



ICAR-IISS Newsletter



Volume 25, Number 1

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FORTHCOMING EVENTS

Training on "Advanced Instrumentation for Assessment of Soil Health Indicators, Pollution and Greenhouse Gas Emission from Soil" from 7th to 20th September 2022 under the Accelerate Vigyan Scheme of SERB (DST)

EDITORS

Dr Pramod Jha
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Dr Khushboo Rani
Dr Dinesh Kumar Yadav

ICAR-IISS, Bhopal Welcomes Dr Himanshu Pathak, Secretary (DARE) & Director General (ICAR)

We are greatly privileged to congratulate Dr Himanshu Pathak on assuming the charge of Secretary, Department of Agriculture Research and Education (DARE) cum Director General (DG), ICAR on 1st August 2022. Dr Himanshu Pathak was serving as the Director, ICAR-National Institute of Abiotic Stress Management, Baramati, India. Prior to this he was the Director of the ICAR-NRRI in Cuttack. He completed his Ph.D in Soil Science and Agricultural Chemistry from Indian Agricultural Research Institute, New Delhi, India (1992), Post-doctorate Experiences at University of Essex with BOYSCAST Fellowship, United Kingdom (1996-97) and Institute of Meteorology and Climate Research, with Humboldt Fellowship at Germany (2004-05). He worked as a Scientist, 1992-01 and Senior Scientist, 2001-06, Indian Agricultural Research Institute, New Delhi; Co-Facilitator, Rice-Wheat Consortium for the Indo-Gangetic Plains (RWC), International Rice Research Institute (IRRI)-India, New Delhi 2006-09; Principal Scientist, Indian Agricultural Research Institute, New Delhi 2009-16; Professor, Department of Environmental Sciences, Indian Agricultural Research Institute, New Delhi, 2013-16. His contribution in the area of climate change, abiotic stress management and natural resources management is highly recognized throughout the world. He is recipient of several fellowships: National Academy of Agricultural Sciences (NAAS), India (2007); West Bengal Academy of Science and Technology, India (2013); Indian National Science Academy (INSA), India (2014); National Academy of Sciences, India (NASI) (2016).



ICAR-IISS, Bhopal: A Decade of Soil Research (2013-2022) Director's Desk

Soil 'soul of infinite life' is indispensable for sustenance of human civilization. It forms the base over which very survival of life on earth exist. The success of civilization is directly linked with the ability of human being to cultivate crops on the soils. This relationship between humans, the earth, and food sources affirms soil as the foundation of agriculture. Soil performs several functions viz. medium for plant growth, regulator of water supplies, recycler of raw materials, habitat for soil organisms, and buffering. However, the soils of our country are showing the sign of fatigue, an important cause of yield reduction due to long term adoption of monoculture, poor crop rotation, and intensive agricultural practices.



The ICAR-Indian Institute of Soil Science (ICAR-IISS) was established on 16th April, 1988 at Bhopal with a mandate of "Enhancing Soil Productivity with Minimum

ICAR-INDIAN INSTITUTE OF SOIL SCIENCE, BHOPAL (AN ISO 9001:2015 CERTIFIED INSTITUTE)

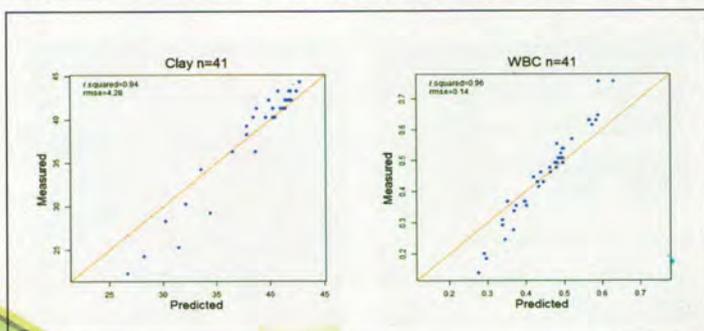
Sardar Patel Outstanding ICAR Institution
UNFAO King Bhumibol World Soil Day 2020 Awardee

Environmental Degradation". To accomplish the mandate of the institute, it has given the priority to soil health related issues faced by farmers and other stakeholders. ICAR-IISS, Bhopal has emerged as a leader in basic and strategic research on soils in the country. In past one decade, the institute has addressed several national natural resource management issues, which significantly impacted the management and sustainable utilization of the soil for ensuring food, nutritional and environmental security in the country.

In the recent times, development of Mridaparikshak-a mini lab was the most significant achievement of the Institute. A Mini Soil Lab – Mridaparikshak was developed and commercialized to provide rapid soil testing and fertilizer recommendation service at the farmer's doorsteps. More than 11399 Mridaparikshak units have been sold in Indian market. With the help of this mini soil lab, about 28.8 million soil samples have been analyzed for achieving the soil health card mission of GOI. On all India basis, around 14% of the total soil health cards were prepared using Mridaparikshak, which saved approx. Rs. 33000 crores of the country, required to establish traditional soil testing laboratories. The institute has received royalty of Rs 4.12 crores through commercialization of this technology during 2016-17 to 2020-21.



Accurate and real-time soil data has become one of the most valuable resources among farmers. ICAR-IISS, Bhopal has a unique distinction of using first time electro-chemical sensors (ISFET) and spectroscopic techniques (MIR/NIR) for assessment of soil health parameters in India. A combination of different spectral pre-treatment techniques,



multivariate and machine learning-based chemometric models using MIR reflectance spectra and laboratory analyzed values of soil properties were tested and validated to obtain suitable prediction models for different soil parameters. A MIR-based spectral library of Indian soils was also created. Among the different properties evaluated, spectroscopic technique (MIR/NIR) can successfully predict with reasonably good accuracy for soil organic carbon concentration, pH, sand, silt and clay content, soil water retention capacity at field capacity and permanent wilting point. The spectroscopic lab of ICAR-IISS, Bhopal was adjudged as Regional (Asia) Champion Laboratory by FAO, Rome.

The institute has made significant research contributions in the area of nanotechnology particularly nano-rock phosphate, for utilizing the vast deposits of rock phosphate available in India for crop production. The technology will help in combating the rising cost of phosphatic fertilizers and will also reduce the dependence on imports of phosphatic fertilizer.



To address the challenges and opportunities of post-green revolution period, research was reoriented towards conservation agriculture, micro and secondary nutrients, climate change and precision agriculture. ICAR-IISS, Bhopal is leading Consortium Research Platform (CRP) on Conservation Agriculture (CA) with involvement of 11 ICAR institutes located in different agro-ecological regions of the



country. The consortia mainstreamed best bet location-specific doable CA practices for enhanced productivity and profitability in rainfed and irrigated eco-systems, developed and refined several CA machineries viz. SORF machine, serrated flails for happy seeder, CRIDA precision planter etc. Also, CA impact on soil health, pest dynamics, input use efficiency, carbon sequestration and greenhouse gas emissions were quantified across soil types and cropping system.

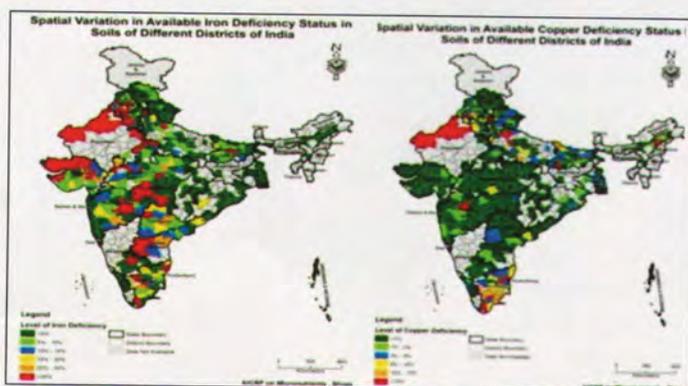
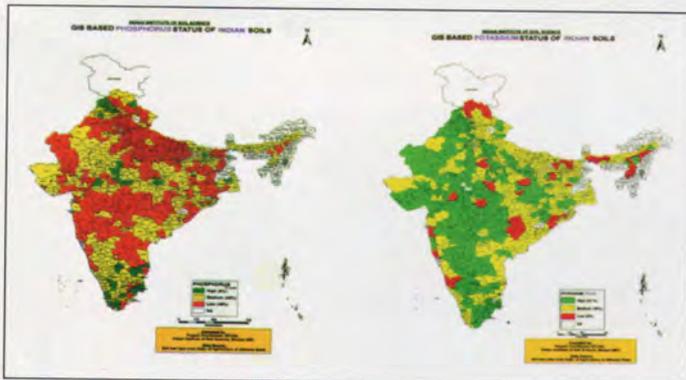
The institute has developed Decision Support System in collaboration with National Informatics Centre (NIC), Pune for on-line fertilizer recommendation to different crops grown in various states using the fertilizer prescription equation. Moreover, tehsil-wise GIS-based soil fertility maps for 11 states were developed using the soil test data collected from different soil testing laboratories located in various parts of the country. STCR prescription equations were successfully integrated in Soil Health Card (SHC) Portal developed by Department of Agriculture, Cooperation & Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India in collaboration with NIC, New Delhi.

decision-making on fertilizer distribution and precision nutrients prescription. Also, 2000 rhizobial strains of 20 major legumes were isolated and characterized from the major growing zones and soil types in Andhra Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Haryana, Uttar Pradesh and Jharkhand. Liquid biofertilizer were developed with *Rhizobium*, *Azospirillum* and *Bacillus* strains by using cell protectants like arabinose, trehalose, glycerol, polyvinyl pyrrolidone (PVP) in different combinations. It enhanced the shelf life upto 12 months in liquid inoculum with high cell counts. A new biofertilizer application technology developed where the strains are coated on seeds for enhancing efficiency.



In order to create a socially, environmentally, and economically sustainable food production system, ICAR-IISS, Bhopal developed the organic package of practices for Soybean, Wheat, Chickpea, Mustard and Isabgol. The institute has successfully isolated thermophiles and endophytes for rapid waste recycling, biocontrol and bioremediation. The development of Ekcel decomposer capsule would pave a new way in the field of in-situ decomposition of agricultural waste. Institute has developed several modified composting technologies like Phospho-sulpho-nitro compost, Rapo-compost, and Family Net Vessel compost etc. Recently institute has filed patent on "Microbial consortia for accelerated decomposition of organic waste and method of decomposition". ICAR-IISS, Bhopal supports marginal farmers via SCSP programme, tribal sub plan and farmers first and is also reaping rich dividends by making agriculture profitable and thus attractive to the farming community.

Institute has strong linkage with various international organizations such as Oxford University, University of Queensland, FAO Rome, ICARDA Morocco, JSPS Tsukuba Japan, ICRAF Nairobi and CIMMYT Mexico. Besides Environmental Planning & Coordination Organization, Bhopal, National Thermal Power Corporation, Noida, Ministry of Environment Forest and Climate Change, New Delhi is also collaborating with the institute on various R&D activities.



The institute has also developed handy software "SQICAL," for rapid calculation of soil quality index. In addition the institute has delineated soils of 640 districts for micro-nutrients status and developed GIS maps for policy



The year 2015 was celebrated as the International Year of Soils, as declared by the United Nations. Using this as a pivot, ICAR-IISS, Bhopal turns the spotlight on the soil health awareness campaign across the nation. The institute was awarded the prestigious King Bhumibol World Soil Day 2020 Award by Food and Agricultural Organization on its World Soil Day 2020 function. Institute was also awarded with ICAR best institute award 'Sardar Patel Outstanding Institution Award 2018' for the exemplary work done in the field of soil science. The institute has also been awarded with Mahindra India Agri Awards 2016, and Cashless ICAR institute award. ICAR-IISS, Bhopal presents a sharp and clear connection between the basic & strategic research carried out by scientists and the direct and indirect impact it has in improving conditions of our farming community as well as improvement in natural resource base of our country.

(Signature of Director)
Dr Ashok K Patra

RESEARCH HIGHLIGHTS

Soil nitrogen mineralization and enzymatic activities under no till system

Soil nitrogen mineralization as measured by quantity of $\text{NH}_4\text{-N}$ produced under anaerobic condition, was significantly ($P \leq 0.05$) affected by different levels of residue retention under no till system. It was observed that nitrogen mineralization potential of soil increased with increase in % retention of residue. Nitrogen mineralization potential of soil ranged from 9.75 to 28.91 $\text{mg kg}^{-1} 7\text{d}^{-1}$ under different treatments. In comparison to 0% residue retained plot, there was 3 fold increase in N mineralization potential of soil in treatment where 90% of residue was retained. Similarly, retention of 30 and 60% of residue retention resulted in 12 and 18% improvement in N mineralization potential of soil in comparison to control. Dehydrogenase activity, a measure of soil total catabolic activity also responded positively with retention of residue. Dehydrogenase activity in soil varied from 66.34 to 103.51 $\mu\text{g TPF g}^{-1} \text{soil } 24 \text{ h}^{-1}$. In comparison to 0% of residue retention, dehydrogenase activity increased by 56% and 90%, in 60 and 90% of residue retained plot, respectively in 0-10 cm of soil depth.

Performance of wheat crop under different feedstock biochar

The experiment on biochar use under rice-wheat cropping



system in Vertisols of Central India revealed that wood biochar application does not result in significant effect on wheat grain yield without manure or fertilizer addition. Further, FYM as well as fertilizer application resulted in significant improvement in wheat grain yield under all the three biochar studied. Application of wood biochar @ 4 & 8 t ha^{-1} along with NPK+FYM resulted in only 5% higher wheat grain yield over no biochar + NPK + FYM. However, Wood coconut husk biochar application @ 8 t ha^{-1} along with NPK + FYM resulted in significant improvement (13%) in wheat grain yield over no biochar + NPK + FYM. Similarly, CRB application at the same rate of biochar addition along with NPK + FYM resulted in about 11% increase in wheat grain yield over no biochar + NPK + FYM.

Evaluation of wheat genotypes for nutrient use efficiency traits

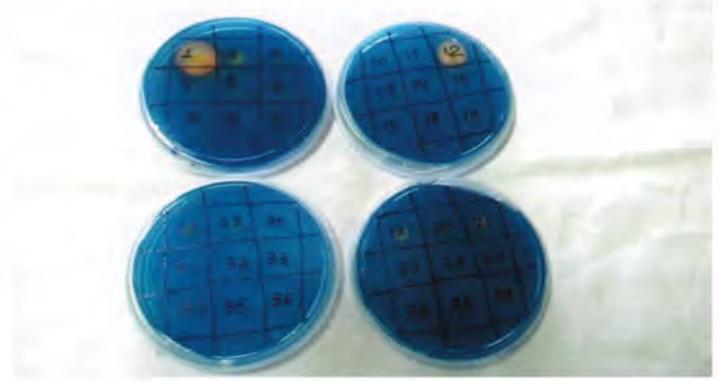
An experiment was conducted during the rabi season of 2021-2022 at ICAR-IISS research farm to evaluate 24 selected varieties of wheat for nutrient use efficiency traits. These genotypes were selected from about 120 genotypes of wheat developed from India and abroad based on the performance during last two years for nitrogen and phosphorus use efficiency and improved crop yield. The grain yield of the 120 genotypes ranged from 7.05 t ha^{-1} to 1.88 t ha^{-1} . The selected 24 genotypes were evaluated under plots of nutrient gradient with low nitrogen, low phosphorus and general recommended dose

(GRD) of fertilizer nutrient (120-60-40 kg/ha of NPK) under field conditions. Ample variations in morpho-physiological parameters like plant height (75-120 cm), SPAD chlorophyll content units (56.7 to 33.8 units), leaf area (485 to 1719 cm²), days to 50% flowering, gas exchange parameters (Ps rate from 30 to 20.6 μmol CO₂ m⁻² s⁻¹ and stomatal conductance 0.10 to 0.41 mol m⁻² s⁻¹) were recorded in these genotypes.



Soil types influencing plant growth promoting endophytic and rhizoplane colonizing bacteria of Mustard

From Mustard (cv Pusa Mehak) grown in three different soil viz. Vertisols, Inceptisols and Alfisols, a total of 37 isolates were obtained from rhizoplane and endorhizosphere of which 19 could grow on nitrogen free medium, 6 isolate solubilized P from tricalcium phosphate, 2 isolate solubilized potassium



from glauconite, 2 possessed siderophore production ability and 8 had zinc solubilizing ability with the highest zinc solubilization index of 3.84 by isolate BVR-7.

Appraisal of soil functional enzymatic diversity in different LTFE soils

Soil functional diversity has been enumerated through different enzymatic diversity indices. The highest Shannon Diversity Index (H), Simpson Yule index (SYI) as well as important enzymatic index i.e Geometric Mean (GMean) have been noticed in 100% NPK+FYM treatment in all three LTFE Barrackpore, LTFE Parbhani and LTFE Palampur soils.

Integrated plant nutrient supply (IPNS) modules for improving carbon stocks in Vertisols

The IPNS module significantly improved different carbon fractions and their stocks with adoption of higher amount of FYM (25 t ha⁻¹) followed by 75% NPK based on STCR along with 5 t ha⁻¹ FYM. Among the different SOC pools, active pools of carbon storage contributed nearly 56% and passive pools represented about 44% in the upper layer (0-15 cm) while at lower layer (15-30 cm) of soil the active pools of carbon storage was about 46% and passive pool registered about 54% carbon storage in maize-chickpea system. Therefore, it can be suggested that adoption of STCR based INM modules is the best technology to improve SOC stocks and crop productivity in Vertisols of Central India.

Climate change effect on rice-wheat productivity

In both rice and wheat crop, the highest value was accorded in T2 (Plants maintained at ambient temperature and CO₂ (600 ppm± 40 μl L⁻¹)) in terms of shoot and root biomass, yield and no. of grain/panicle. The yield increased over control was highest in T2 (16.24%) in rice and (17.40%) in wheat. Study suggests that climate change factors would affect the productivity of rice-wheat cropping system significantly



Plant growth promoting effect of Endophytes fungal isolates

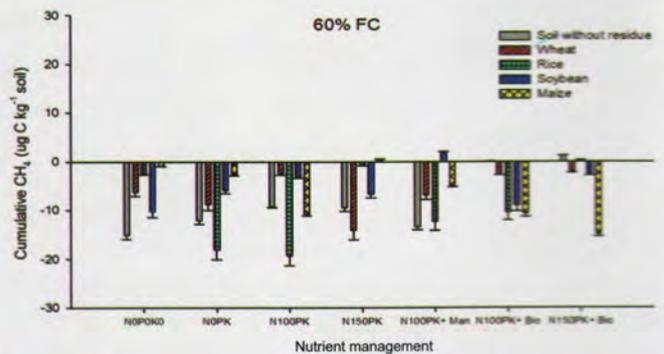
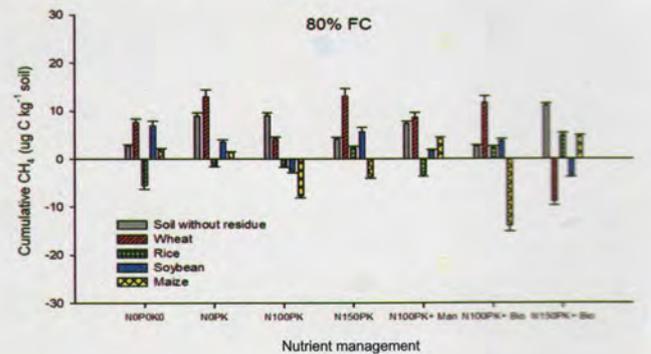
The inoculation effect of endophytic fungus revealed that presence of selected isolates (*Fusarium* and *Curvularia* sp.) had no pathogenic effect on maize and wheat crop growth or even in its presence promotes the plant growth. Furthermore, the fungal isolates show wide range of heavy metal tolerance and grow well in the presence of Pb, Cd, Cr and Hg heavy metals.



Intelligent management of crop residue and nutrients helps mitigate methane emissions from long-term conservation till soils

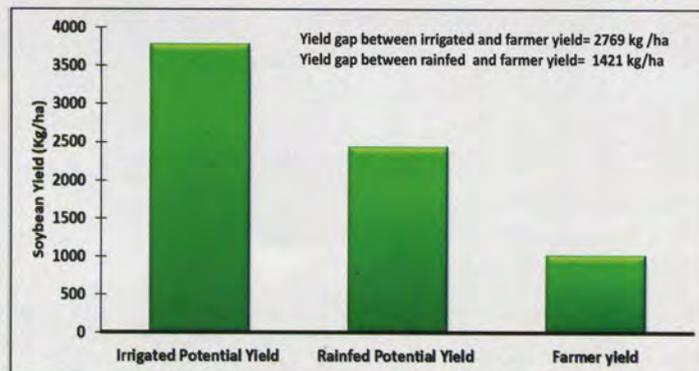
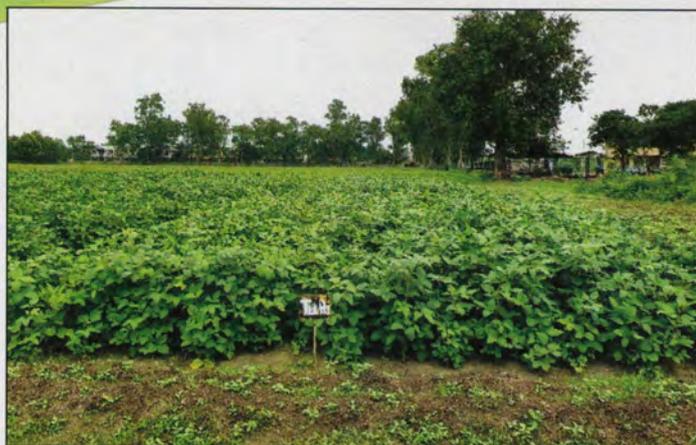
A mesocosm experiment was conducted to evaluate the impact of different crop residues (wheat, rice, soybean, and maize) on methane emissions in response to soil moisture and

nutrient management from long-term conservation till soils. Across crop residue and nutrient levels, reducing soil moisture from 80% FC to 60% FC increased methane consumption. The average methane fluxes at the two soil moistures were 2.72 and -6.97 $\mu\text{g-C kg}^{-1}$ soil, respectively. The incorporation of rice and maize straw increased methane consumption by eight times compared with soybean and wheat across all nutrient and moisture management. Nutrient application (inorganic and integrated) increased methane emission compared with minus nutrient in control and residue amended soil.



Coal ash generated from thermal power plant improved soil properties and crop growth

Application of ash, particularly at its higher rates resulted significantly higher crop yields in red & laterite, mixed red & black and deep black soils. In deep black soil of Bhopal, pond ash application @ >20 t ha⁻¹ significantly increased soybean seed yield. In red & laterite soil of Bhubaneswar, application of fly ash @ 400 t ha⁻¹ registered 14.3% increase in rice yield over no-ash treatment. In mixed red & black soil of Jhansi, some fodder crops like *Stylosanthes seabrana* and cowpea responded significantly to higher rates of ash application. In deep black soils, it improved soil physical properties like bulk density and cone penetration resistance, but reduced water holding capacity and steady state infiltration rate. It also increased availability of essential plant nutrients like P, S, Fe



Chemometric models for prediction of soil physical properties of Inceptisols using MIR spectroscopic technique

The usefulness of MIR reflectance spectroscopy, coupled with multivariate regression analysis, was examined for the evaluation and prediction of important soil physical properties (particle size distribution, soil water retention at field capacity (FC), and permanent wilting point (PWP) in Inceptisols. Good predictions for the independent validation

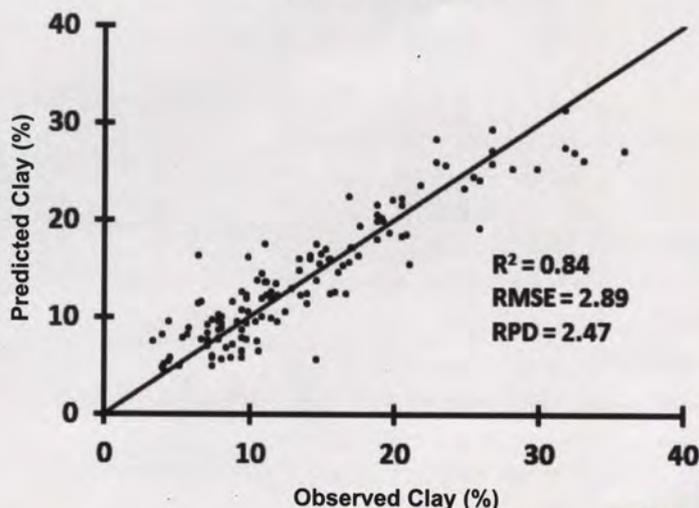
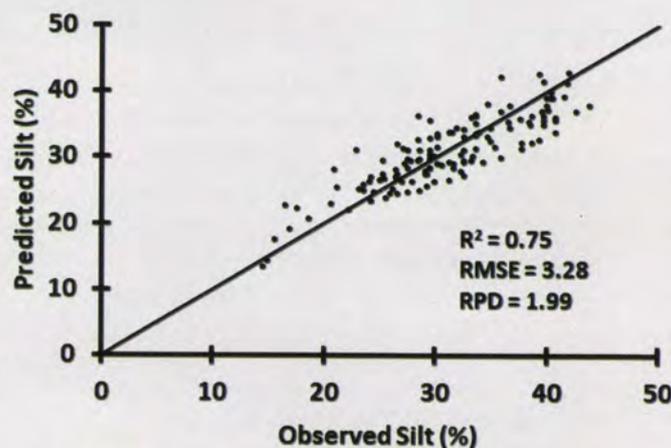
and B in soil. In mixed red & black soil of Jhansi, ash application increased availability of P and K in soil.

Biosynthesis of ZnO nanoparticles and its significance as biocontrolling agent

A low-cost bacterium based “eco-friendly” efficient synthesis of ZnO nanoparticles by using the bacterium *Serratia nematodiphila* has been reported. Strain *Serratia nematodiphila* strain ZTB15 was inoculated and cultured in Luria Bertani medium with 0.1 M zinc sulfate. ZnO nanoparticles were purified by washing through multiple centrifugations at 14,000 rpm for 10 min and dried at 120°C. ZnO nanoparticles disc contacting 100 µg mL⁻¹ concentration exhibited antibacterial activity against *Xanthomonas oryzae* pv. *oryzae*. The nanoparticles also exhibited antifungal activity against the phytopathogenic fungi *Alternaria* sp. About 85.93% inhibition in mycelia growth was observed at 250 µg mL⁻¹ of ZnO nanoparticles.

Assessment of potential yield and yield gap of soybean in India

The well-calibrated and validated DSSAT model was used to estimate the potential yield and yield gap of India's major soybean growing districts (43) under rainfed and irrigated ecosystems. The average simulated yield under irrigated conditions was 3794 kg ha⁻¹ as against the simulated average rainfed yield of 2446 kg ha⁻¹, which indicated a 35.52% reduction in grain yield due to adverse moisture conditions under rainfed ecosystems. However, the average simulated yield gap between irrigated and rainfed conditions was 1348 kg ha⁻¹. As against simulated yield, the average actual (farmers) yield across 43 districts of India includes 1025 kg ha⁻¹ under a rainfed ecosystem and which was 2769 and 1421 kg ha⁻¹ lower than irrigated and rainfed potential yield, respectively. Across the locations, under irrigated conditions, less yield variability was observed compared to rainfed and actual yield.





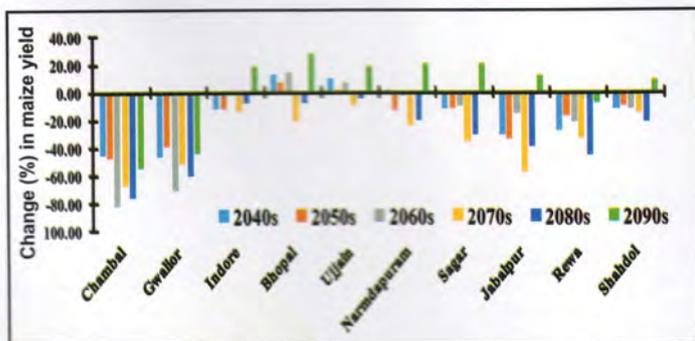
data set were obtained for clay (R^2 : 0.84, RMSE: 2.89), silt (R^2 : 0.75, RMSE: 3.28), sand percentage (R^2 : 0.71, RMSE: 4.14), soil water retention at PWP (R^2 : 0.74, RMSE: 1.52) and FC (R^2 : 0.70, RMSE: 2.37), in models developed through PLSR technique. To conclude, MIR spectroscopy could potentially be used for simultaneous prediction of sand, clay, silt percentage, and soil water retention of Inceptisols from the Indo-Gangetic plains of India.

Conservation Agriculture practices improve soil aggregation and carbon

Regardless of the cropping system, the soil under NT and RT exhibited better aggregation (20.77- 25.97% increase) and SOC (12.9-19.4% increase) compared to the CT practice at surface layers. The aggregate-associated C concentration increased with aggregate size and was highest with large macro aggregate and lowest with silt+clay fraction across different tillage and cropping systems. Higher SOC stock was recorded under NT (4.22 ± 0.133 Mg C/ha) compared to RT (3.84 ± 0.123 Mg C/ha) and CT (3.65 ± 0.04 Mg C/ha) practices at 0-5 cm depth. Thus, the adoption of CA practices reduced CO₂ emissions while also contributing to increases in SOC as well as improvement in soil structure.

Decadal analysis of impact of future climate on maize production in Central India

The global mean temperature has increased by 0.8°C since the 1850s. It is projected to increase by 2 to 7°C at the end of the century. The rising temperature and CO₂ concentration could significantly affect crop production. This study has performed the decadal impact of climate change on maize productivity in central India using the ensemble global climate models (GCM). The GCMs, namely BCC-CSM1-1, BCC-CSM1-1-M, GFDL-CM3, GFDL-ESM2G, GFDL-ESM2M, GISS-E2-H, and GISS-E2-R, were ensembled to generate future climate data (2040–2090) for Central India, under scenarios RCP4.5 and RCP8.5. The results show a decrease in up to 30% of maize grain yield in varying decades under the RCPs studies.



PROGRAMME HELD

National Girl Child Day

Women Cell, ICAR-IISS, Bhopal organized National Girl Child Day on 24 January 2022 in virtual mode.

73rd Republic Day, 2022

Republic Day was celebrated in the institute with lots of zeal and joy on 26th January, 2022. Dr Ashok K Patra hoisted the flag and addressed the gathering on this occasion. He greeted all the staffs of institute and urged to strive hard for buildup of nation.



12th International Women's Day celebration, 2022

Women Cell, ICAR-IISS, Bhopal celebrated International Women's Day on 8th March, 2022 with great zeal and cheerfulness.



35th Foundation Day

ICAR-Indian Institute of Soil Science, Bhopal celebrated “35th Foundation Day” on 16th April, 2022 with great zeal and enthusiasm. Dr SK Chaudhari, DDG (NRM) congratulated all the staffs of ICAR-IISS, Bhopal on this occasion.



- Dr Asha Sahu awarded as Best Waste Management Expert 2022 in the Powerful Women Awards at the Maharashtra Sadan, Cannaught Place, New Delhi organized by Crazytales on 11th May, 2022.
- Dr Priya Gurav received fellowship for Training of Young Scientist in 37th M. P. Young Scientist Congress during March 14-17, 2022, M.P. Council of Science and Technology, Madhya Pradesh.
- Dr Priya Gurav and Dr. Khushboo Rani have been elected as a Councillors, Central Zone of the Clay Minerals Society of India (CMSI), New Delhi for the years 2022 and 2023.
- Dr Pramod Jha delivered invited talk on “Carbon Sequestration in Agricultural Soils: Current Trend and Future Strategies” in National Seminar on Managing Soils Under Changing Climate” organized by ISSS&LUP, Nagpur during 24-26 March, 2022.
- Dr Nisha Sahu received Best Scientist Award in 11th Science and Technology Awards-22, in the month of June organized by EET CRS, Bengaluru.
- Drs Asit Mandal, J K Thakur and Brij Lal Lakaria acted as rapporteur in technical session of National Workshop on Natural Farming for Sustainable Agriculture & Environment organized on 24th April, 2022 at IISS, Bhopal.
- Dr SR Mohanty was conferred with prestigious NAAS fellowship in the month of June, 2022.



STAFF NEWS (PROMOTIONS/RETIREMENT/JOINING)

- SRC, ICAR-IISS organized Farewell Function on 17.03.2022 for Dr Monoranjan Mohanty who has been deputed as Scientist G, Office of the Principal Scientific Adviser to GoI.



- Mr Ashish Chobey joined as Administrative Officer at ICAR-IISS, Bhopal on 08.06.2022.
- Institute condole the untimely demise (28.01.2022) of Sh Anurag, Security Supervisor, ICAR-IISS, Bhopal

EXTENSION ACTIVITIES

Distribution of vermibeds in tribal belts of Madhya Pradesh

In connection with the project activities in the tribal belts of Madhya Pradesh 200 portable vermibeds were procured, distributed and demonstrated composting method using portable vermibeds to the project beneficiaries of Betul district during February-March, 2022.



The Training-Cum-Farmer's Visit programme on Soil Health Management was organized by Indian Institute of Soil Science, Bhopal, at KVK Barwani on March 11, 2022 under TSC-TSP project and about 125 tribal farmers were participated in one-day training programme. The objective of the training and Farmer's Visit was to impart and upgrade the knowledge of farmers and creating awareness amongst farmers for agriculture techniques and practices like importance of soil testing, organic farming, integrated nutrient management, conservation agriculture and soil health, soil health card,





दैनिक भास्कर बड़वानी भास्कर 12-06-2022

नवाचार • कृषि वैज्ञानिक ब्लॉक के अलग-अलग स्थानों पर जा रहे, तैयार करेंगे फर्टीलिटी मैप जिले की मिट्टी की कमी पता करने को ले रहे सैंपल

उपजाऊ क्षमता और सूक्ष्म तत्वों का लगाएंगे पता
 कृषि वैज्ञानिक एग्रेग्रेट सर्वेक्षण में बजरा के जिले की मिट्टी का नमूना संग्रहण है और इसमें पुराने तत्वों को बच रखा है। इसका संकलन है फर्टीलिटी मैप तैयार किया जा रहा है।
 कृषि वैज्ञानिक क्षेत्र के किसानों को बजरा का नमूना लेना है। उन्हें बजरा के पत्रों को पत्रों में नमूना लेना है। उन्हें बजरा के पत्रों में नमूना लेना है। उन्हें बजरा के पत्रों में नमूना लेना है।



collection of soil sample and soil testing in horticultural crops.

A Training-Cum-Agricultural Input Distribution Program were conducted at KVK Barwani during 10-11 June, 2022. Thirty-five tribal farmers participated in Training-Cum-Agricultural Input Distribution Program from different villages of the Barwani district of Madhya Pradesh. The soybean seeds were distributed to tribal farmers of Barwani district for kharif season.

Front line demonstration of Nutrient management

Seventeen demonstrations (twelve for wheat and five for chickpea) on the balanced use of fertilizers and integrated nutrient management were undertaken during the rabi season from Oct., 2021 to April, 2022 at farmers' fields of Raipur, Kanera, Khichital and Karond khurd villages under SCSP. A

10 to 12% higher yield of wheat and chickpea was reported in FLD plots compared to farmers' practice plots.

Mass multiplication of Earthworm Mother Culture and distribution of portable vermibeds to farmers

Earthworm mother culture was multiplied in the mother culture unit established in the institute. About 300 kg of worm mother culture were made ready in worm mother culture unit for distribution among the beneficiary farmers of the SAP. 70 vermibeds were distributed to the farmers for establishment of vermicomposting units for safe disposal of farm waste, thus promoting swachhta in the village and creating wealth out of waste.



Demonstration of microbial mediated compost application in wheat

A front-line demonstration was organized in the field of Shri Mahendra Meena in village Rasuliya Pathar by utilizing the compost prepared through introduction of microbial inoculation, to show the impact of microbial enriched compost application alongwith farmers practice of fertilizer application (100:60:40 kg NPK ha⁻¹) on crop growth and yield of wheat variety HI 1544 compared with farmer's practice. Data on crop growth and yield parameters were recorded and significant effect of microbial mediated compost on plant height, ear length and number of grains per ear heads was

observed and a higher grain yield of 5.7 ton ha⁻¹ was recorded under demonstration with microbial mediated compost against farmers practice (4.5 ton ha⁻¹).

Preparation of microbial culture capsule for accelerating composting process

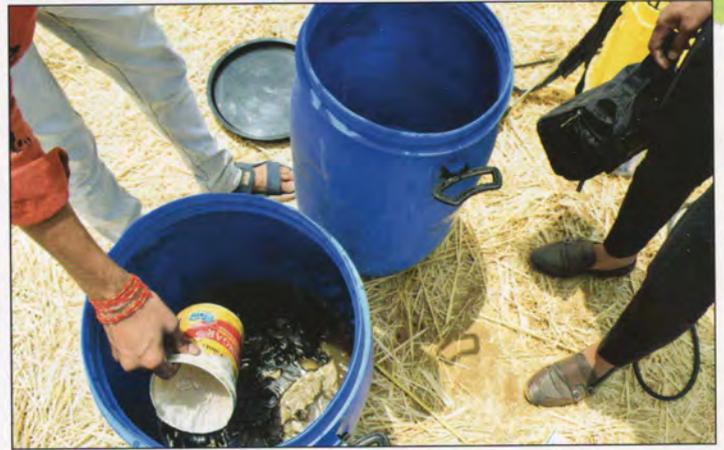
After demonstration of indoor composting using microbial culture in adopted villages, the culture formulated in the form of capsules was prepared in more numbers to distribute among the farmers. The microbes in capsules can be easily activated by the farmers in sugar-bran solution to use in compost pit. The capsules can also be used for in situ decomposition of wheat residue in field.



Demonstration of IISS-Ekcel decomposer under Swachhata Action Plan (SAP)

In-situ crop residue decomposition using IISS-Ekcel decomposer capsules was demonstrated in four farmer's field after harvesting of wheat crop during Rabi, 2022 at Mohammed Nagar Sattikheda, Jhapadia and Kalyanpur village of Bhopal district under Swachhata Action Plan.

Dr AK Viswakarma organized a workshop entitled "Kisan Bhagidari, Prathmikta Hamari" 75 Azadi Ka Amrit Mahotsav Campaign to sensitize farmers about importance of soil health management for sustainable agriculture and human health with special emphasis on "Biofortification, Nutrient Grooming and Crop Diversification" on 28th April 2022. The program was attended by 78 progressive farmers from four villages (Beenapur, Bandikhedi, Khujari and Hinoti sadak).



Farmers First programme

Under Farmers first Programme, Dr AK Vishwakarma organized one day workshop on Pulses for Soil Health and Nutritional Security on 10 February, 2022 and Field Visit on 28 February, 2022. Besides, many one day training programme were also organized under Farmers First Programme on multiple important topics such as "Resource Conservation Technologies for Sustainable Agriculture" was held on 24 March, 2022; Agriculture mechanization for crop residue management was held on 04 April, 2022; Bio-





fortification, nutrient grooming and crop diversification” was organized on 28 April, 2022. Two Field Day programs were conducted in Khamkheda and Bhairampur village on 26 and 29 March, 2022 wherein more than 100 farmers were involved in each village.



Farmers-Scientist interface on Resource Conservation Technologies was organized under Farmers First Programme with Dr VP Chahal (ADG Agriculture Extension ICAR) on 22 June, 2022 in which total 35 farmers participated.

Distribution of seed, fertilizer and mother culture of vermicompost was done by Dr VP Chahal (ADG Agriculture Extension ICAR) followed by interaction with farmers and field visit.

Kishan mela and training cum Input distribution to tribal farmers of Rajnandgaon (Chhattisgarh) during 8-9 March, 2022

A Kishan Mela and Training cum Input distribution to tribal farmers of Rajnandgaon (Chhattisgarh) was organized by the team of scientists Dr R Elanchezhian, Dr P Tripathi, Dr MV Coumar and Dr Narayan Lal from ICAR-IISS, Bhopal during 8-9 March, 2022.



Training on Soil health management and improving crop productivity at Rajnandgaon (Chhattisgarh)

ICAR-IISS, Bhopal and KVK Rajnandgaon jointly organized training on Soil Health Management at Rajnandgaon at Agricultural College and Research Institute, Surgi, Rajnandgaon during 3-4 May, 2022 with involvement of about 300 tribal farmers.



Field demonstration trial (FLD) on Integrated Nutrient Management (INM) under schedule caste sub plan (SCSP)

A field demonstration (FLD) was conducted on Integrated Nutrient Management (INM) in soybean, maize and wheat



crops at Sahapur village of Bhopal. In this trial, balance fertilization, integrated nutrient management and farmer practices were evaluated in different crops for improving crop productivity and sustaining soil health at farmers fields under the SC sub plan

TRAINING PROGRAMME/WORKSHOP ORGANIZED

- A review meeting of the NICRA project under strategic component was organized at ICAR-IISS, Bhopal from 4 to 6 January, 2022.
- Dr AB Singh organized 02 days farmer's training under Soil Health Card at ICAR-IISS, Bhopal during 19-20 January, 2022.
- Dr SR Mohanty organized 21 days ICAR winter school "Advance biofertilizer technologies to improve nutrient use efficiency, soil health and greenhouse gas mitigation" during February, 8-28, 2022.
- ICAR-IISS, Bhopal organized World Pulse Day on 10 Feb 2022 on "Pulses for soil health and nutritional security" organized by ICAR-IISS Bhopal. In which 50 farmers joined in offline mode and 200 joined online.
- ICAR-IISS and NICRA jointly organized four training programs on "Climate-Smart Agriculture and Soil Health Management", during 23-25 February, 2-4 March, 8-10 March, and 14-16 March, 2022 at Raipur, Begonia, Parwalia Sadak, and Kanera Village, respectively. A total of 240 farmers participated (i.e. 60 farmers participated in each training program).
- ICAR-IISS, Bhopal organized consultation meeting on Natural farming with Shri Kamal Patel, Hon'ble Minister of Agriculture and Farmers Welfare, Govt. of Madhya Pradesh at ICAR-IISS, Bhopal on 25 February, 2022.

- Drs Brij Lal Lakaria, Pramod Jha, AK Vishwakarma and AK Biswas organized a short course on "Concepts and Mechanisms of Soil Carbon Sequestration and Stabilization for Soil Health Improvement and Climate Change Mitigation" during 02-11 March, 2022 in which 16 participants from ICAR Institutes and State Agricultural Universities participated.



- Drs Sudeshna Bhattacharjya, Asha Sahu and Kollah Bharati organized the National Webinar on "Agritech innovations to leap forward sustainable management of soil and environment" on 15 March, 2022 under Azadi Ka Amrit Mahotsav as coordinators.



- National Campaign on "Farm Mechanisation" was organized at ICAR-IISS, Bhopal from 28 March to 4 April, 2022. On this occasion, farmers from nearby villages visited the institute and were introduced to modern farm implements, i.e., happy seeders, grass cutters, different types of seed drills etc. on 4 April, 2022. A training-cum-interactive meet was organized at ICAR-IISS, Bhopal.
- ICAR-IISS, Bhopal organized campaign on "Waste to Wealth" on 23rd April, 2022 at Khamkheda village.
- ICAR-IISS, Bhopal organized National Workshop on Natural Farming for Sustainable Agriculture &

- Environment as a part of "Annadata Devo Bhava", 75 Azadi Ka Amrit Mahotsav at ICAR-IISS, Bhopal on 24 April, 2022.
- ICAR-IISS, Bhopal organized Workshop on "Kisan Bhagidari, Prathamikta Hamari" under 75 Azadi Ka Amrit Mahotsav Campaign to sensitize farmers about importance of soil health management for sustainable agriculture and human health with special emphasis on "Biofortification, Nutrient Grooming and Crop Diversification" on 28 April, 2022.
- Drs AB Singh, Asha Sahu, Sudeshna Bhattacharjya organized one day training on "Vermicomposting Technology" for the B. Sc. students of Government Gitanjali Girls College, Bhopal on 28 April, 2022.
- The Institute Technology Management Unit organized a one day IPR workshop for farmers on "Protecting Farmers Rights in areas of Farm Innovations, Breeding and Protection of Varieties" at Krishi Vigyan Kendra, Raisen on May 17, 2022.
- Dr AB Singh has organized a field visit and interactive lecture regarding organic farming, natural farming and vermicomposting under the 3-days Training Programme on "Climate Information for Disaster Resilient Agriculture", jointly organized by ICAR- Indian Institute of Soil Science (IISS), Bhopal, National Institute of Disaster Management (NIDM), Ministry of Home Affairs, GoI and Indian Meteorological Department (IMD), Bhopal Centre.





SCIENTISTS PARTICIPATION IN TRAINING/SEMINAR/WORKSHOP

Name	Programme attended/participated	Year 2022
Dr AK Patra	SFC meeting organized by ICAR-NBSS & LUP, Nagpur	January 4
Drs KC Shinogi and Priya Gurav	Winter School on Farm Mechanization for facilitating Conservation Agriculture and Climate Smart Technology at ICAR-CIAE, Bhopal	January 04-24
Dr AK Patra	NICRA review meeting at ICAR-IISS, Bhopal	January 4-6
All Scientists	Online review meeting of Officers and Staff of ICAR Hqrs organized by ICAR, ASRB and DARE	January 4
Dr Asha Sahu	National Webinar on "Issues of Crop Residue Burning and Management" organized by ICAR-CIAE, Bhopal	January 5
Dr Nisha Sahu	As member attended the virtual meeting organized by The Indian Society of AgroPhysics (ISAP), IARI, New Delhi chaired by Dr SK Chaudhari, DDG (NRM) and President of ISAP	January 5
Dr SR Mohanty	Divisional meeting of Foreign Aided Projects July to December 2021	January 7
Drs AK Patra and Pradip Dey	Attended Zoom Meeting for Techno Commercial Assessment and Expert Committee of ICAR-IISS and Agrinnovate India Limited (AgIn)	January 10
Dr Pradip Dey	Attended the online Meeting on Smart Farming and Application of Digital Technology for Farming	January 12
Dr AK Patra	Acted as member of assessment committee meeting of Dr Gopal Mahajan, Scientist (Soil Science)	January 15
Dr Pradip Dey	Attended as Member of the Madhya Pradesh State Steering Committee Meeting of the Indo German Project on 'Soil Protection and Rehabilitation for Food Security in India' (ProSoil)	January 17
Dr Khushboo Rani	Training Programme on Data Visualization in Agribusiness and Agricultural Research (Online), ICAR-NAARM, Hyderabad	January 17-22
Dr Asha Sahu	International Webinar on Climate Change & Soil Health, Sri Sri University, Cuttack	January 18
Dr Jitendra Kumar	8 th International Conference on Sustainability Science (ICSS 2022) (Virtual mode)	January 18-20
Drs AK Patra, Pradip Dey, Tapan Adhikari, R Elanchezhian and RH Wanjari	Review meeting on trials/testing of IFFCO Nano urea under the chairmanship of Secretary (DARE) & DG (ICAR)	January 20

Drs AK Patra and Jitendra Kumar	Attended foreign aided externally funded project review meeting of NRM division	January 24
Dr Jitendra Kumar	Participated virtually in the conference "How to Implement Integrated Land-Use Initiatives for Sustainable Development" organized by the Biocarbon fund	January 26
Dr AK Patra	Attended demonstration of AquaF Technology under the Chairmanship of Secretary (DARE) & DG (ICAR).	January 28
Dr AK Patra	Acted as member of Jury for IARI Gold Medal Contest	February 6
Dr AK Patra	Attended meeting of CGIAR Centers	February 7
Dr Immanuel C Haokip	Participated in ICAR Winter School on "Advance biofertilizer technologies to improve nutrient use efficiency, soil health and greenhouse gas mitigation" organized by ICAR-IISS, Bhopal	February 8-28
All Scientists	Workshop on Pulse for soil health and nutritional security organized at ICAR-IISS, Bhopal	February 10
Drs Khushboo Rani and Abinash Das	Training Programme on Geospatial Analysis using QGIS & R, ICAR-NAARM (Online), Hyderabad	February 14-19
Dr AK Patra	Attended an online meeting of Programme Advisory Committee (PAC)-Earth & Atmospheric Sciences (E&AS)	February 16-17
Dr Immanuel C Haokip	First International Conference on "Recent Advances for Managing Sustainable Soil Health and Crop Production" organized by GVK Society, Agra.	February 18 - 20
Drs Pradip Dey, RH Wanjari, Dhiraj Kumar and Nisha Sahu	Participated in National Seminar on "Agrophysics for Smart Agriculture" organized by the Indian Society of Agrophysics and Division of Agricultural Physics, IARI, New Delhi	February 22-23
Dr Asha Sahu	5 days "Hands on Training Programme on Microbial Techniques" organized by Madhya Pradesh Council of Science and Technology, Bhopal	February 21-25
Dr Pradip Dey	Attended webinar on "Smart Agriculture" and "Budget Implementations" addressed by the Hon'ble Prime Minister and Hon'ble Agriculture Minister	February 24
Drs Abinash Das, Khushboo Rani, Pradip Dey and Nisha Sahu	Attended 9 th Annual Convention and Webinar on "Managing Agro-chemicals for Crop and Environmental Health" organized by Society for Fertilizers and Environment, Kolkata	February 25-26
Dr Brij Lal Lakaria	Review meeting on Natural Farming experiment being conducted under AINP-OF under the chairmanship of DDG (NRM)	February 25



All Scientists	National Science Day Celebration & 12 th Prof SK Mukherjee Memorial Lecture, ICAR-IISS, Bhopal	February 28
Dr Pradip Dey	As member, attended 6 th Meeting of Environmental Services Sectional Committee (online), SSD 07, organized by BIS India	March 4
Drs Abinash Das and DK Yadav	Virtual International Conference of Youth in Agriculture, IAAS, Bonn, Germany	March 10-13
Drs Khushboo Rani and Abinash Das	Short Course training programme on Concepts and mechanisms of soil carbon sequestration and stabilization for soil health improvement and climate change mitigation, held at ICAR-IISS, Bhopal	March 2-11
Dr Priya Gurav	Participated and presented in 37 th M. P. Young Scientist Congress M. P. Council of Science and Technology, Madhya Pradesh	March 14-17
All Scientists	Participated in Online webinar on Agritech Innovations to Leapforward Sustainable Management of Soil and Environment organized at ICAR-IISS, Bhopal	March 15
Dr Pramod Jha	National Seminar on "Managing Soils Under Changing Climate" organized by NBSS & LUP, Nagpur	24-26 March
Drs AK Patra, R Elanchezhian and Pradip Dey	National campaign on "Farm Mechanisation organized at ICAR-IISS, Bhopal	March 28 - April 4
Dr Pradip Dey	Participated as member of the UGC Expert Committee for the review of functioning of Mandsaur University, Mandsaur, Madhya Pradesh	April 7-8
Dr Nisha Sahu	Participated in online Global conference on Environmental Science and Applications (GCESA) 2022 as invited Speaker	April 11-13
Drs Brij Lal Lakaria and AK Biswas	National Workshop on "Challenges in production and use of Biochar" in Aurangabad, Maharashtra organized by ICRAF and GIZ in collaboration with NGO partners	April 19-21
Dr AK Patra	Participated in the Workshop cum demonstration on Drone Technology in Agriculture at NRRI, Cuttack	April 21
Drs AK Patra and R Elanchezhian	National Conference on "Natural farming for Sustainable Agriculture and Environment"	April 24
All Scientists	National workshop on "Annadata Devo Bhava" 75 Azadi Ka Amrit Mahotsav: Natural Farming for Sustainable Agriculture & Environment, ICAR-IISS, Bhopal	April 24

Dr Pradip Dey	Participated as Expert for Interview Board of Public Service Commission of Arunachal Pradesh for the recruitment of Agricultural Development Officer	May 10
All Scientists	Attended the ICAR Online Lecture Series by Prof Rattan Lal on "Managing Soil for Food and Climate Security and Advance SDGs of the UN"	May 10
Drs AK Patra and R Elanchezhian	Workshop on Climate Information for Disaster Resilient Agriculture	May 18-20
Dr Pradip Dey	Attended webinar on "Managing Soil Health for Food Security and Environmental Resilience" at MANAGE, Hyderabad on 19 May, 2022	May 19
Dr Pradip Dey	Attended International Workshop on "Climate Proofing of Watershed Development Projects with special reference to Soil and Water Conservation Technologies in context of Climate Smart Agriculture"	May 22
All Scientists	Attended lecture on "Our polluted soil – why we need to stop destroying the very thing that sustains us" by Prof. Ravi Naidu, The University of Newcastle, Australia	June 5
Dr AK Patra	Attended 59 th Board of Management Meeting at MGCGV, Chitrakoot	June 6
Dr Nisha Sahu	Participated and delivered Oral presentation in 5 th National Conference on Doubling Farmers Income for Sustainable and Harmonious Agriculture (DISHA -2022) at Kamla Nehru Institute of Physical and Social Sciences (KNIPSS), Sultanpur, UP in association with GAPS & PKVSS	June 11-12
Dr AK Patra	Attended Executive Council Meeting of the ISSS	June 17-18
All Scientists	National level campaign on "Efficient and Balanced use of Fertilizers" (including nanofertilizers)	June 21
All Scientists	Attended International Day of Yoga celebration with fervor at ICAR-IISS, Bhopal	June 21
Dr AK Patra	Participated in a brain storming workshop on "National Air Quality Resource Framework" (NARFI) to be organized by the Office of the Principal Scientific Adviser to the Govt. of India, at India International Centre, New Delhi	June 22
Dr DK Yadav	Orientation Workshop for Nodal Officers of Disaster Management of Ministries/Departments of GOI organized by National Institute of Disaster Management (NIDM), Rohini, Delhi	June 27-28



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