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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

## Water Management and Climate Change

It is evident that the climate is changing and will continue to change which affect the societies and environment. Due to this there are changes in the hydrological systems that are affecting water availability and water quality. Also there are changes in water demand, which in turn will have impacts on energy production, food security and the economy. India has 18% of world's population and 4% of world's fresh water. Out of total water used in different sectors, about 80% is used in agriculture. India receives an average of 4,000 billion cubic meters of precipitation every year. However, only 48% of it is used in India's surface and groundwater bodies. A dearth of storage infrastructure and inappropriate water management has created a situation where only 18-20% of the water is used. The population of India is likely to be 1.6 billion by 2050, resulting in increased demand for water, food and energy. Hence, the effect of climate change on water is to be critically analyzed from agriculture, energy and water resources perspectives.

The specific challenges for agricultural water management are two-fold. The first is the need to adapt existing modes of production to deal with higher incidences of water scarcity and water excess. The second is to 'decarbonize' agriculture through climate mitigation measures that reduces GHG emissions and enhance water availability. Since, water mediates much of the climate change impacts on agriculture; increased water scarcity in many regions of the world presents a major challenge for climate adaptation. The scope for adaptation in *rainfed* agriculture is determined largely by the ability of crop varieties to cope with shifts in temperature and to manage soil water deficits. Irrigation allows cropping calendars to be rescheduled and intensified, thus providing a key adaptation mechanism for land that previously relied solely on precipitation. Agricultural demand, particularly for irrigation water, which is a major share of total water demand of the country, is considered more sensitive to climate change. A change in field-level climate may alter the need and timing of irrigation. Increased dryness may lead to increased demand, but demand could be reduced if soil moisture content rises at critical times of the year. It is projected that most irrigated areas in India would require more water around 2025 and global net irrigation requirements would increase relative to the situation without climate change by 3.5-5% by 2025, and 6-8% by 2075.

In India, increase in irrigation requirements due to climate change can be an alarming situation with decline in groundwater table. To obtain better quantitative assessment of the climate change impact, it is imperative that more accurate 'damage due to drought' and 'damage due to flood' relationship should be established and updated periodically. More studies are needed in different basins, aquifers and agro-climatic regions of India to assess the sensitivity of the basin response to climate change.

Adaptation plans need to incorporate targeted strategies that assist lower-income populations – those who are disproportionately affected by climate change impacts – to navigate new conditions. Low-

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income group people, who are already the most vulnerable to any threats to water supply are likely to be worst affected. Ensuring that everyone has access to sustainable water and sanitation services is a critical climate change mitigation strategy for the years ahead.

The enhanced surface warming over the Indian subcontinent by the end of the next century would result in an increase in pre-monsoonal and monsoonal rainfall and no substantial change in winter rainfall over the central plains. This would result in an increase in the monsoonal and annual run-off in the central plains, with no substantial change in winter run-off and increase in evaporation and soil wetness during the monsoon and on an annual basis. According to available estimates, due to judicious utilization, the demand on water in this sector is projected to decrease to about 68% by the year 2050, though agriculture will remain the largest consumer of water. In order to meet this demand, augmentation of the existing water resources by development of additional sources of water or conservation of the existing resources through impounding more water in the existing water bodies and their conjunctive use will be needed. The National Commission for Integrated Water Resources Development estimated the water requirements for the years 2010, 2025 and 2050 at the national level for surface water irrigation as 330-339, 325-366, 375-463 billion cubic meters, whereas for groundwater 213-218, 236-245, 253-344 billion cubic meter, respectively. The water-related effects of climate change generate risks to business and power generation. Water stress can put a halt to energy generation. Impacts will also carry into operational aspects, affecting the supply of raw materials, disrupting supply chains, and causing damage to facilities and equipment.

The silver lining in the climate change is in Africa and Asia, where the investment in solar technology to transform agricultural development is rapidly expanding, providing a cost-effective and sustainable energy source to secure food production and sustain livelihoods. In India, from just around 18,000 in 2014-2015, Solar Irrigation Pumps (SIPs) have increased to nearly 200,000 in recent years, with an annual growth rate of 68%. The piloted Solar Power as a Remunerative Crop (SPaRC) model in Gujarat provides smallholder farmers with a remunerative incentive. The Indian Government has incorporated the model in its US$21 billion KUSUM (*Kisan Urja Suraksha Evam Utthan Mahabhiyan*–Farmer Energy Security and Development Mission) scheme, which aims at installing two million SIPs. Considering the inter-annual variability of rainfall in India, assessment of only volume may not be helpful until temporal and spatial variations of climate change and their impacts are studied individually on agriculture, energy and the infrastructure sector.

In the recent past, ICAR-Indian Institute of Water Management focused on management of water resources for agricultural use and future projections of water balance components in changing climatic scenarios. Conjunctive use of water can be a good climate resilient water management strategy. Use of underground pipe conveyance system along with micro irrigation systems (drip, sprinkler and rain-gun) as demand side management and installation of artificial groundwater recharge structures along with water harvesting structures as supply side management have proved their mettle as climate change resilient water management interventions in groundwater over exploited irrigated areas. Development of climate smart villages on the basis of climate resilient water management interventions will address the climate change impact for sustainable agricultural water management.

## RESEARCH ACHIEVEMENTS

# Development of a Composite Index and Software for Benchmarking Data Analysis of Irrigation Systems

Benchmarking of irrigation system is an important management tool to improve water use efficiency and management of irrigation projects. The application of the concept of benchmarking to water resources sector in India was started in the year 2002 under the auspices of Indian National Committee on Irrigation and Drainage (INCID), New Delhi.

### *Benchmarking Data Analysis of Maharashtra*

Benchmarking of irrigation schemes though has been recommended for continuously monitoring the performance using a set of indicators, very little time series analysis of the benchmarking data has been found in the literature. Maharashtra is one of the leading states in regard, continuously recording data on benchmarking since 2000. The benchmarking data of Maharashtra state was analyzed using nine indicators. They were two systems performance indicators such as (i) annual irrigation water supply per unit irrigated area ($m^3$/ha), (ii) ratio of irrigation potential utilized (IPU) to irrigation potential created (IPC); three agricultural productivity indicators such as (iii) agricultural annual output per unit command area (₹/ha), (iv) agricultural annual output per unit irrigated area (₹/ha), (v) agricultural annual output per unit irrigation water supply (₹/$m^3$); four financial indicators such as (vi) cost recovery ratio, (vii) total O&M cost per unit irrigated area (₹/ha), (viii) total revenue per unit volume of irrigation water supplied (₹/$m^3$), and (ix) total O&M cost per unit water supplied (₹/$m^3$). In total, data of 119 benchmarking systems were analyzed of which 50 were major, 33 were medium and 36 were minor irrigation systems.

### *Development of Composite Index for Benchmarking*

While analyzing benchmarking data using above indicators it has been observed that a group of systems perform well in respect to a particular indicator. The same group does not do well when we analyze the data using another indicator. Therefore, to arrive at certain logical conclusion about the performance of a well-defined group of irrigation system, it was decided to develop a composite index taking into consideration all the above nine indicators. It has been assumed, the composite index "Y" will be as follows:

$$Y = aX_1 + bX_2 + cX_3 + dX_4 + eX_5 + fX_6 - gX_7 + hX_8 - iX_9 \quad \ldots(1)$$

Where, a, b, c, d, e, f, g, h and i are weightage factor of each of the indicator for deciding the composite index; and $X_1$, $X_2$……$X_9$ are the indicators as mentioned above (indicator 1 to indicator 9). Negative sign is given before $gX_7$ and $iX_9$ because in the case of these two indicators (Indicator 7 - Total O&M cost per unit irrigated area and Indicator 9 - Total O&M cost per unit water supplied), lesser is the value better is the performance.

In order to find out the weightage factor for individual indicators, an opinion survey of experts was carried out. Each expert was asked to give weightage out of total 10 to individual indicators. In other words, the sum total of all the weightage factors for all the nine indicators will be 10. After the opinion survey, average weightage factor for indicator 1 to 9 was obtained as 2.25, 1.81, 0.75, 1.12, 1.44, 0.62, 0.66, 0.72, and 0.62, respectively.

In order to address the issues of dimensions, values and to make the indicator comparable, each indicator was normalized using 0-10 scale. The highest value of the indicator was assigned 10 and accordingly the normalized values for the other indicators were calculated. Table 1 presents the normalized mean value of the indicators for all the three type of irrigation systems.

**Table 1.** Normalized mean value of the indicators (0-10 scale)

| | Major | Medium | Minor |
|---|---|---|---|
| Indicator 1 | 8.41 | 7.42 | 4.03 |
| Indicator 2 | 5.66 | 6.79 | 8.34 |
| Indicator 3 | 4.84 | 4.01 | 2.45 |
| Indicator 4 | 5.56 | 2.91 | 2.60 |
| Indicator 5 | 4.07 | 3.33 | 2.58 |
| Indicator 6 | 4.07 | 6.50 | 3.36 |
| Indicator 7 | 4.26 | 4.95 | 2.37 |
| Indicator 8 | 4.24 | 3.39 | 2.87 |
| Indicator 9 | 3.62 | 5.14 | 2.33 |

Thereafter, using the above normalized values of the indicators in equation 1 and the average weightage factors, the value of the composite index for major, medium and minor irrigation systems were obtained as 50.57, 44.34 and 36.40, respectively. This clearly indicates that major irrigation systems have outperformd the medium and minor irrigation systems. This is primarily because of better water availability in the major irrigation system than that of medium and minor irrigation systems.

### *Development of a User Friendly Software for Benchmark Data Analysis*

A user friendly software was developed in Visual Basic programming language for analysis of benchmarking data for public irrigation schemes. The software consists of a database module with Microsoft Access as back end tool for storing and accessing of benchmarking data of irrigation systems. The irrigation systems data can be either entered manually or uploaded through excel file. Various forms have been created in visual basic to access the data from the database. The main menu of the database system is shown in Fig. 1 which has the option of data entry, data viewing and data analysis. Thus, the software module after opening will display menu for data entry, data viewing and data analysis.

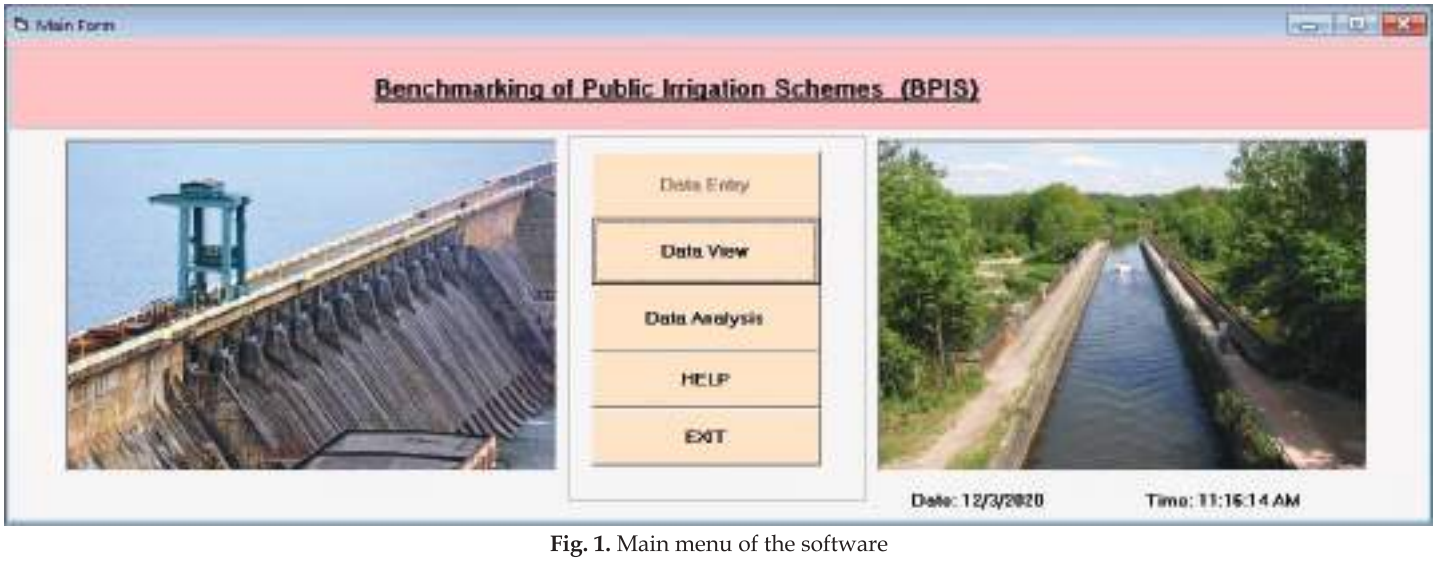



**Fig. 1.** Main menu of the software

In the data entry module, year wise benchmarking data can be entered manually or through excel file. Data can be viewed and modified/updated by selecting suitable option.

Another module was created to analyze the irrigation system's performance using various indicators. In this module, there is provision to calculate the value of performance indicators for the individual irrigation system. Presently, a total of nine indicators were analyzed in three modules. The value of a performance indicator for a specific irrigation system can be viewed by selecting the type of irrigation system (major/medium/minor), plan groups (highly deficit/ deficit/ normal/ surplus/ abundant), the year and the name of the irrigation system. The temporal trend of an indicator can be viewed graphically for various plan groups and for different type of irrigation systems. Besides graphical presentation of the indicators, the values can also be seen in tabular form. Further, simple statistical tools (mean, standard deviation and coefficient of variation) were incorporated in the software so that it becomes handy for the system's manager to do the statistical analysis and to draw logical conclusions.

*Atmaram Mishra, A.K. Nayak, S.K. Ambast, D.K. Panda and P. Nanda*

# Enhancing Economic Water Productivity in Scarce Irrigation Command

In India, the general perception of canal irrigation systems is that of massive physical infrastructure with low irrigation performance. The low water use efficiency (WUE) and water productivity (WP), and the widening gap between the irrigation potential utilized (IPU) and irrigation potential created (IPC) are of particular concerns in canal irrigation systems. The National and State Governments allocate huge investments annually to bridge the perceived gap between IPU and IPC and enhance WUE and WP. In canal irrigation systems, often, the geographical unit of management focus is the designed canal command area (CCA). However, the CCA is usually much smaller than the water influence zone (WIZ) through direct use of canal irrigation supply, and indirect use of return flows through groundwater for direct or conjunctive irrigation. Therefore, accurate estimates of land and water use patterns in the WIZ are imperative for a precise assessment of IPU/IPC, WUE, and WP.

Under the above backdrop, this ICAR-IWMI collaborative research study in research partner with MPKV, Rahuri (Maharashtra) introduces a new analytical framework for performance assessment in the WIZ, which includes the CCA and a 1 km buffer zone that benefit from the recharges from canal irrigation return flows and reservoir lift irrigated area or RLIA in Sina irrigation system, which is a water-scarce medium irrigation system in Maharashtra (Fig. 2). The designed irrigation potential of the Sina irrigation system is 8,444 ha. The system receives an average of about 640 mm rainfall, primarily between June and October in the monsoon season with the potential annual evaporation of 1,445 mm.

The information management system primarily includes land and water use and agricultural production information, climatic, and socio-economic data. The performance analysis system comprises water and energy accounting, benchmark indicators, and the economic water productivity cost curve. The performance analysis supports the decision support system for identifying financially viable strategies, including cropping patterns and technologies, for enhancing water productivity in the WIZ. The study also develops EWP cost curve showing additional net benefits relative to the economic water productivity of the crops grown with different technologies.

The RS/GIS analysis showed a substantial under estimation of the IPU in official records. The actual ratio of IPU/IPC based on RS/GIS estimates is close to one in the CCA and substantially higher than one if water use accounts groundwater irrigation in the whole WIZ. There is hardly any gap between IPU and IPC in the Sina Irrigation system. Farmers capture the return flows either within the CCA or in the buffer zone through private investments on pumps. There are at least 3,000 open and tube wells, and also other small surface water bodies spread across the WIZ. Groundwater irrigation generates many social benefits in the WIZ. Therefore, any investments for increasing the irrigated area in the CCA can have far-reaching implications outside the CCA. Policy interventions focusing only the command area cannot ignore the impacts on groundwater irrigation and social benefits in the whole WIZ.

### *Water Use Patterns*

The water accounting analysis of Sina showed under-estimation trends for the consumptive fraction (CF) of irrigation supply and the total depletion fraction (DF) of the reservoir storage. However, the CF based on RS/GIS data shows a completely different picture. The differences of the CWUs between the official and RS/GIS-based irrigated area are more than seven times within the CCA in 2010-11 and four times in 2016-17 in the CCA and RLIA.

The comparison shows that the actual WUE of irrigation supply in Sina is significantly higher than the official records. The WUE in the WIZ could be close to one. The CWU in the whole WIZ is larger than the available water supply. This disparity could be due to the under-estimation of groundwater recharge, or over-estimation of CWU due to deficit irrigation. However, the EWP in Sina WIZ is significantly low. The low-value crops, such as sorghum, oilseeds, and pulses, which dominate the cropping patterns contributed to this low EWP.

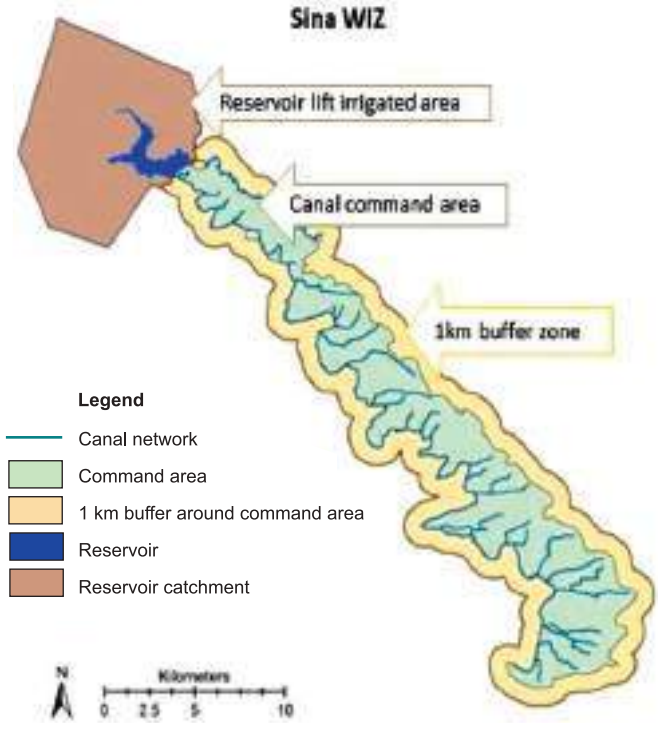



**Fig. 2.** Water influence zone (WIZ) of the Sina irrigation system

### *Strategies for Improving EWP*

As Sina is a physically water-scarce irrigation system, any improvement of CWU and WUE in one region in the WIZ can impair the water supply and agricultural production in other areas within the WIZ. For physically water-scarce irrigation systems, increasing EWP of irrigation CWU is the most viable alternative. These systems will have to reallocate the beneficial CWU to high-value less-water intensive crops. The crops with the highest EWP are fruits (pomegranate), vegetables (onions), and fodder (lucerne). For Sina WIZ, fruits, and green fodder which supports milk production, could be the permanent crops to use groundwater irrigation, when there is no canal irrigation supply. The groundwater availability under low rainfall conditions determines the extent of permanent crops (fruits or fodder). In moderate to high rainfall years, in addition to the fruits and fodder crops, cropping patterns can accommodate a larger share of high-value crops such as vegetables and pulses. These cropping patterns can generate more value output with the scarce irrigation CWU. The EWP cost curve, indicating the net value of production versus economic water productivity per unit of irrigation CWU, paves the way for selecting the potential cropping patterns and technology. Combinations of different crops with fruits generate substantially higher output in both moderate to high rainfall conditions.

Thereby, the policy recommendation 1 emerged as accurate estimation of actual irrigated area (IPU) in the CCA using RS/GIS methods are necessary before further investments for bridging the gap between IPU and IPC in canal irrigation systems. The annual IPU/IPC could be over one in many water-scarce irrigation systems. Policy recommendation 2 suggested that the estimation of water accounts needs to consider the irrigated area in the whole WIZ. The cropping outside the CCA in the WIZ would not have been possible without the groundwater irrigation which was recharged from the reservoir and surface irrigation in the CCA. Policy recommendation 3 prescribed that it is necessary to reassess WUE estimation methods in canal irrigation systems. The current approach of estimating beneficial CWU focuses only the surface irrigation in the CCA. However, groundwater and conjunctive irrigation are prevalent in the WIZ. Similarly, the policy recommendation 4 focused on increasing EWP. Low EWP indicates the potential for reallocation of CWU to increase the value of output. In scarce water systems, the allocation of CWU for agricultural production patterns that increases EWP is the way forward. And the policy Recommendation 5 suggested that all water-scarce irrigation systems should assess the groundwater recharge zones and the volume that can support crop production in the WIZ at times when there are no releases for irrigation from the reservoir. Shift gradually to cropping patterns that include high-value water stress-tolerant crops, which can primarily use groundwater with micro-irrigation.

*R.K. Panda, U.A. Amarasinghe, S.D. Gorantiwar, S.K. Ambast and A.K. Sikka*

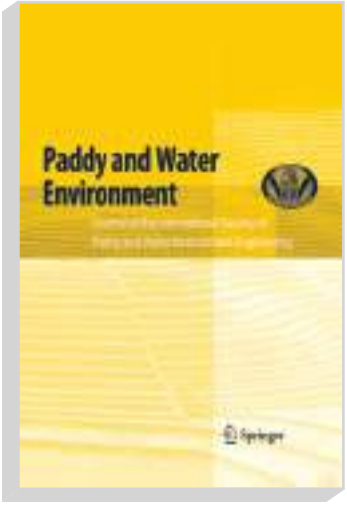
# Sustainable Agri-waste Management at Farm-level through Self-reliant Farming System


Annually 500 M t organic wastes are produced in India from agriculture sector. Transportation of bulky organic manures for centralized collection, processing and distribution to farms is cost prohibitive. Hence, recycling of agricultural wastes using vermicompost technology at farm level is a practical way of managing agriwaste for meeting the plant nutrient requirement in farming. This may solve the problem of increased demand for chemical fertilizers associated with the need to produce more food, especially in Asia and Africa. This will help in saving natural gas and reducing carbon foot print associated with the manufacture and transport of chemical fertilizers.

Our experience with a 1.584 ha farm for three years (2015-18) revealed that 8.1 t vermicompost was produced in 3 batches from 24 t agriwastes produced within the farm area. The system productivity by recycling farm generated agriwastes and run-off water was 18.05 t (about 11.4 t $ha^{-1}$) rice equivalent yield which was higher by 2.6 times as compared to rice fallow (4.46 t $ha^{-1}$). Also, net return from this system (₹ 70141 $ha^{-1}$) was higher by 2.3 times, after considering the fixed cost towards construction of water recycling pond. An increase in carbon stock in soil for the four year study period was 0.66 Mg $ha^{-1}$ $year^{-1}$ with the agriwaste recycling system under organic nutrition. For the inorganic fertilizer plot, the increase in carbon stock was 0.53 Mg $ha^{-1}$ $year^{-1}$. A decrease in bulk density from 1.56 to 1.46 Mg $m^{-3}$, increase in water holding capacity from 0.43 to 0.52 $cm^3$ $cm^{-3}$ and increase in available P and K content in soil from 38.0 and 174.7 kg $ha^{-1}$ to 45.8 and 186.5 kg $ha^{-1}$, respectively, were noted. Agriwaste recycling enhanced organic carbon, available N and P content and water holding capacity of the treated soils, indicating the environmental sustainability. Thus, recycling of agricultural waste at farm level is useful in improving soil health and crop productivity. Also, the recycling of agriwaste and run-off water in self-reliant farming system mode enhanced crop productivity and net return with a gainful employment of surplus labour. This indicates the social sustainability of the practice. Thus, the practice is useful both for the environmental and societal sustainability.

*Adapted from Rautaray S.K., Dubey R., Raychaudhuri S., Pradhan S., Mohanty S., Mohanty R.K. and Ambast S.K. (2020). Sustainable agriwaste management at farm level through self-reliant farming system. Waste Management and Research 38(7): 753-761. View the full article online at https://doi.org/10.1177%2F0734242X20920350*

# Crop and Nutrient Management Improves Nutrient Uptake and Grain Yield in Rice

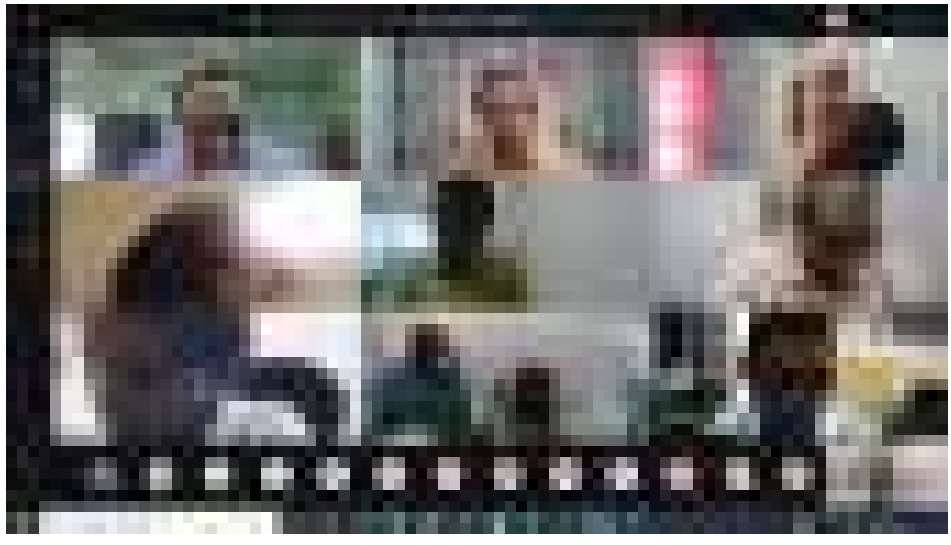



System of rice intensification (SRI) together with appropriate nutrient management holds promise in increasing rice productivity with micronutrient enriched grains. Scientists of ICAR-IIWM, Bhubaneswar conducted trials to investigate the performance of SRI *vis-à-vis* conventional management practices (CMP), both with either integrated nutrient management (INM) or organic sources of nutrients. Grain yields were consistently higher under SRI (34.6%) than with CMP under the same nutrient management system. At the same time, yields under INM were higher than for those with organic fertilization. There were significant differences among treatment combinations also; both SRI-INM and SRI-organic out-yielded CMP-INM and CMP-organic, respectively, by 43.8 and 24.8%. Further, SRI with organic sources produced 18.6% higher grain yield than CMP with INM, which showed a way to achieve higher output of rice grain grown organically. Significant improvements were observed with SRI in root growth, xylem exudation rate, LAI, canopy light interception, SPAD chlorophyll level, photosynthesis rate, and grain-filling rate. The improvements in physiological functioning evidently contributed to better grain formation and yield under SRI management. Both the rice grains and straw obtained with SRI methods contained more N, P, K, Fe, Mn, Cu, and Zn than grains and straw produced with CMP. SRI methods not only raised rice productivity, but also enhanced nutrient uptake due to greater root growth and activity, and improved the nutritional content and quality of produced grain.

*Adapted from Thakur, A.K., Mandal, K.G. and Raychaudhuri, S. (2020). Impact of crop and nutrient management on crop growth and yield, nutrient uptake and content in rice. Paddy and Water Environment, 18:139-151. View the full article online at https://doi.org/10.1007/s10333-019-00770-x*

# RESEARCH MEETINGS

## Virtual Biennial Scientists Meet of AICRP-IWM



A virtual biennial scientists' meet of AICRP on Irrigation Water Management was organized at ICAR-IIWM during June 24-26, 2020 through video conferencing. Hon'ble DG, ICAR and Secretary, DARE, Dr. Trilochan Mohapatra graced inaugural session of the meet as Chief-Guest and addressed the delegates. Dr. Mohapatra suggested researchable issues on various aspects of water management and stressed the need to focus on 'more crop per drop'. Dr. S.K. Chaudhari, DDG (NRM) graced the occasion as Guest-of-Honor and addressed the delegates. Dr. Atmaram Mishra, Director, ICAR-IIWM welcomed the dignitaries and briefed about the history of AICRP on IWM and its present themes of research. Dr. P. Nanda, Principal Scientist introduced about the activities of the AICRP on IWM. The Chief Scientists of the 26 AICRP centers presented the achievements during 2019-20 in six technical sessions and new research proposals were discussed. To improve the research proposals and outputs, six prominent expert members in the field of irrigation water management *viz*., Dr. P.K. Sharma, Former VC, SKUST, Jammu; Dr. P.S. Minhas, Former Director, ICAR-NIASM, Baramati; Dr. D.K. Sharma, Former Director, ICAR-CSSRI, Karnal; Dr. S.K. Gupta, Former Head, ICAR-CSSRI, Karnal; Dr. R.B. Singhandhupe, Former Head, ICAR-CICR, Nagpur; and Dr. S.D. Gorantiwar, Prof. and Head, MPKV, Rahuri were invited to the biennial meet. Each one of them chaired a technical session and gave their technical inputs and suggestions. Dr. S.K. Chaudhari, DDG (NRM), the Chief-Guest of plenary session addressed the delegates and emphasized on digitization of the old reports, development of state-specific water management plan, need for opening of new centres, development of regional-scale studies and recasting of the present research themes. Dr. S. Bhaskar and Dr. Adlul Islam ADGs, NRM Division, ICAR, New Delhi also graced the occasion as Guests of Honour. Dr. Atmaram Mishra, Director, ICAR-IIWM delivered the concluding remarks. Dr. P. Nanda and Dr. S. Mohanty, Principal Scientists, ICAR-IIWM organized this meet.

## Institute Research Council (IRC) Meeting

Institute's Research Council (IRC) meeting was organized during March 3-4, 2020 at ICAR-IIWM under the Chairmanship of Dr. A. Mishra, Director of the institute. Six new project proposals were presented initially. Thereafter, progress and achievements of the fourteen externally-funded projects were presented and deliberated in the meeting. The progress of two ongoing and one completed institute projects were also presented and discussed. The Chairman, IRC concluded with positive remarks and encouraged scientists to continue good work, timely reporting and systematic record keeping. He also emphasized to take research projects at our institute farm and experiments should be always kept in the presentable form to the visitors. Dr. S.K. Jena, Principal Scientist and Member Secretary of the IRC, acted as the organizing secretary of the meeting.

The first meeting of the Institute Research Council for the year 2020-21 was held during June 2-4, 2020 with the welcome address by Dr. S.K. Jena, Principal Scientist & Member Secretary, IRC. The program was conducted through video conferencing. The inaugural session was graced by Dr. S.K. Chaudhari, DDG (NRM) and Dr. Adlul Islam, ADG (S&WM), and chaired by Dr. Atmaram Mishra, Director, ICAR-IIWM & Chairman, IRC. DDG (NRM) emphasized to have state specific water management plan for the country. Ten new project proposals were presented and discussed in IRC meeting, out of which, two were pan-India level, two were basin level, two were state level and four were field level studies. The progress, achievements and recommendation from five concluding projects and nine ongoing projects were also discussed. The Director and Chairman, IRC in his concluding remark emphasized for good research publication, efforts for getting externally-funded project and development of institute museum.

# Virtual Review Meeting by DDG (NRM), ICAR

Dr. S.K. Chaudhari, Hon'ble Deputy Director General (Natural Resource Management), ICAR reviewed the progress of Standing Finance Committee (SFC) document with regard to research achievements (2017-2020) and future research plan for the plan period (2020-2025) of ICAR-IIWM, the research achievements and future research plans of AICRP on IWM and CRP on water during May 9-11, 2020. Directors of NRM institutes, Dr. S. Bhaskar, ADG (AAF&CC), Dr. Adlul Islam, ADG (S&WM), Heads and scientists from various institutes participated in the meeting. Dr. Atmaram Mishra, Director, ICAR-IIWM presented the research achievements and future research plan of the institute. Dr. Chaudhari appreciated the efforts of ICAR-IIWM and suggested to develop field scale water management solutions for the nation, use of ICT/artificial intelligence in agricultural water management including canal automation, development of state specific water management plans and policy papers on energy saving and groundwater-energy nexus. He also suggested to study water management strategies for Bundelkhand region, rejuvenation of defunct bore wells, groundwater modelling under AICRP on IWM and impact analysis of rubber dams installed through CRP on Water.

## EVENTS, NEWS & CELEBRATIONS

# Visit of Additional Secretary (DARE) & Secretary, ICAR at ICAR-IIWM

Shri Sanjay Kumar Singh, Additional Secretary (DARE) & Secretary, ICAR, visited ICAR-IIWM, Bhubaneswar on February 20-21, 2020 and reviewed the on-going research activities of ICAR institutes at Bhubaneswar. The meeting was attended by the Directors of ICAR-IIWM, ICAR-CIFA, and ICAR-CIWA, and scientists of different institutes. Dr. A. Mishra, Director, ICAR-IIWM welcomed the Chairman and other dignitaries. In opening remark, Chairman Shri Singh stressed the need for faster adoption of water management, aquaculture and gender friendly technologies at farmers' fields on large scale. He emphasized on embedding proven ICAR technologies with government schemes like *Jal Shakti Abhiyan*. He also suggested for carrying out the economic analysis of water management interventions like groundwater recharge filters, raised and sunken bed and ICAR flexi rubber check dams at different levels i.e. limited scale adoption and large scale adoption. Further, he stressed the need for anchoring, integration, digitization of all information of technologies and capacity building of KVK functionaries and women Sarpanch. On this occasion, the Annual Report of All India Coordinated Research Project on Irrigation Water Management for the period of 2018-19 was released by the Chairman. Later, the Chairman reviewed the progress of on-going field experiments during his visit to ICAR-IIWM research farm, Deras, Khordha.

## Republic Day Celebration

The 71st Republic Day of the country was celebrated on January 26, 2020 by the Institute. On this occasion, national flag was hoisted by the Dr. S.K. Ambast, Chief Guest & Director of the institute. He addressed the staffs and family members of the Institute with encouraging words and urged upon the need for hard work and dedication by the staffs for the welfare of farming community, and to make the institute as well as the country proud.

## Farmer's Training Program Organized

A workshop-cum-farmers' training on 'Revival of village ponds through scientific interventions' was organized at Kapileswarpur GP, Puri on March 11, 2020 under the DST funded project. Scientists of ICAR-IIWM, Bhubaneswar and State government officials provided training to the farmers. Dr. S.K. Jena, Principal Scientist organized this training program.

## ICAR-IIWM Observed International Women's Day

ICAR-IIWM celebrated International Women's Day by organizing a farmers-scientists interaction meet at research farm, Deras on March 8, 2020. Theme of this meet was 'Importance of Women in the Field of Agricultural Water Management'. During interaction, women education, involvement of farm women in agricultural activities, water conservation methods, soil management options, horticultural activities, animal husbandry and possibilities of woman empowerment through agricultural entrepreneurship, and government schemes for self-help groups (SHGs) were discussed. The meeting was attended by 57 farm women from Haridamada, Chatabara, Jamujhari villages of Khurda district of Odisha. Dr. P.K. Panda, Dr. R.R. Sethi, Dr. D. Sethi, Dr. Prativa Sahoo and Mr. Partha Deb Roy organized the event.

## ICAR-IIWM Staff Distributed Food Packets


Due to COVID-19 pandemic, several laborers have returned to their home. Staff of ICAR-IIWM distributed 350 packets containing packaged dry food and mask to the needy migrating workers with the help of state government functionaries on May 1, 2020.

## Celebrated Foundation Day

ICAR-Indian Institute of Water Management celebrated its 33rd Foundation Day on May 12, 2020. On the occasion, a virtual meeting was organized in which, Dr. Atmaram Mishra, Director of the institute welcomed Dr. S.K. Chaudhari, Hon'ble Deputy Director General (Natural Resource Management), ICAR; Directors of the other ICAR institutes, Dr. Adlul Islam, ADG (S&WM) and staff of ICAR-IIWM. Dr. Chaudhari, DDG (NRM) and Chief Guest of the program congratulated Director and staff of the institute for outstanding research contributions in the field of agricultural water management. He also reminded to not be complacent but should always be vigilant and do excellent work. He highlighted to work in a team to achieve the goal. The program was coordinated by Dr. P.S. Brahmanand, Principal Scientist of the institute.

# Celebration of International Day of Yoga

The International Day of Yoga was celebrated at the Institute on June 21, 2020 in virtual mode. The theme of this year yoga days was 'Yoga for Health - Yoga at Home'. Two days yoga practice was held on June 18 and June 20, 2020. Dr. Atmaram Mishra, Director, in his welcome address sensitized the audience and said that Yoga is the way to build the bridge between *Atma* and *Paramatma*. Also, the result of the slogan competition was announced. A mass yoga was performed in the morning on June 21, 2020 as per the Common Yoga Protocol (CYP), which was issued by the Ministry of Ayush, Government of India. In the forenoon hours, competitions were held on slogans and article writing on yoga. The program was coordinated by Dr. M. Raychaudhuri, Principal Scientist and Nodal Officer of the International Day of Yoga.

# Insurance Payout Ceremony of ICAR-IWMI Collaborative Research Project

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. About 150 farmers of flood affected villages of Gaighat and Katra blocks of Muzaffarpur district of Bihar under IBFI project were paid index-based flood insurance ranging from ₹ 3,500 to ₹ 20,000 per ha during 2019-2020 by Chief Guest of the function and Hon'ble Union Minister of Animal Husbandry, Dairying & Fisheries Shri Giriraj Singh at ICAR-RCER, Patna, Bihar on February 22, 2020.

The brief achievements of ICAR-IWMI collaborative research project entitled 'Index based flood insurance (IBFI) and post-disaster management to promote agriculture resilience in selected states in India' were published as 'Success Story' in ICAR website. "Agricultural resilience in flood prone areas through post-flood management and IBFI"

Available at:https://www.icar.org.in/content/agricultural-resilience-flood-prone-areas-through-post-flood-crop-management-and-ibfi

# Farmers' Awareness Campaign Organized

A farmer's awareness campaign was organized on post-flood crop management plan at IBFI project sites at Srimakundpur (Kanas block), Puri district of Odisha on January 4, 2020.

# Capacity Building under SCSP Project

A training program on 'scientific water management for enhancing water use efficiency and farmers' income' was organized in collaboration with RRTTS, OUAT, Bhawanipatna for the farmers of SCSP project at Dangariguda village, Karlapada GP, Bhawanipatna block during March 13-14, 2020. Thirty farmers of the village attended this training program.

Farmers were taken on an exposure visit to get hands on experience of the micro-irrigation (drip) installed at the farm of a progressive farmer, Dhananjay Sahu and also to RRTTS, OUAT farm, Bhawanipatna.

## Constitution Day Celebration

Various programs were organized for the yearlong celebration of constitution day in between November 26, 2019 to November 26, 2020. Dr. P.S. Brahmanand, Principal Scientist and Mr. Ajit K. Nayak, Scientist, of the institute delivered a talk on '*Important Constitutional Amendments & their Significance*' and '*Constitution and Citizen's Duties, Land Legislation and Land Reforms*' on January 27 and February 29, 2020, respectively. Dr. Atmaram Mishra, Director addressed the staff of institute and highlighted about the importance of Indian constitution and citizens' duties.

An 'Awareness Campaign about Fundamental Duties' was organized by ICAR-IIWM at adopted village of *Mera Gaon Mera Gaurav* i.e., Mendhasal, Khordha district, Odisha on June 30, 2020. Salient features of our Indian constitution and its uniqueness with main focus on fundamental duties of citizens were discussed with the farmers. They were also sensitized about the importance of water conservation and '*Jal Shakti Abhiyan*' of Government of India. Dr. O.P. Verma, Scientist of the institute coordinated these programs.

## Training Programs Organized

A training program on 'Doubling Farm Income by Rainwater Harvesting, Land Shaping and Use of Micro-irrigation (Drip and Sprinkler)'was organized at Kutiguda village, Kosagumunda block, Nabarangapur district on January 7, 2020 under RKVY funded project. Around 200 farmers participated in this training. Dr. Pramod Kumar Panda, Principal Scientist of the institute organized this program.

Another training program on 'Doubling Farm Income by Rainwater Harvesting, Land Shaping and Use of Micro-irrigation (Drip and Sprinkler)' was organized for the officers of Department of Agriculture, Horticulture, Soil Conservation, Rural Development and NGO Heads of Nabarangapur district on January 9, 2020. Nearly 100 officers participated in this training program. Dr. Pramod Kumar Panda, Principal Scientist of the institute organized this program.

## Training Program Organized under Agri-CRP on Water Project

A 3-days Training Program on 'Enhancing Water Use Efficiency in Canal Commands' was conducted at Bhakarsahi village of Balipatna block in Khurda district of Odisha during March 12-14, 2020. The training was conducted under the SCSP component of the Agri-CRP on Water Project (Theme 8). Seventy four farmers attended the training program. The training program was organized by Dr. P. Nanda, Dr. S. Mohanty and Dr. A. K. Nayak, Principal Scientists of the institute.

# TRAININGS / PROGRAMS ORGANIZED & EXHIBITIONS PARTICIPATED

## Farmers' / Officers Training Programs

| Subject | Place | Period | Participants |
|---|---|---|---|
| Farmers' Awareness Campaign | Srimakundpur village, Puri | January 4, 2020 | 35 |
| Training on 'Doubling Farm Income by Rainwater Harvesting, Land Shaping and Use of Micro-irrigation (Drip and Sprinkler)' for Farmers | Kutiguda village, Nabarangapur | January 7, 2020 | 200 |
| Training on 'Doubling Farm Income by Rainwater Harvesting, Land Shaping and Use of Micro-irrigation (Drip and Sprinkler)' for Officers | Nabarangapur | January 9, 2020 | 100 |
| Farmers-Scientists Interaction Meet | Deras Research farm, Khurda | March 8, 2020 | 57 |
| Workshop-cum-Farmers' Training on 'Revival of Village Ponds Through Scientific Interventions' | Kapileswarpur, Puri | March 11, 2020 | 78 |
| Training Program on 'Scientific Water Management for Enhancing Water Use Efficiency and Farmers' Income' | Dangariguda village, Kalahandi | March 13-14, 2020 | 30 |

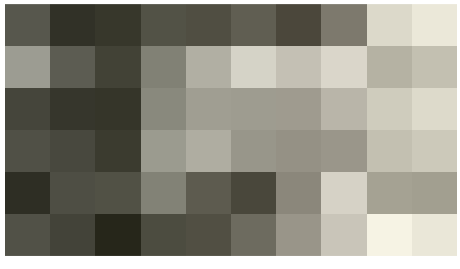
## Exhibitions

Institute's achievements were displayed/ showcased in the following exhibitions held in different locations:

| Events | Place | Date/Period | Coordinated by |
|---|---|---|---|
| National Workshop on 'Rice Research and Development: Doubling Farmers Income' | ICAR-NRRI Cuttack | February 28, 2020 | Dr. S.K. Rautaray and Mr. N. Manikandan |
| Farmers' Fair | OUAT Bhubaneswar | March 7, 2020 | Dr. S.K. Rautaray and Dr. D. Sethi |

## *Swachh Bharat Abhiyan*

The Director and staff of ICAR-IIWM actively participated in the *Sharmdan*, sanitation drive and *swachhata* awareness programs under *Swachh Bharat Abhiyan*. One cleanness and two awareness drives were conducted in the institute main campus and in Mendasal research farm. Five sanitation drives against COVID-19 were organized inside the institute main building, Mendasal research farm and also in residential quarters. In the month of January 2020, *swachhata* awareness campaign was organized for the female residents of Santala Basti, Chandrasekharpur, Bhubaneswar. Scientists of the institute make them aware about domestic wastes and their management in daily life, ill effect of *Parthenium* weed, single used polythene. The Director encouraged young participants to work as an ambassador of *Swachha Bharat Abhiyan* to create awareness among other residents of their hamlets or village. Jute bags were distributed to the participants to motivate them to curb use of polythene bags. Government e-Market (GeM) and ICAR-ERP has been fully implemented at the institute during this period. Beautification, landscaping and pruning old tress and mowing the lawn were done in the institute main campus. ICAR-IIWM, Bhubaneswar received Public Appreciation Plaque from Pipili Sankrutika Parishad, Pipili, Puri, Odisha for sincere and exemplary execution of *Swachha Bharat Mission* in the institute campus, public places and adopted villages during 2014-19. Mr. N. Manikandan, Scientist & Nodal Officer with the help of Mr. S.K. Karna, Mr. K.K. Sharma and Mr. B.N. Nayak coordinated all activities.



Activities during *swachhta* awareness-cum-cleanliness programs

# AWARDS, HONOURS & RECOGNITIONS

- ICAR-IIWM was bestowed with 'Public Appreciation Award' and Dr. P. Nanda, Principal Scientist and Dr. P.S. Brahmanand, Principal Scientist & Nodal Officer, *Swachh Bharat Abhiyan* were honoured with '*Swachhta* Visionary Leadership Award' for their extraordinary contribution towards *Swachha Bharat* Mission activities during five year period of 2014-19 in a function organized by Pipli Samskrutika Parishad at Pili, Odisha on January 14, 2020. The award was presented by His Excellency Prof. Ganeshi Lal, Governor of Odisha.

- Drs. P.K. Panda, P. Panigrahi and P. Debroy of the institute involved in a project- Farm based Scientific & Technological Interventions for Socio-economic Development of Aspirational District Nabarangapur, which received Skoch Platinum Award for the 2019-20.
- Drs. S.K. Rautaray, S. Mohanty and S. Pradhan received the 'Gannet Memorial Award 2020' by Institute of Engineers, Odisha State Centre in the category of Environmental Science for the paper 'Environmental benefits from organic nutrition in rice crop'.
- Dr. O. P. Verma received Appreciation award 2018-19 from Bhubaneswar Official language implementation committee for his significant contribution in organizing and conducting various Hindi language competitions.

- Dr. S.K. Rautaray received compliment letter for Lead Paper presentation on 'Water Saving Techniques for Agriculture under Climate Change' at National Seminar on 'Climate Smart Agriculture for Enhancing Farm Profitability' organized by Indian Society of Agronomy (Odisha Chapter) held at OUAT, Bhubaneswar during January 28-29, 2020.
- Dr. S. K. Jena, Principal Scientist was invited as key note speaker in the 29th Swadeshi Science Congress and National conference on 'Science and Technology for Sustainable Development' at ICAR-CPCRI, Kasaragod, Kerala during February 27-29, 2020.
- Dr. S. K. Jena, Principal Scientist attended 54thISAE Convention and International symposium on 'Artificial Intelligence Based Future Technologies in Agriculture' during January 7-9, 2020 at Pune, Maharashtra; and was Chairman of the selection committee for best poster presentation in the field of Soil & Water Conservation Engineering; and co-chairman of the technical session on 'Groundwater and Drainage'.
- Dr. M. Raychaudhuri, Principal Scientist evaluated Doctoral degree thesis of Agricultural Chemistry and Soil Science of Post-graduate studies, BCKV, West Bengal.

## Radio Talk

- Dr. P.K. Panda, Principal Scientist participated as an expert in 'Live phone in' program on '*Adinia Barsaru Fasalaku Surakhya Kariba Kipari*' (How to save crops from untimely rain) at All India Radio, Cuttack on January 4, 2020.
- Dr. P.K. Panda, Principal Scientist delivered a radio talk on '*Agami Sankata: Tusarta Bharat*' (Future Challenge: Thirsty India) at All India Radio, Cuttack on March 19, 2020.
- Dr. P.K. Panda, Principal Scientist participated as an expert in the discussion on 'Agro-advisory services for the farmers in the context of spread of Covid-19 for improving village economy' at All India Radio, Cuttack on April 19, 2020.
- Dr. P.K. Panda, Principal Scientist participated as an expert in the discussion on 'Agro-advisory services for the farmers in the context of spread of Covid-19'at All India Radio, Bhawanipatna, Kalahandi, Odisha on April 21, 2020.

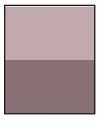
## Joining, Transfer, Promotion and Superannuation

- Dr. Atmaram Mishra joined as Director (Acting) of the institute on February 4, 2020.

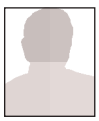
- Mrs. Ankhila R. Handral, Scientist (Agricultural Economics) joined ICAR-IIWM on April 4, 2020 (FN).

- Mr. Biswaranjan Behera, Scientist (Agronomy) joined ICAR-IIWM on April 4, 2020 (AN).

- Dr. S.K. Ambast, Director transferred from the institute on February 4, 2020 and joined as Joint Director (Education) to ICAR-NIBSM, Raipur.



- Dr. G. Kar, Principal Scientist transfered from the institute on March 3, 2020 and joined as Director, ICAR-CRIJAF, Barrackpore, West Bengal.



- Mr. J. Nayak, Assistant promoted to AAO of the institute w.e.f. May 1, 2020.

- Mr. A. Mallick, AAO of the institute superannuated on April 30, 2020.