



Vol. 25, Number 2

July - December 2022

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Forthcoming events

Training programme on "Soil Pollutants Impact Assessment and Remediation of Contaminated Sites" at ICAR-IISS, Bhopal during 23-25 May, 2023" sponsored by CPCB, New Delhi.

Editors

- Dr. Tapan Adhikari
- Dr. Asit Mandal
- Dr. B.P. Meena
- Dr. Narayan Lal
- Dr. M. Homeshwari Devi
- Dr. Rahul Mishra

Director's Desk

Soil Science Research Road Map: Indian Perspective



The services provided by soils viz., food production, purifying water, storing carbon, cycling nutrients, remediating waste and providing habitats are critical for the health, productivity and longevity of a society. Delivering on societal demands in the context of climate change and unprecedented population growth places great pressure on global soil resources. Hence a conceptual revolution rather a paradigm shift in soil science research is urgently required to protect soil. Mere theoretical knowledge /concepts will not suffice the current situation, their implementation in practice is essential. Knowledge on soils particularly soil quality, data harmonization networks, climate change, climate-smart sustainable soil management, sustainable development goals, soil information, science-policy interface needs to be shared and transferred, needs to be harmonized, stored and organized and needs to be applied in practice. The road map functions as a strategic research agenda that allows for strategic decision making in science, policy and implementation issues. It is comprised of three components viz., (i) science (ii) policy makers and (iii) implementers (farmers & advisors, land owners & managers, civil society and industry). The preparatory phase of the provisional roadmap is to be developed using the following inputs collated from the core group of soil scientists:

Research prioritization and multidisciplinary approach

Identification of key priority areas, more holistic and problem-solving projects in synchronization with Government schemes, and basic and strategic disciplinary as well as multi-disciplinary research are the need of the hour to attain professional excellence and innovations.

Basic research with high probability of convergence

More emphasis on fundamental processes operating in soil-plant continuum, which should find its application solving the problems aiming at improving soil functions. Basic research on alternate farming such as organic farming, natural farming etc., needs to be strengthened.

Improving nutrient and water use efficiency

Fertilizer product research involving nanotechnology and other novel approaches, *in situ* water harvesting, watershed-based resource management, micro-irrigation and fertigation technologies, and precision farming involving AI and decision support tools, maintenance and sustenance of soil health, SSNM, use of RCTs are the ways and means of enhancing nutrient and water use efficiency.



Initiation of research on "One health approach"

Multidisciplinary research on 'One Health', an integrated and unifying approach to assess and maintain soil, animal, human and environment health needs to be initiated. Feasibility of using modern tools like hyperspectral, proximal and remote sensing in assessing soil the state of soil health should be assessed.

Nutrient mining

In-depth understanding of nutrient mining and ways and means of arresting it should be devised.

Initiation of research on rhizosphere for better understanding of nutrient dynamics and its availability

Impact of root growth and respiration, rhizodeposition, and uptake of water and nutrients on biological, chemical and physical changes in soils over variable distances from the root surface should be unraveled. Crop root density and architecture need to be assessed.

In-depth study on using non-conventional sources of plant nutrients

In the face of scarcity and escalating price of chemical fertilizers, research on the feasibility of conventional sources of plant nutrients, such as waste mica, low grade rock phosphate, glauconite etc. intensified.

Integration of AICARPs

Meaningful integration and interaction among AICRPs are need of hour to address and improve the soil health holistically.

Orientation of soil research in the context of climate change

Center for carbon research for efficient carbon management needs to be established. Working on carrying capacity of major soil groups and assessing quality of soil organic carbon under various agro-climatic conditions should constitute priority. Assessment and comprehend the impact of climate on soil properties and functions including nutrient supply capacity is urgently required.

Research on risk assessment and remediation of polluted soils should get impetus

Detailed study on risk assessment and remediation options should be taken under normal and change conditions.

Initiation of PG Courses

PG degree course in soil science in collaboration with ICAR-IARI is the need of hour.

Collaboration and linkages

National and international collaboration should be widened. Strong linkages with industries need to be established for up scaling the technologies. Functional linkages / MoUs with national and overseas universities need to be developed.

Resource generation and capacity building

Resource can be generated through externally funded projects, organizing HRD programmers, attracting R & D funds of industry and commercialization of technologies. Exposure of scientist and research personnel to national/international centres of excellence are required for capacity building.

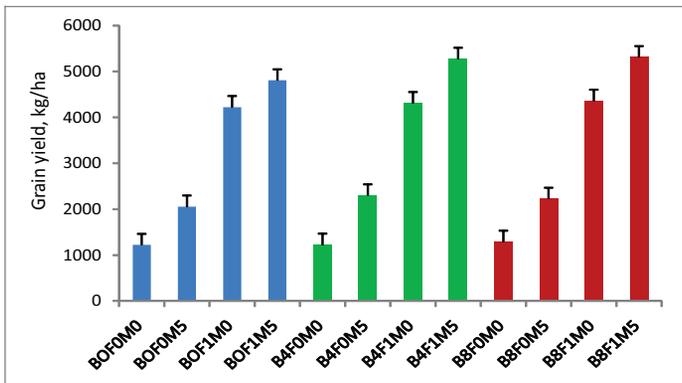
Our challenge as scientists is to focus on the scientific research towards finding solutions for the societal issues of our time. For this interdisciplinary collaboration and networking is needed. It is necessary to bring scientists and stakeholders that have the same goal, work on the same societal issue, but have different scientific backgrounds. This provisional roadmap will be further developed by involving stakeholders and the scientific community to formulate the final soil roadmap.

S. P. Datta
Director

RESEARCH HIGHLIGHTS

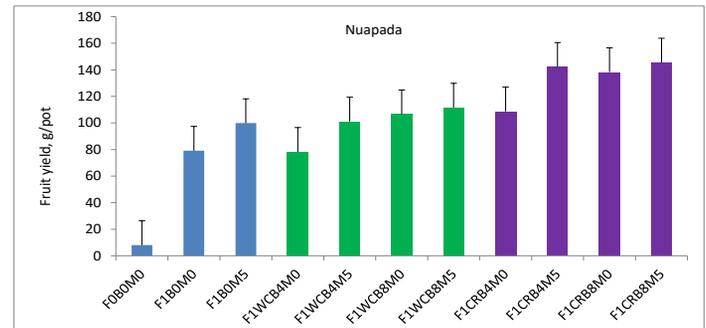
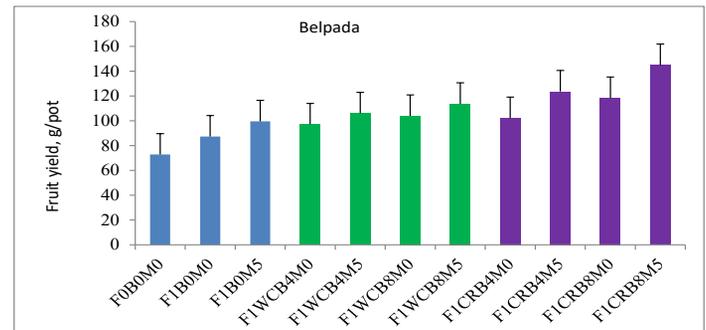
Effect of bio-char on rice yield

Biochar application in rice crop revealed that application (0, 4 and 8 t ha⁻¹) of biochar *viz.*, Wood Biochar (WB), Wood Coconut Husk Biochar (WCB) or Crop Residue Biochar (CRB) did not improve the rice grain yield. However, application of recommended dose of fertilizers and manure (5 t ha⁻¹) significantly improved the rice grain yield. The mean grain yield of rice under varied between 1223 and 5314; 1327 and 5023; and 1521 and 5161 kg ha⁻¹ under WB, WCB and CRB, respectively. The application of WB @ 4.0 and 8.0 t ha⁻¹ along with NPK+FYM resulted in only 9.75% and 10.5% higher rice grain yield over no biochar +NPK+FYM. However, it varied between (12.3 and 14.75%); and (7.9 and 4.2%) under WCB and CRB, respectively.



Effect of biochar on okra productivity in Inceptisols and Alfisols

A greenhouse study was conducted during *kharif* season 2022 using okra as test crop to assess the effect of WCB and CRB application in Inceptisols and Alfisols soils from Belpada and Nuapada in Odisha, respectively. In Inceptisols of Belpada, the pod yield of okra varied between 73 and 145 g plot⁻¹ while it varied between 8 and 146 g pot⁻¹ in acidic soils of Nuapada. Fertilizer and FYM application showed significant improvement in the fruit and pod yield of okra. In soils of Belpada, there was no significant effect of WCB application however, CRB showed a significant improvement in fruit yield of okra. In soils of Nuapada, both WCB and CRB showed significant improvement in biomass yield. Among the two biochars, CRB has shown better effect on fruit yield compared to WCB in both the soils.



No biochar

With biochar

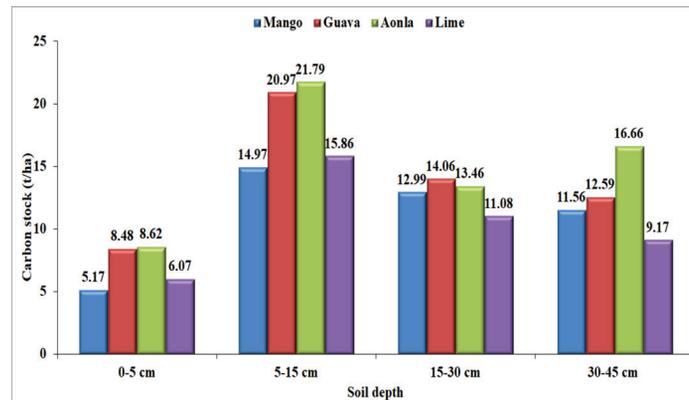
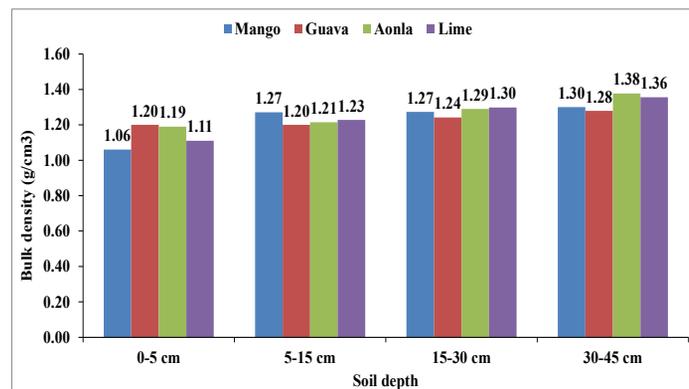
Impact of INM modules on crop productivity and soil health in maize-chickpea system.

A field long-term study was conducted to evaluate the different integrated nutrient management (INM) modules for enhancing crop productivity and sustaining soil health during *kharif* season maize as test crop. In this study, different INM modules consisting of chemical fertilizers (NPKZn), farmyard manure (FYM), poultry manure (PM), urban compost (UC) as a source of nutrients and maize residue (MRM), *glyricidia loppings* (GLM) used a mulching have been investigated. The crop productivity was considerably improved with adoption of INM modules as compared to organic and inorganic modules. Maize yield was significantly higher with adoption of FYM based INM modules and followed by poultry manure based INM modules as compared to general recommended dose (GRD) and STCR based NPK fertilizers. Whereas, application of organic modules (the integration of UC, MRM and GLM) did not influenced the maize yields as like as FYM based INM modules. Significant positive increasing trend of total organic carbon (TOC) content and nitrogen concentration were also noticed with adoption of FYM at 20 Mg ha⁻¹ and STCR based 75% NPK + FYM at 5 Mg ha⁻¹.



Agri-horticultural systems and its impact on crop quality and soil health

Bulk density of soil was influenced by different fruit orchard and it is gradually increasing throughout the depth (0-45 cm) of the soil profile. Irrespective of the soil depth, the highest carbon stock was observed in aonla orchard (15.13 t ha⁻¹) followed by guava (14.02 t ha⁻¹).



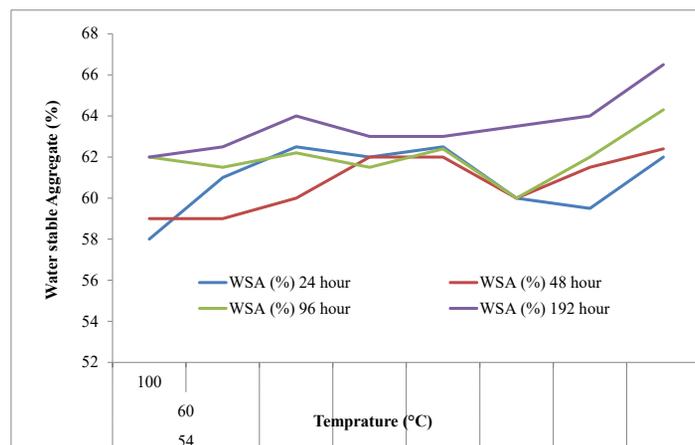
Phenolic content in fruit crops is major constituent and it is highly correlated with stress. Its production was significantly influenced by mulching treatments. Black polythene mulch resulted in lowest whereas control (without mulch) resulted in highest phenolics as well as thickness of leaf. The leaf chlorophyll content was highest under black polythene mulch whereas, lowest under white polythene mulch followed by control.

Effect of mulching in leaf characteristics in mango

Treatments	Total phenolics (mg GAE/100 g)	Chl_A (mg/100g)	Chl_B (mg/100g)	Total_Ch (mg/100g)	Leaf thickness (mm)
10 kg wheat residue	1175.71	7.91	2.65	10.56	0.25
10 kg gram residue	1085.23	8.21	2.34	10.55	0.30
10 kg dry grass	787.61	6.63	2.07	8.70	0.22
Black polythene	332.85	12.28	3.56	15.83	0.25
White polythene	997.14	6.19	1.82	8.00	0.22
Control	1268.57	6.63	2.03	8.65	0.32
LSD (0.05)	54.89	0.422	0.151	0.421	0.019

Effect of heating and duration of heating on soil aggregate stability

Soil sample was subjected to higher temperatures (control, 35, 42, 46, 54, 60, and 100°C) in an incubator and oven for varying lengths of time (24, 48, 96, and 192 hours). The effect of temperature for different durations on aggregate stability was analysed. After 24 hours of different temperature exposure to the soil sample, no effect was observed; however, after 48 hours of different temperature exposure, the 100°C soil sample showed a slight improvement in the aggregate stability. The soil exposed to 100°C for 192 hours showed significantly increased aggregate stability. This study found that soil exposed to lower temperature for a short period of time has no effect on aggregate stability, whereas soil exposed to higher temperatures (100°C) for a long period of time has a significant effect.



Screening of groundnut cultivars under organic production system

Yield response of 12 groundnut cultivars were evaluated to screen out promising cultivars for organic management practices for central India. The best performing cultivars under organic management practices was GPBD-5 (2.1 t ha⁻¹) followed by DH-256 (2.0 t ha⁻¹) and GJG-17 (1.93 t ha⁻¹).



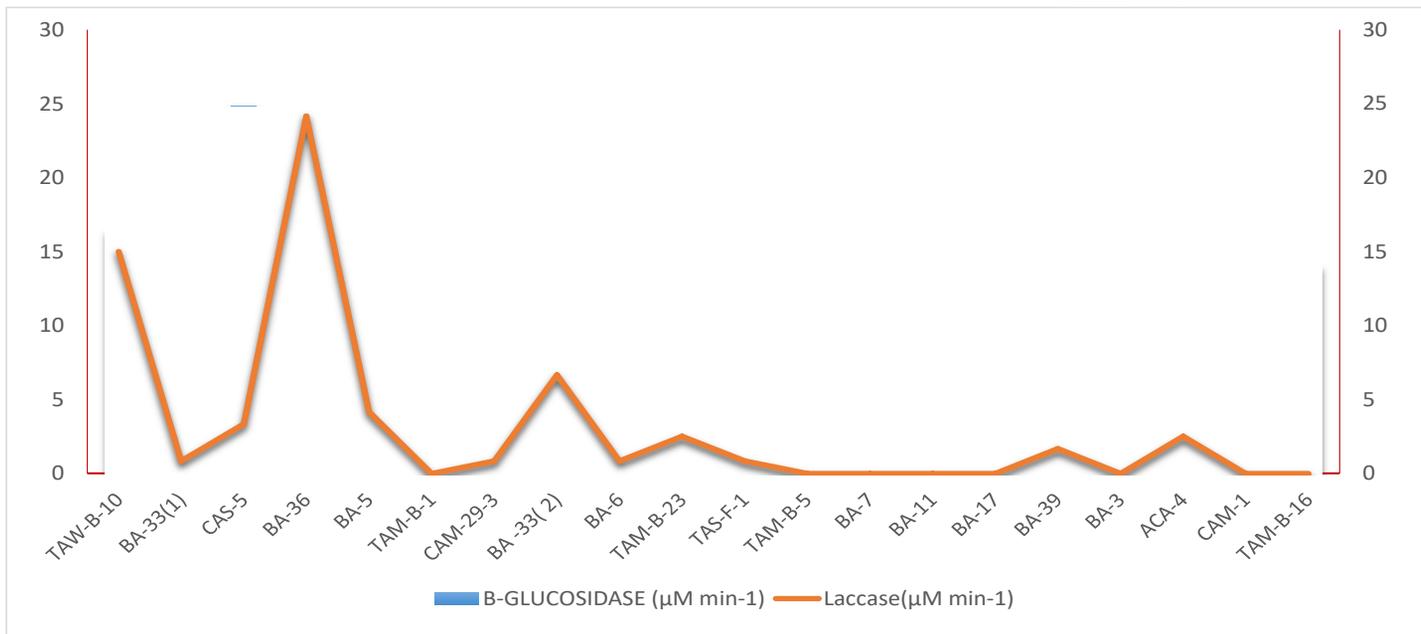
Evaluation of natural farming practices in different agro-ecology

Field experiment was conducted during *kharif* season 2022 to evaluate natural farming practices and recorded the highest soybean yield with adoption of integrated crop management practices along with chemical pesticide (ICMP), which was similar to integrated crop management practices with natural farming (ICMNF) and AI-NPOF package. Maize crop was grown as an intercrop in natural farming practices. Among the natural farming practices, the highest seed yield was observed with complete natural farming practices.



Deciphering thermophiles from hot springs of Central India for thermozymes production

About 101 thermophiles were isolated from the three hot springs *viz.*, Choti Anthoni (CA), Badi Anthoni (BA) and Tatapani (TA) of Central India includes water, mat and soil samples. After qualitative screening of lignocellulolytic microbes, 19 and 1 potential bacterial and fungal isolates were selected, respectively. Further, quantitative estimation of β -glucosidase and Laccase activity were performed. It was observed that CAS-5 showed highest (24.82 $\mu\text{M min}^{-1}$) β -glucosidase activity whereas BA-36 performed better (24.17 $\mu\text{M min}^{-1}$) for Laccase activity.



Lability and carbon management index of soils of LTFE Barrackpore and LTFE Parbhani

Carbon management index (CMI) is a sensitive measure of the rate of change in soil C dynamics of a particular system with respect to a more stable reference system. In both the LTFE centres, CMI of different treatments have been calculated with respect to fallow soil. Data

revealed that LTFE Parbhani soil has higher content of labile carbon which is subjected to faster changes as compared to LTFE Barrackpore. As it is well perceived that CMI is the indicator of rate of change in soil C dynamics, higher value reflects faster changes in soil C dynamics in LTFE Parbhani as compared to the lower value of CMI in LTFE Barrackpore indicating that soil C has reached more stable equilibrium state.

Treatment	LTFE Parbhani			LTFE Barrackpore		
	LI	CPI	CMI	LI	CPI	CMI
Control	1.03 b	0.91 c	92.52 b	1.32 a	0.72 c	94.64 ab
Fallow	1.00 b	1.00 abc	100.00 b	1.00 b	1.00 a	100.00 a
100% N	0.90 b	0.95 bc	86.03 b	1.32 a	0.79 bc	103.41 a
100% NP	4.59 a	1.00 abc	454.00 a	0.91 bc	0.77 c	69.73 cd
100% NPK	4.04 a	1.14 ab	453.47 a	0.70 c	0.76 c	52.78 d
100% NPK+FYM	3.84 a	1.16 a	438.08 a	0.82 bc	0.96 ab	77.48 bc

Means followed by different letters are significantly different from each other.

Non- contact and contact nano sensor for soil moisture measurement

Developed a prototype (non contact nano sensor) named “MEGH” (Measuring Essential Good Hydration) for measurement of soil water potential in a non-invasive manner. The nano sensor was fabricated by using cellulose and cobalt chloride for the measurement of water potential from soil. The working of the prototype including the designed strip for the successful

determination of the soil water potential was successfully demonstrated. The sensor changes colour from blue to pink in response to increase in the humidity. The prototype was also calibrated in laboratory settings to quantify the soil moisture in equilibrium with the vapour pressure above the soil surface. The prototype was completed as IOT enabled that enables a user to monitor the soil moisture at a place in real time. The prototype was validated in a laboratory grade setting to quantify the soil moisture.

Conventional Sensor

✗ Corrosion

✗ Interference of Salts

✗ Saturation



Non-contact Nano-Sensor

✓ Long lasting

✓ No interference of Salts

✓ Online monitoring by cloud

✓ No saturation

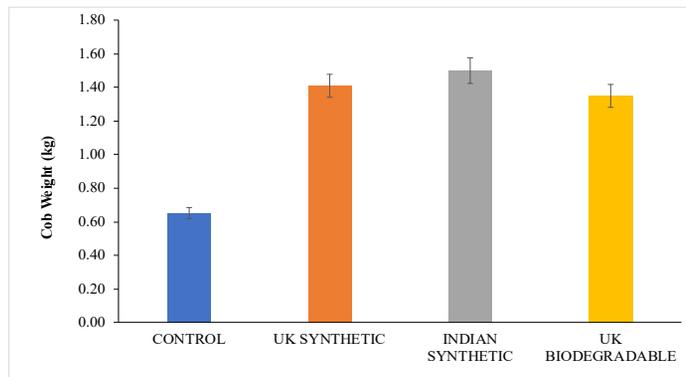
✓ Low cost

Designed and characterized a contact nano sensor by using polyaniline and other combination of chemicals. A set-up is developed for surface modification of MP 406 – existing soil moisture sensor using nano particles of polyaniline material. Standardization and calibration of nano sensor for soil moisture stress measurement is under process. Nano sensors with their small form factor and reliability display accurate multisensory capabilities to detect and collect environment data in relation to crop yield.



Plastic mulch film agronomic trial

Replicated field plot experiment was conducted at ICAR-IISS, Bhopal farm with the treatments viz., control (No film), conventional (UK), conventional (India), biodegradable (UK) to assess the impact of plastic mulch on crop yield. Poly-mulching in field experiment recorded two-fold increases in maize yield.



Effect of fly ash on soil health and crop yield

A field experiment has been conducted to explore the potential of pond ash in improving soybean-wheat productivity in Vertisol. Results indicated that ash application (100 t ha^{-1}) significantly increased soybean seed yield up to 35%. Biomass and grain yields of subsequent wheat crop responded significantly (up to 16%) to ash application up to 200 t ha^{-1} . Physical characteristics in the rhizosphere of this clayey soil improved significantly due to ash application, facilitating root growth of crop plants. Ash, particularly at higher rates of its application, also increased available P, S and B contents in soil. Activities of Radionuclides ^{238}U , ^{226}Rd , and ^{232}Th were slightly higher in ash samples than soil, and ^{40}K in ash was lower than soil. However, these values in all the samples were within safe limits.



Soybean crop grown with recommended rates of NPK and FYM



Soybean crop grown with 400 t ha^{-1} ash and recommended rates of N PK and FYM

Spinach growth in response of dry- and fresh-municipal sludge in microcosm column

Dry- (DS, dried for six months) and fresh- (FS, immediately collected) sludge collected from sewerage treatment plant and spinach (*Spinacia oleracea*) was grown in a microcosm column experiment in Vertisol. The DS had ~9% (w/w) moisture, 6.27 pH, 1.23 dS m⁻¹ EC, and C: N ratio 7.3; whereas, FS recorded ~397% (w/w) moisture, 7.62 pH, 1.97 dS m⁻¹ EC, and C: N ratio 7.1. Total ten treatments were formulated with varying doses of dry- and fresh- sludge and amendments like biochar and lime. Addition of dry- and fresh- sludge resulted increased germination percentage and fresh sludge performed better than the dry sludge. Addition of biochar helped to maintain the higher yield throughout growth period. Similar trends were also recorded for leaf area and chlorophyll (chlorophyll a, chlorophyll b and total chlorophyll) content of the spinach.



Pollution assessment in Malanjhand open cast copper mine areas

Geo-referenced water samples were collected from the Malanjhand open cast copper mine areas viz., waste dump leachates, discharge pond, mine effluents and tailing dam reservoir as well as from waterbodies of mine site villages viz., Chinditola, Bhimjhuri, Karamsar, Borekhera, Darbaritola, Kaindatola, Chartola and Dudhi area. The copper mine water extremely to slightly acidic (pH 2.51 to 6.5) and water in nearby villages acidic to slightly alkaline (pH 2.85-7.5) in nature, oxidation reduction potential varies between 150-480 mV, dissolved oxygen is approximately ≤ 5.8 mg L⁻¹, electrical conductivity and Total Dissolved Solids (TDS) ranges between 250-4250 μS cm⁻¹ and 0.1-2.4 ppt, respectively.



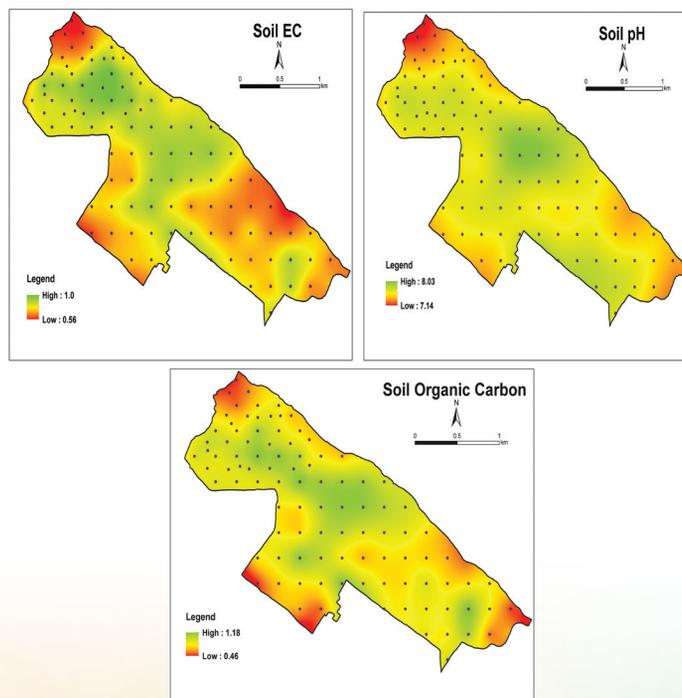
(a) Acid mine drainage



(b) Blue coloured copper precipitater of near water bodies

Spatial distribution of soil properties by different interpolation methods of Jajmau industrial area, Kanpur

A study was conducted to interpolate the analysis of spatial variability of soil organic carbon (SOC), pH and EC in Jajmau industrial area, Kanpur district. A total of 140 soil samples (0-25 cm) collected grid wise at an interval of 250 m using GPS. After normalization, data were interpolated by Ordinary Kriging (Spherical, Exponential and Gaussian). The performance of methods was evaluated using Mean Absolute Error (MAE), Root Mean Square Error (RMSE) and Goodness of prediction (G) obtained through cross validation. The best model is selected based on low MAE, low RMSE and highest G percentage. The results showed that Spherical Model, Guassian Model and Exponential Model was the best method with moderate spatial dependence to estimate soil organic carbon, pH and EC with lowest RMSE value 0.265, 0.321 and 0.210, respectively.



Nutrient management modulates the decomposition kinetics of different crop residues from *in-situ* decomposition study

In situ decomposition experiment (564 days/18-month) was conducted with a soybean-wheat and maize-chickpea cropping systems to investigate the potential mechanisms governing the decomposition of incorporated litter at 15 cm soil depth. Across nutrient management, the results showed that in the soybean-wheat cropping system, the wheat stem and roots' mean decay rate was 3.6 and 4.7 times higher than the stem and root of soybean, respectively. However, in the maize-chickpea cropping system, the maize stem decomposition rate was less than 0.7 times compared with the chickpea stem and the decomposition of maize root was more than 1.7 times compared with the chickpea root. Further, the results demonstrated that across the cropping system, integrated use of nutrients (N100 PK + FYM @5t ha⁻¹) resulted in a higher decomposition rate of residue stem and root compared with NOPK. The decomposition rate of above-ground straw was significantly higher than that of below-ground roots across residue types and nutrient management. It may be concluded that the cropping system, residue types, nutrient management, and the above-ground/below-ground residue are the key driving factors for nutrient release kinetics and residue decomposition rate.

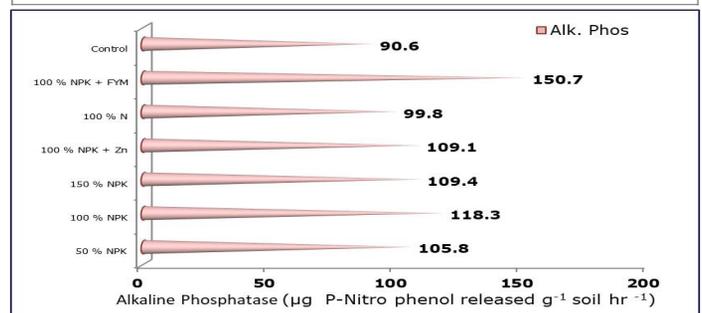
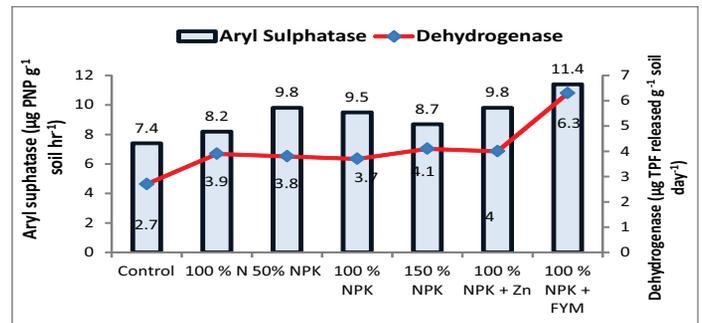
XRD analysis of coal and ash samples

Different types of mineral phase present in coals, lignite and corresponding ashes. Diffraction pattern suggested the presence of amorphous and crystalline phase of minerals in coals and respective ash. Results of XRD revealed that in bituminous, sub-bituminous coals and lignite were quartz, kaolinite while siderite and anatase were dominant in bituminous, sub-bituminous and gypsum was prominent in lignite. In prepared ash from all the coals and lignite at the temperature (550, 950 and 1100 °C) predominate minerals were quartz, hematite, anhydrite, mullite, rutile, anatase, illite, magnetite and siderite, however, kaolinite present in coal converted into amorphous phase due to heating above 500 °C.

Long-term effect of fertilizers and manures on soil enzymatic activity in Inceptisols of Coimbatore

A finger millet-maize cropping sequence is being followed since 1971 in Inceptisols at TNAU, Coimbatore under irrigated conditions. The study was undertaken to estimate soil enzymatic activity under LTFEs. The data pertaining to long term application of fertilizers

and manures in finger millet-maize cropping system revealed that the activity of aryl sulphatase was found to be highest in integrated nutrient management (INM) *i.e.*, 100% NPK + FYM > 100% NPK + Zn > 50% NPK > 100% NPK > control. Similarly, the dehydrogenase activity followed the order 100% NPK + FYM > 150% NPK > 100% NPK + Zn > control. Further, the activity of phosphatase also found to be higher in 100% NPK + FYM. By using 10 t ha⁻¹ of FYM along with 100% recommended dose of fertilizers increased the alkaline phosphatase activity in soil. The alkaline phosphatase activity followed the order: 100% NPK + FYM > 100% NPK > 150% NPK ≥ 100% NPK + Zn > 50% NPK > control. Thus, application of FYM along with 100% NPK proved beneficial for improving the soil enzymatic activity which in-turn enhanced crop yield under long term cropping of finger millet-maize system.



Development of moisture flexible Soil Test Crop Response (STCR) Model for fertilizer recommendation

To develop fertilizer adjustment (targeted yield) equations flexible to available moisture in soil, elevated and reduced levels of NPK fertilizers were administered along with standard (STCR recommended) levels to broccoli, which were simultaneously subjected to varied levels of available soil moisture deficits (ASMD). It was observed that yield of broccoli with varying levels of fertilizer and moisture stresses remained in the range of 3.90 (no fertilizer, 60% ASMD) to 21.8 (NPK-285:40:115; 40% ASMD) t ha⁻¹. Increasing doses of NPK fertilizer application significantly increased yields of broccoli heads. Imposition of moisture stresses up

Effect of silicon on rice productivity in Vertisols of Central India

In the PB-1 rice crop, T4 (P+ Si priming) produced the highest yield, while the control treatment resulted in the lowest yield compared to the other treatments. The yield increased over the control was observed as follows: T4, P+ Si priming (50%) > T6, P+ Si priming + Si foliar (35%) ≥ T5, P+ Si foliar (35%) > T1, P (33%) > T2, Si priming (31%) > T3, Si foliar (5%). The study indicated that using Si as seed priming, along with P fertilizer, could have a significant impact on rice productivity in the Vertisols of Central India.



Awards/Honours/ Recognition

- Dr. Ashok Kumar Patra awarded “Glinka World Soil Prize” 2022 from FAO.



- Rahul Mishra received best oral presentation award for presenting a paper on “GIS interpolation in assessing extractable arsenic, pH and organic carbon in soils of Nadia district of West Bengal, India” 3rd National Conference on “Natural Farming, Organic Farming and Chemical Farming in Indian Agriculture – Present Scenario and Way Forward” to be held at the Krishi Vigyan Kendra, Ujjain during 17- 19 October, 2022.
- Dr Khushboo Rani awarded ISSS best doctoral research presentation award at 86th annual convention of Indian Society of Soil Science held at Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra held during 15-18 November, 2022.



- Dr. Narayan Lal, Scientist invited as chief guest by SV convent School, Nazirabad, Bhopal and attended junior scientist fellowship award ceremony programme on 20 October, 2022.
- Dr. N.K. Lenka received Dr. D.N. Puri award for Natural Resources Conservation and Watershed Management (2019-20) by the Indian Association of Soil and Water Conservationists, Dehradun on September 22, 2022 at the National Conference on “Landscape Management for Preventing Flood & Reservoir Sedimentation” held at BAU, Ranchi.
- Dr. N.K. Lenka received Fellowship for the year 2021 from the Society for Science of Climate Change and Sustainable Environment, New Delhi.
- Dr. Pramod Jha and Dr. A. K. Vishwakarma awarded the Fellowship of Indian Association of Soil and Water Conservationists, Dehradun.
- Dr. Asit Mandal acted as external advisory board member of SYMBIOREM project, Bilbao, Spain during September 21-22, 2022.
- Dr. Priya Gurav received Best Poster presentation award in National Seminar on “Application of Clay and Allied Sciences in Agriculture, Environment and Industry” at ICAR- NBSS & LUP, Regional Centre Kolkata during September, 22-23, 2022.
- Dr J.K. Thakur awarded Agriculture Scientist Award-2022 from Dr. B. Vasantharaj David Foundation on October 1, 2022.
- Dr J.K. Thakur awarded with NESAs Eminent Scientist of the Year Award 2022 from National Environmental Science Academy, New Delhi, on 30 November, 2022.
- Dr. Asha Sahu received “Third Prize” in the Soil Essay Competition on 25 August, 2022 organized by the East and South East Asian Federation of Soil Science Societies and Malaysian Society of Soil Science.
- Dr Asha Sahu, received first prize from Sh. Agam Jain (IPS) in the “Kavita Path” competition organized during Hindi Pakhwada on 26 September, 2022.

- Dr Asha Sahu received 2nd Prize in Quiz Competition on Vigilance by Sh. Niranjana B. Vayangankar, Deputy Inspector General of Police (Cyber Crime) on 17 November, 2022.
- Sudeshna Bhattacharjya received the best scientific poster award on “Potential of lignocellulolytic microbial consortia in achieving in-situ crop residue decomposition to abate residue burning” in Global Symposium on Soils for Nutrition organized virtually from 26-29 July, 2022 by Food and Agricultural Organization (FAO), Rome.
- Dr. Arvind Kumar Shukla and Dr. Sanjib Kumar Behera received FAI award - Excellence for the best work done in the field of Plant Nutrition from The Fertilizer Association of India, New Delhi on 07 December, 2022.

Staff News (Promotions/Retirement/Joining)

- Dr. Abhijit Sarkar promoted as RRL-10 to RRL-11 (Rs.6000 to Rs. 7000) w.e.f. 01 February, 2021.
- Dr Asit Mandal promoted as RRL -12 to RRL 13A (Rs. 8000 to 9000) w.e.f. 23 June, 2021
- Dr. J.K. Thakur Promoted as RRL-12 to RRL 13A (Rs.8000 to 9000) w.e.f. 21 April, 2022.
- Dr. Nisha Sahu promoted as RRL-11 to RRL 12 (Rs.7000 - Rs. 8000) w.e.f. 26 July, 2022.
- Dr. Ashok K. Patra (Director) superannuated on 30 September, 2022.
- Dr. M C Manna, Principal Scientist (Acting Director) superannuated on 31 October, 2022.
- Dr. Arvind Kumar Shukla, Principal Scientist and I/c Project Coordinator (AICRP-MSPE) got relieved from the institute w.e.f November 16, 2022, upon his selection to the post of Vice-Chancellor, RVSKVV, Gwalior, Madhya Pradesh.

Programme Held

- World soil day celebration

मृदा स्वास्थ्य जागरूकता दिवस पर सैकड़ों किसानों ने लिया भाग

प्रदेश पब्लिसिटी ➤ **ओडिशा**

भारतीय मृदा विज्ञान संस्थान, भोपाल द्वारा विश्व मृदा दिवस के दौरान मृदा स्वास्थ्य जागरूकता सप्ताह 1 से 7 दिसंबर 2022 तक मनाया जा रहा है। दिनांक 1 दिसंबर 2022 को भारतीय मृदा संस्थान द्वारा स्व'छ भारत परियोजना के अंतर्गत ग्राम बीनापुर में मृदा स्वास्थ्य पर प्रशिक्षण एवं जागरूकता दिवस मनाया गया। कार्यक्रम में मुख्य अतिथि के रूप में संस्थान के निदेशक डॉ. आर. एस. चौधरी ने किसानों को संबोधित करते हुए ससत खाद्यान्न उत्पादन के लिए मृदा स्वास्थ्य का महत्व एवं उसे बनाये रखने की आवश्यकता पर जोर दिया। उन्होंने कहा कि मृदा स्वास्थ्य का सीधा संबंध हमारे स्वास्थ्य से है क्योंकि स्वस्थ मृदा से ही स्वस्थ एवं पोषक खाद्यान्न का उत्पादन किया जा सकता है। कार्यक्रम में डॉ. ए. के. विश्वास, विभागाध्यक्ष, मृदा रसायन विभाग ने मृदा स्वास्थ्य की उपयोगिता एवं उसे बनाये रखने के उपायों से किसानों को अवगत कराया। डॉ. आशा साहू, वरिष्ठ वैज्ञानिक ने किसानों को स्वस्थ जलनों के उपयोग द्वारा स्वस्थित कपोटिटा तथा फसल अवशेषों के प्रबंधन पर जानकारी दी तथा किसानों को वरिष्ठ कपोटिटा द्वारा कचरे में फसल अवशेषों तथा परेतु कचरे द्वारा कपोटिटा बनाने के विषय में जानकारी दी। कार्यक्रम में डॉ. ए. के. विश्वास, प्रधान वैज्ञानिक ने किसानों को प्राकृतिक कृषि एवं संरक्षण कृषि के द्वारा मृदा स्वास्थ्य प्रबंधन और ससत फसल उत्पादन के विषय पर विस्तार से जानकारी दी। डॉ. ब्रजलाल लकाहिया, प्रधान वैज्ञानिक ने किसानों को फसल उत्पादन एवं मृदा स्वास्थ्य बनाये रखने में संतुलित पोषक तत्व प्रबंधन के विषय में जानकारी दी। कार्यक्रम में किसान वैज्ञानिक परिषदों का भी आयोजन किया गया जिसमें किसानों की कृषि से संबंधित समस्याओं का समाधान किया गया। कार्यक्रम में विभिन्न मंडलों के 120 से अधिक किसानों ने भाग लिया। कार्यक्रम के अंत में प्रधान वैज्ञानिक डॉ. ए. के. विश्वास ने इस कार्यक्रम में भाग लेने एवं कार्यक्रम को सफल बनाने हेतु सम्मिलित सभी किसानों एवं वैज्ञानिकों का आभार व्यक्त किया।

Trainings/Workshops/Seminar/Meeting organized

- Review meeting of NTPC project with Shri Sanjeev Kumar Saxena, GM (Ash Management) Corporate centre, NTPC on 8 July, 2022 with Drs. J.K. Saha, Ajay, A.K. Vishwakarma, K. Hati, Vassanda Coumar, Hironmoy Das and Nisha Sahu.
- Organized a High-end workshop on “Advanced Instrumentation for Assessment of Soil Health Indicators, Pollution and Greenhouse Gas Emission from Soil” for M.Sc and Ph.D. students during 7 to 20 September 2022 under the Accelerate Vigyan Scheme of SERB (DST) sponsored by SERB-DST (Coordinated by Drs. Sangeeta Lenka, N.K. Lenka, J.K. Saha, and A.K. Patra along with the organizing team of scientists as Drs. Vassanda Coumar, Abhijit Sarkar, Rahul Mishra, Nisha Sahu, Dinesh Kumar Yadav and Madhumonti Saha).



SCSP Project Team (Cluster I) organized a special Swachhta campaign at Shahpur village by Drs. Ajay, Nisha Sahu, Dinesh Kumar Yadav and Rahul Mishra.



- Drs. Ajay, Sangeeta Lenka, Nisha Sahu and Dinesh Kumar Yadav organized one day awareness program under World Soil Day on “Importance of healthy soil in maintaining sustainable productivity” by at Shahpur village on 7 December, 2022.
- Drs AB Singh, JK Thakur, AK Tripathi, BP Meena and Asit Mandal organized three days farmers training on “Natural farming and Soil Health” Sponsored by ATMA, Kaimur, Bihar during 29-31 August, 2022.



- Drs. Tapan Adhikari, Asit Mandal, Jyoti Thakur and A. K. Patra organized a workshop on “Microplastic-House Hold Survey” under the project entitled “Do Agricultural Micro Plastics Undermine Food Security and Sustainable Development in Less Economically Developed Countries?” sponsored by GCRF-UKRI, Govt. of UK during 16-17 August, 2022.



- Dr. Asit Mandal with SBM team organized a community mobilization campaign on the occasion of swachhta pakhwada. Organized community mobilization campaign on 27 December 2022 under Swachh Bharat Mission (SBM) program.



Drs. A.B. Singh, Sudeshna Bhattacharjya and Asha Sahu organized six days training program on “Soil Testing and organic Farming” from 11-16 July 2022 at ICAR- IISS, Bhopal.



- Drs. J. Somasundram, N.K. Sinha and J.K. Thakur organized a National Campaign “Cow, Compost, Carbon and Climate” for mass awareness on the theme Organic/Natural Farming in the country on 12 August 2022 at ICAR- IISS, Bhopal.
- Drs. Ajay, K.M. Hati, Pramod Jha, Asit Mandal, B.P. Meena, Asha Sahu and Sudeshna Bhattacharjya organized Quiz Contest for high school students of Sardar Patel Government School, Karond, Bhopal and St. George Sr. Sec. School, Bhopal on the occasion of “Agricultural Education Day” on 03 December, 2022.



- As Coordinator Dr. Asha Sahu and Dr. Sudeshna Bhattacharjya organized an “Institute Educational Trip” for the 120 students of Class-X from Sagar Public School, Gandhi Nagar, Bhopal on the Farmers Day, 23 December, 2022.



- Organized World Soil Day-2022 (1-7 December, 2022) for creating awareness to save soil amongst public through a massive rally.
- The team of scientists MGMG group 7 (Dr. A.K. Biswas, Dr B L Lakaria, Dr. Asha Sahu, Dr. BP Meena) from ICAR-Indian Institute of Soil Science, Bhopal organized a Swachhta Campaign on 20 October, 2022 to create awareness among the farmers and professionals about Swachhta Campaign.
- Organized Training cum Soil Health Awareness Day on 01 December, 2022 at village Binapur.



- Organized Workshop on “Rapid Composting for Sustainable Soil Health” on 02 December, 2022 at ICAR-IISS, Bhopal.
- Organized Swachhta drive under the action plan for Swachhta Pakhvada on 20 December, 2022 for utilization of organic wastes/generation of wealth from waste.
- As a part of action plan for SwachhtaPakhavada, organized Quiz contest on the theme “Swachh Bharat Abhiyan” for the 120 students of Sagar Public School, Gandhi Nagar, Bhopal and rewarded 50 winners on 23 December, 2022.



Institute Staff Recreation Club (ISRC) Organized Program

- “Health Awareness Program” on 22 July 2022 at ICAR-IISS, Bhopal.



- Farewell Function of Shri Jineshwar Prasad held on 29 July 2022 at ICAR-IISS, Bhopal.
- 76th Independence Day on 15th August 2022 at ICAR-IISS, Bhopal



- Farewell program held on 26 August, 2022 of Mr. Thomas Joseph, Drs. Hiranmoy Das, A.O. Shirale and Dolamani Amat.



- SBI program on “Financial Management” on 02 September, 2022.



- Drs. B.P. Meena, J.K. Thakur and A.B. Singh organized a workshop-cum training composting for Soil and human Health on 2 December, 2022 at IISS Bhopal.
- Drs. J.K. Thakur, B.P. Meena, A.K. Vishwakarma and A.B. Singh organized a workshop on Agricultural-Technologies for conservation of waste to wealth, Safe disposal of all kinds of waste on 22 December, 2022.



Extension Activities

- Farmer-Scientist meeting-cum (FSM) field visit organized on 9 November, 2022 under the project ‘Enhancing the productivity of major crops through improving the natural resource base of tribal inhabited areas of Madhya Pradesh’.



Filed visit cum Farmers –Scientist interaction meet was organised with Dr. S.R.K. Singh, Scientist ATARI, Jabalpurat village Bhairopur, Kalyanpur and Khamkheda on 29 July, 2022.



Special Swachhta Campaign during 2nd to 31st October 2022 : Various activities were organized under the special Swachhta Campaign in different villages by the institute involving farming community, members of the civil society and dignitaries.

Distribution of Inputs for Experimental Farmers Wheat 2 bag, NPK (12:32:16) 1.5 bag and Urea 2 bag per farmers in the village of Khamkheda, Binapur, Bandikhedi and Hinoti Sadak there are total number of farmers 16 for wheat Experiment.



Training programs were organized at ICAR-IISS Bhopal mother culture unit on 1-10 November, 2022. Many farmers of different villages were participated in these training programs.

Wheat and gram seed, fertilizer NPK (12:32:16), urea, dry land weeder and shovel were distributed among the SC farmers (367) under SCSP Programme.



Frontline Demonstration of Bio formulations in tribal farm fields of Madhya Pradesh

Under the STC (TSP) project ‘Enhancement of soil health and livelihood of tribals in Central India’, 200 frontline demonstrations (FLD) on nutrient management interventions were carried out in the tribal farm fields of Betul District in Madhya Pradesh in an area of 160 hectares, for soybean (37), maize (131) and paddy (32) crops during the *kharif* 2022 season. Under the nutrient management intervention, bio-formulations such as *Rhizobium*, *Trichoderma*, *Pseudomonas*, *Azotobacter*, *Acetobacter*, PSB and ZSB were applied along with farmyard manure @5 t ha⁻¹ and chemical fertilizers viz., DAP (@ 100 kg ha⁻¹ for all the three crops) and Urea (@ 125 kg ha⁻¹ for maize and paddy crops). Under farmer practice chemical fertilizers were only applied for all the three crops. The average yield of soybean, maize and paddy under the nutrient management intervention were 12.5 q ha⁻¹, 40.2 q ha⁻¹, 43.1 q ha⁻¹ respectively and the yield of respective crops from the farmers’ practice (FYM+CF) were 7.3 q ha⁻¹, 33.6 q ha⁻¹, 37.3 q ha⁻¹.



(a) Maize crop under farmers practice



(b) Maize crop under nutrient management intervention

Frontline Demonstrations on bio formulations in the tribal fields of Betul district (M.P)

Input distribution under TSP project

In connection with the Frontline Demonstrations, liquid bio-formulations viz., *Rhizobium*, *Pseudomonas*, *Trichoderma*, and *Beauveria bassiana* were procured

from Jawaharlal Nehru Krishi Viswa Vidhyalaya, Jabalpur, Madhya Pradesh and distributed to 200 beneficiary tribal farmers of Betul district during 30-31 December, 2022.



Under the project ‘Enhancing the productivity of major crops through improving the natural resource base of tribal inhabited areas of Madhya Pradesh’ Farmer Field School on Soil Health improvement through in-situ composting of paddy residue using IISS-EKCEL decomposer capsules was organized for the tribal farmers of Kaweli, Kulpa and Sarra villages of Balaghat District of Madhya Pradesh during 9-10 November, 2022. Scientists of institute demonstrated preparation of the microbial solution using the decomposer capsules for composting farm waste and field application for in-situ stubble management.



Microplastic-House Hold Survey

Dr. Tapan Adhikari, Asit Mandal, J K Thakur and Ashok K Patra organized Workshop on household survey (WP4) “Do Agricultural Micro Plastics Undermine Food Security and Sustainable Development in Less Economically Developed Countries?” sponsored by GCRF-UKRI, Govt. of UK during 16-17 August 2022. Project team also visited different villages surrounding Bhopal and interacted with the farmers during collection of the pertinent data regarding polymulching and microplastic pollution in agricultural field.



List of Radio talk /Television talks

- Dr. A.B. Singh given talk on “Jaivik Kheti Aur Mrada Swasthya” dated 01 March, 2022 at Doordarshan Bhopal.

Scientist Participation in Training/Seminar/Workshop

Name	Programme attended/participated	Year 2022
Dr. Asit Mandal	Patent Drawing Master class conducted by Turnip Innovation Pvt. Ltd.	1 July
Drs. Tapan Adhikari, K.M. Hati and B.L. Lakaria	Review meeting of Foreign Project at ICAR-IIWM Bhubaneswar	23 July
Drs. Khushboo Rani, Narayan Lal, Immanuel Chongboi Haokip, B.P. Meena, Asha Sahu, Asit Mandal, Sudeshna Bhattacharjya, Abinash Das, Nisha Sahu, Dinesh Kumar Yadav, Rahul Mishra and Abhijit Sarkar	Global Symposium on Soils for Nutrition organized by Food and Agriculture Organization (FAO), Rome	26-29 July



Drs. Tapan Adhikari and N. K. Sinha	The World Congress of Soil Science 2022, in Glasgow.	31 July - 5 August
All Scientists	National campaign on Cow-Compost-Carbon and Climate under theme Organic farming and natural farming organized by ICAR- IISS, Bhopal	22 August
Drs. Immanuel Chongboi Haokip, M. Homeshwari Devi, Shinogi K. C. and J. K. Thakur	International Conference on Advances in Agriculture and Food System Towards Sustainable Development Goals, UAS Bangalore	22- 24 August
Dr. M. Homeshwari Devi	International Seminar on Challenges and Opportunities of medicinal plant based industries in BIMSTEC countries (IChaMP), IIT Guwahati	26-27 August
Dr. Pradip Dey	One day seminar on “Agrochemicals for Up keeping Crop and Environmental Health organized by Society for Fertilizers and Environment & School of Agricultural and Allied Sciences, The Neotia University, West Bengal	13 September
Dr. M. Homeshwari Devi	National Conference on Ozone layer, its depletion and impact on living beings, NRCC, Jorbeer, Bikaner, Rajasthan	16-17 September
Dr. Asha Sahu	Remtech Europe 2022 (attended session: Waste and circular economy in the remediation sector; Phytoremediation training) Organized by Remtech EXPO	19-23 September
Dr. Asit Mandal	Kick-off meeting as a member of External advisory board of Symbioem European project	21-22 September
Dr. Sanjay Srivastava	6th meeting of South Asia Laboratory network.	21-22 September
Dr. J. K. Thakur	Annual International Conference of Association of Microbiologists of India, University of Mysore (UOM), Mysuru	21-23 September
Drs. B.L. Lakaria and Pramod Jha	Delivered Keynote Address on issues of Traditional knowledge on soil & water conservation; scope of biochar in agriculture and carbon sequestration and stabilization in the National conference on Landscape Management for Presenting Flood and Reservoir sedimentation at Birsa Agricultural University, Ranchi, Jharkhand	22-24 September
Dr. A.K. Biswas	Delivered the 23rd Dr. N.S. Randhawa Memorial lecture on the topic ‘Conservation Agriculture: A Recipe for Soil Health and Climate Resilience’ at Dr. PDKV, Akola	23 September
Dr. A.K. Biswas	Keynote Address on the topic ‘Prospects of Crop Residue Recycling in Regenerative Agriculture’ in the National Seminar on ‘Sufam 2022: Bundelkhand’ at RLBCAU, Jhansi	24 September
Dr. Pradip Dey	Delivered Professor S.K.Mukherjee Memorial lecture on “Strategies for sustaining soil quality and productivity in salt affected soils” organized by Gwalior Chapter of the Indian Society of Soil Science, RVSKVV, Gwalior	28 September
Dr. M. Homeshwari Devi	National Seminar on Multidisciplinary Advance Research in North-Eastern, India, Waikhommani Girls’ College Thoubal, Manipur	12 October
Dr. Pradip Dey	Meeting on Farmers-Scientists-Inputs Dealers-Students interactive on the eve of Global Fertilizer Day at SSKVK, Kolkata and Delivered a lecture on technical session “Soil testing and Fertilizer recommendation”	13 October
Dr. Shinogi K. C.	National Conference on Tribal Horticulture organized by Dr. YSR Horticultural University, Andhra Pradesh	17-18 October



Drs. A.K. Biswas and Brij Lal Lakaria	Workshop under the project “Sustainable Biochar Production Through Agroforestry Systems and Its Application” in Odisha organized by IIFOR–ICRAF with GIZ and NGO partners from Maharashtra and MP at Balangir, Odisha	17-19 October
Dr. M. Homeshwari Devi	DST sponsored online MDP on “Community Resource Management” at IIFM, Bhopal	17-21 October
Drs. R.H. Wanjari and Dhiraj Kumar	Organized the Swachhta Campaign in the village Chopra Kala and Imaliya in Phanda Tehsil of Bhopal district by MGMT Group-3	19 October
All Scientist	Observed Vigilance Awareness Week, 2022	31 October to 6 November
Drs. Immanuel Chongboi Haokip, Dhiraj Kumar, Khushboo Rani, Abinash Das, Rahul Mishra and Dinesh Kumar Yadav	21 days Summer School in ‘Geospatial Science and Technology’ sponsored by DST and ICAR-IISS, Bhopal	3-23 November
Dr. Asit Mandal	On-line training program on RNA world: Advance bioinformatics for deciphering regulatory molecules, ICAR-IASRI, New Delhi	3-9 November
Dr. Pradip Dey	Participated and delivered a lecture on training programme on “Natural Farming: Challenges and Opportunities” under Centre of Advanced Faculty Training in Soil Science at Jabalpur, Department of Soil Science JNKVV, Jabalpur	5-6 November
Dr. A.K. Vishwakarma	Attended 29th Zonal meeting of ATARI Zone IX held at KVK, Morena	11-13 November
Drs. Pradip Dey, Nisha Sahu, Khushboo Rani, Abhijit Sarkar, Asit Mandal, Asha Sahu, J. K. Thakur, Sudeshna Bhattacharjya and A. B. Singh	Participated in 86th Annual Convention of the Indian Society of the Soil Science (ISSS) and National Seminar on Developments in Soil Science – 2022 held at MPKV, Rahuri	15-18 November
Dr. A.K. Vishwakarma	Attended meeting with Shri Ramesh Chand, Member NITI Aayog at New Delhi to discuss on green manure crops, cover crops etc. and their potential input to add organic matter and soil organic carbon at NITI Aayog, New Delhi	18 November
Drs. Nisha Sahu, Asha Sahu, Asit Mandal, Abinash Das, Narayan Lal and B.P. Meena	Symposium on “Soils: Where food begins” organized by the ICAR-IARI, New Delhi and ISSS-Delhi Chapter	30 November
Dr. Pradip Dey	Panel Member in National Conclave on Soil – Blueprint for actions - Ideas for transformation and roadmap and sustainable farming, organized by NITI Aayog, GIZ and NABARD at NASC, New Delhi	5 December
Drs. R.H. Wanjari and Dhiraj Kumar	Mid-Term Meeting to review the ATR of 26th meeting of ICAR Regional Committee No. VII (comprising states of Chhattisgarh, Goa, Madhya Pradesh and Maharashtra) organized by ICAR-Central Institute of Agricultural Engineering, Bhopal, Virtual mode	12 December
All Scientists	Observed the Soil Health Awareness Week in ICAR-IISS, Bhopal	1-7 December
Drs. Asha Sahu and Sudeshna Bhattacharjya	7th International Scientific Meeting as Soil Science Symposium on “Soil Science & Plant Nutrition” held by the Federation of Eurasian Soil Science Societies collaboration with Erasmus Mundus Joint Master Degree in Soil Science (emiSS) Programme at Samsun, Türkiye (online)	2-3 December
Drs. R.H. Wanjari and Dhiraj Kumar	AICRP LTFE Workshop at Dr. PDKV, Akola	16-17 December

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