कार

जलवायु परिवर्तन के प्रतिकूल प्रभावों को ध्यान में रखते हुए कृषि क्षेत्र में उचित जल के आवंटन एवं प्रबंधन के साथ-साथ जलवायु परिवर्तन के प्रतिकूल प्रभावों में कमी लाने तथा महत्वपूर्ण जलवायु अनुकूलित कृषि पद्धतियों का वर्णन कर के राजभाषा हिन्दी में एक मौलिक पुस्तक लिखी गई, जिसका शीर्षक 'भारत में जल एवं खाद्य सुरक्षा के लिये जलवायु परिवर्तन के अनुकूल कृषि' है। यह पुस्तक डॉ. गौरांग कर, डॉ. ओम प्रकाश वर्मा एवं डॉ. सुनील कुमार अम्बष्ट, भाकृअनुप - भारतीय जल प्रबंधन संस्थान, भुवनेश्वर, ओडिशा द्वारा लिखी गई। इस पुस्तक को वर्ष 2017 के लिये मौलिक पुस्तक लेखन की श्रेणी के अंतर्गत केंद्र सरकार के कार्मिकों हेतु गृह मंत्रालय, भारत सरकार का राजभाषा गौरव पुरस्कार (प्रथम) प्राप्त हुआ है। यह पुरस्कार 14 सितंबर 2018 को हिन्दी दिवस समारोह के अवसर पर भारत के उपराष्ट्रपति माननीय श्री एम. वेंकैया नायडु के कर कमलों द्वारा प्रदान किया गया। इस समारोह की अध्यक्षता माननीय गृहमंत्री, भारत सरकार, श्री राजनाथ सिंह जी ने की। इस समारोह में श्री हंसराज गंगाराम अहीर जी तथा श्री किरेनरी जीजू जी, माननीय गृह राज्यमंत्री, भारत सरकार भी उपस्थित थे।



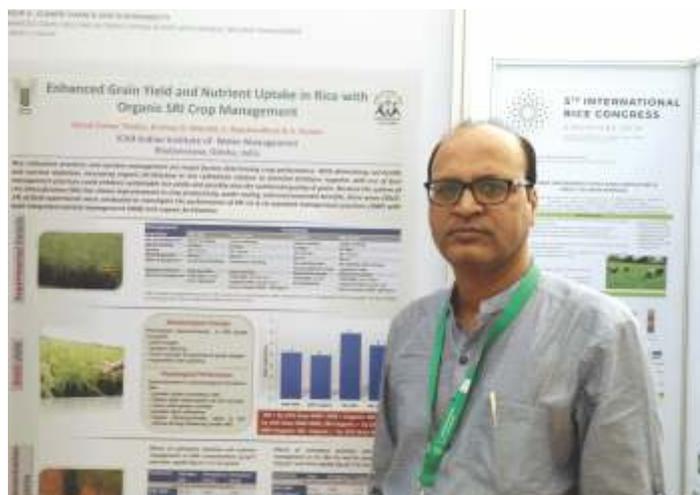
- Dr. M. Raychaudhuri, Principal Scientist has been invited as an expert in the selection committee by UBKV, Cooch behar for the promotion of teachers, subject matter specialist (Soil Science) and programme assistant (Lab. Technician).
- Dr. M. Raychaudhuri, Principal Scientist invited to deliver lecture on 'Soil health build up as the prime need in organic management and conversion to organic with soil health management' at Regional Centre for Organic Farming, Bhubaneswar, Department of Agriculture and Cooperation, Gol.
- Dr. M. Raychaudhuri, Principal Scientist co-chaired technical session on 'Soil Engineering and Technology I' in 83rd Annual Convention of Indian Society Soil Science held at Anand Agricultural University (AAU), Gujarat during November 27-30, 2018.
- Dr. M. Raychaudhuri, Principal Scientist became women chess and women table tennis champion during 'ICAR Zonal Sports (Eastern Zone) Tournament 2018' at ICAR-IINRG, Ranchi, Jharkhand held during October 5-8, 2018.



ICAR-IIWM sports team at ICAR-IINRG, Ranchi

Deputation Abroad

- Dr. S. Mohanty, Principal Scientist, visited Egypt to attend a training program on 'Soil and Water Management' at Egyptian International Center for Agriculture at Cairo during October 18 - December 15, 2018.
- Dr. S.K. Ambast, Director, visited at Tel Aviv, Israel as leader of the Indian delegation on behalf of Bureau of Indian Standard (BIS) to attend International Standards Organization (ISO) meeting during October, 20-25, 2018.
- Dr. A.K. Thakur, Principal Scientist, visited Singapore and Malaysia to attend and present paper in 5th International Rice Congress (IRC2018) during October 15-17, 2018 at Singapore; and attended 'Workshop to Enhance Cooperation and Sharing among SRI National Networks and Stakeholders in Asia' during October 18-19, 2018 at Malaysia.



Radio Talk

- Dr. P.K. Panda, Principal Scientist of this institute delivered a radio talk on '*Khadya Surakhya Pain Mati Maara Jatna* (Soil Health Maintenance for Food Security)' at All India Radio, Cuttack on December 4, 2018 on the occasion of World Soil Day.
- Dr. P.K. Panda, Principal Scientist of this institute participated as an expert to discuss on the topic '*Bivinna Fasala Pain Jalara Superichalana* (Efficient Water Management Practices for Various Crops)' at All India Radio, Cuttack on December 28, 2018.



Joining



Dr. Subodha Kumar Karna and Mr. Kamlesh Kumar Sharma, joined ICAR-IIWM on October 29, 2018 (FN) as Technical Assistant (T-3) Laboratory Technician and Hindi Translator, respectively.



Mr. Sunanda Kumar Sahoo, joined ICAR-IIWM as Technical Assistant (T-3) Library on November 9, 2018 (FN).

ICAR - Indian Institute of Water Management

Chandrasekharapur, Bhubaneswar - 751 023, Odisha, India

Phone : 91-674-2300060 (Director), 2300010/2300016/2301815, Fax : 91-674-2301651

E-mail : director.iwmm@icar.gov.in, director.dwm@icar.org.in // Web : www.iwmm.res.in