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Content

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Director's Desk

There are rising apprehensions about the dearth of soil-plant-animal health and safety, data on Emerging Contaminants (ECs). Emerging Contaminants include a range of chemical compounds including nanomaterials, micro/nano-plastics, detergents, industrial chemicals, pesticides, surfactants, pharmaceuticals, personal care products and some others. With the advancement in analytical techniques, progressively emerging contaminants are recognized and included into the list. ECs are usually highly resistant and bio-accumulable compounds and even in trace quantities, can have toxic effects on soil-plant-animal health and aquatic systems. Consequently, ECs may have substantial noxious impacts on soil ecology, environmental safety and public health. In the current scenario, intentionally or unintentionally ECs are progressively being added into the soil matrix and water bodies of the environment both from point and non-point sources based on their utilization and application mode. Unfortunately, agricultural soils act as the major sinks of ECs in the environment whereas the sources are being considered as urban surface runoff, discharge from industries, sewage treatment plants etc. Once entered into the soil matrix and aquatic system, they undergo several physico-chemical and biological alterations as and when interacted with biotic and abiotic constituents. The major conversion processes are oxidation-reduction reactions, hydrolysis, photolysis, biodegradation etc. Though, these processes decrease the rate of contaminant accumulation, some of the converted products are much more noxious than the original compounds, rising apprehensions about their existences in the natural ecosystem. ECs and their altered products dispersal in soil environment and water bodies eventually affect soil and human health. Furthermore, these contaminants move into the food chain via the consumption of crop produces and crops cultivated in contaminated soils, primarily through the soil to plant uptake and translocation. Hence, it is vital to comprehend the entry-mechanisms, fate and behaviour, bioavailability, and subsequent toxic effect of ECs to evaluate their environmental hazards and risks.

So far, research findings on ECs mentioned in various articles and review papers emphasizing on specific toxic compound and different natural systems. Hence, an amalgamation of the significant research achievements on ECs is yet to be gathered and documented systematically. This perspective seeks to address the gap by investigating the research topics like release sources, distribution, and transport of emerging contaminants, analytical techniques for the detection and quantification of ECs, physical, chemical, and biological transformation in the soil and water system, impact of ECs and their transformed products on the ecosystem, toxicity studies, food chain transfer through the soil-plant system, environmental and human health risk assessment, soil ecotoxicology, formulation of regulation and policy matters.

In this context implementation of "One Health Approach" is urgently required particularly for our country. The concept is being promoted for battling health threats to soil, plant and

animal kingdoms through human-animal-plant-environment interface. The idea of the One Health concept is, principally, to take the opportunity for protecting the health of our planet in totality by involving the three interfaces, explicitly, human, animal, and environment. The requirement of a synchronized, collective, multi-disciplinary, and cross-divisional approach to solve budding health risk will build the foundation for One Health Approach in India.

Our institute ICAR-IISS, Bhopal has already completed several national and international research projects and taken further new initiatives to prepare a synchronized database of different contaminants like toxic heavy metals, nano contaminants, micro/nano plastics, pesticides etc. which will help the policy makers and planners to formulate and develop national policy, rules and regulation of different ECs vis-a-vis One Health Approach for our country. Overall, the present viewpoints will help to understand the importance and trigger the researcher's mind throughout India to advance our knowledge on emerging contaminants and their human and ecological health risks for sustaining soil and human health.

Dr. S. P. Datta
(Director)

RESEARCH HIGHLIGHTS

Size distribution of water-stable aggregates and aggregate stability under different tillage and residue regimes

Tillage with residue retention significantly ($P < 0.05$) influenced the distribution of large macro-aggregates (>2 mm size) in soybean-wheat cropping system. The proportion of large macro-aggregates was significantly higher in the no tillage (NT) treatment than that in conventional tillage (CT). In contrast, the proportion of small macro-aggregates (1-0.25 mm) was higher in the CT than in NT. A similar trend was also observed for micro–aggregates (0.25-0.053 mm) fractions, but the difference was not significant. No significant impact of tillage and residue retention on aggregate size distribution was recorded in 10-20 cm of soil depth. Significant impact of no till with residue retention was observed on water stable aggregates (WSA). Although increased rate of residue retention under no till system resulted in improvement in WSA, the effect was not significant. Retention of residue to the extent of 90% resulted in 20% improvement in WSA in comparison to CT system. The effect of no till system along with residue retention significantly impacted soil MWD. There was 5.5-77% improvement in soil MWD in no till system with different levels of residue retention in comparison to CT system. The highest improvement of 77% was recorded under no till system with 90% residue retention. MWD of soil increased from 0.91 mm in CT system to 1.61 mm in no till system with 90% of residue retention. Retention of 30% and 60% residues of previous crops improved MWD of soil by 32% and 55% respctively.

Aggregate size distributions and stability under different levels of tillage and residue (0-10 cm)

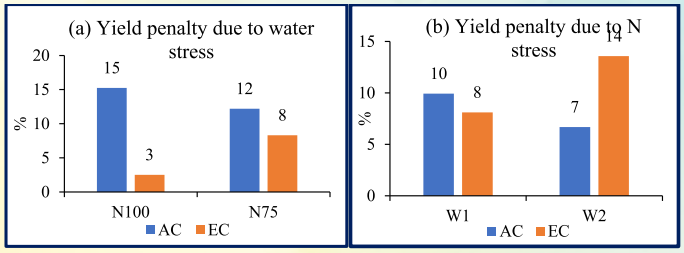
Treatment	Large macro-aggregates	Small macro-aggregates	Micro-aggregates	Silt+-clay fraction	MWD (mm)	WSA (%)
CT	13.73b	56.68a	11.78a	17.6a	0.91c	67.70a
NTR0	13.83b	54.58a	11.63a	19.83a	0.96bc	70.36a
NTR30	26.50ab	43.73a	8.54a	20.60a	1.20abc	69.96a
NTR60	28.67ab	45.46a	6.53a	18.60a	1.41ab	73.96a
NTR90	36.13a	45.06a	5.81a	12.57a	1.61a	81.06a

Note: Values followed by a letter not in common within a column, are significantly different based on Duncan's multiple range test at P = 0·05.

Alleviation of water stress under CO_2 elevation in wheat crop

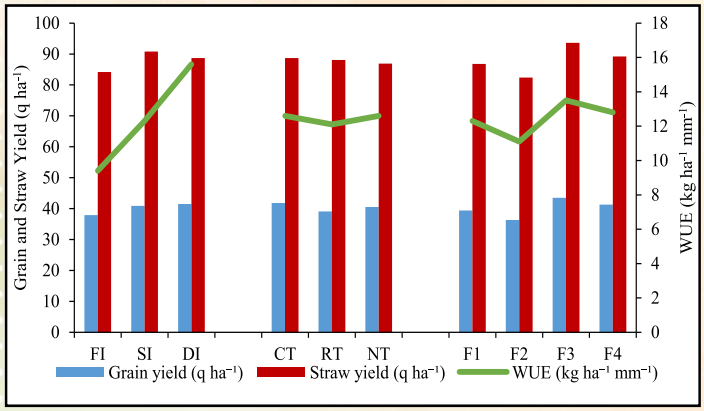
A field experiment was conducted in open top field chambers (OTCs) under two CO_2 (ambient and ≈550 µ mol mol^{-1}) levels, two water stress levels (optimum water supply (W_1) and two irrigations less (W_2) and two N levels (N_{75} and N_{100}) with wheat crop (var. HI 1544) during the rabi season of 2022-23. With water stress (two irrigations less), yield reduction varied from 3-15%. Under recommended dose of N application with less of two irrigations, yield declined by 15% than fully irrigated condition maintained under ambient environment (AC), whereas under elevated CO_2 environment (EC), the yield penalty was only 3%. At 75% N application, the yield penalty under ambient was 12% as compared to 8% under elevated CO_2 environment. With N stress (i.e., 25% reduction in fertilizer-N supply), yield reduction varied from 7-14% under different situations.

When N stress was combined with water stress, the yield penalty under elevated CO_2 was 14%, indicating higher demand of N under elevated CO_2 environment.



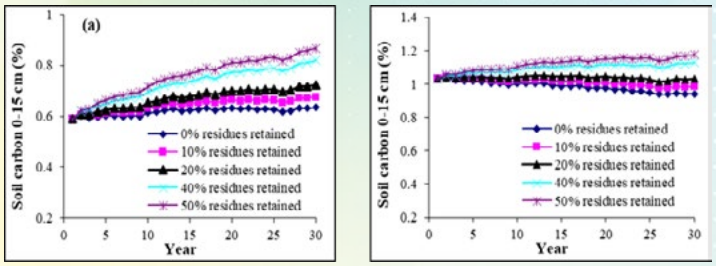
Water and nutrient management practices in conservation agriculture for Vertisols of Central India

A field experiment was conducted with four levels of fertilizer treatments (F1: 100 % RDF, F2: 75% RDF, F3: STCR and F4: LCC (leaf colour chart), three levels of tillage treatments (CT-Conventional tillage, RT-Reduced tillage and NT-No tillage) and three irrigation methods namely FI: flood irrigation, SI: sprinkler irrigation and DI: drip irrigation on wheat crop (variety HI-1544) in rabi season. The water applied at 402, 334 and 266 mm in flood, sprinkler and drip, respectively. No significant difference was found in the grain and straw yield of wheat among different irrigation methods and tillage systems. The grain and straw yield (q ha^{-1}) were same under 75% and 100 % RDF. Significantly higher water use efficiency (WUE) (kg ha^{-1} mm^{-1}) was recorded under drip irrigation over sprinkler irrigation and flood irrigation. Further, the sprinkler irrigation resulted in significantly higher WUE over flood irrigation. It was concluded that water and fertilizer can be saved through appropriate method of irrigation and fertilizer dose. Similarly, the energy can also be saved in terms of fuel and labour by adopting the conservation tillage system.



Minimum crop residue thresholds for soil carbon benefits in subtropical Vertisol of Central India

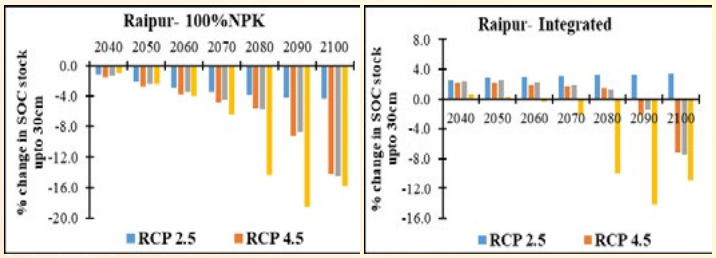
Agricultural Production Systems Simulator (APSIM) was used to estimate the benefits of nitrogen and crop residue management on soil properties in subtropical Central Indian Vertisols in soybean-wheat cropping system. The simulations with various residue retentions, fertility levels, and N inputs revealed that residue management significantly affected soil organic carbon (SOC) concentration. The threshold residue retention for no change in SOC content was found to be around 10% for adequately fertilized crops and 30% for N-limited ones. The conditions where SOC were higher (1%), approximately 60% residue retention was the threshold level for N limited condition. This level was reduced to 30% and 20% in the case of medium and high levels of N management.



Effect of residue and soil fertility management on SOC. (left) low initial SOC and high N; (right) high SOC and high N

Soil organic carbon (SOC) sequestration potential under the changing climatic scenarios in rice-based cropping system

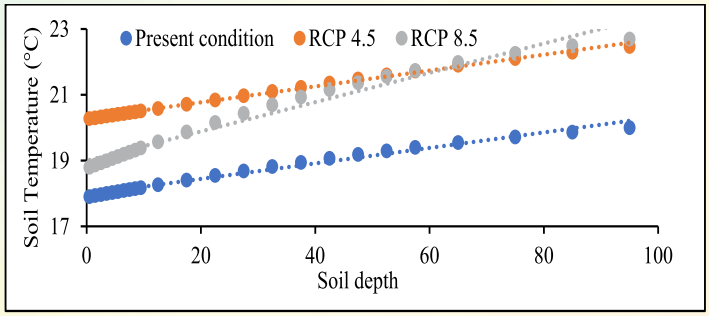
To simulate the long-term dynamics of SOC in rice-based cropping systems under different management practices, RothC process-based model was utilized. The model accounted for soil, climate, and management practices (100% NPK and 100% NPK+FYM), and used data of the LTFE experiment. The RothC model was parameterized and validated to predict SOC stock. The validated model was then used to evaluate the impacts of different management practices on SOC dynamics under different climatic scenarios. The results demonstrated that management practices with



FYM have great potential to increase SOC sequestration in the rice-based cropping system. The equilibrium SOC concentration was higher with an integrated application of N with FYM. Climate change decreases the rate of SOC sequestration in all the studied agroecosystems, with highest reduction reported under RCP 8.5, followed by RCP 6.0, RCP 4.5, and RCP 2.6.

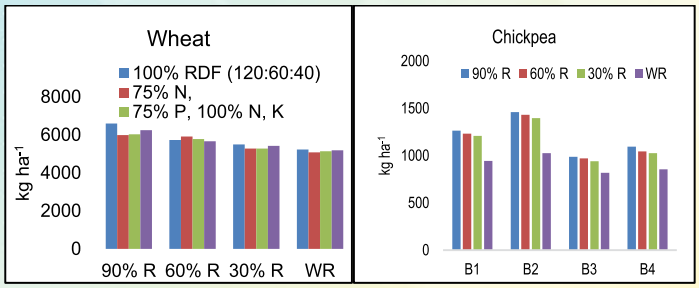
Impact of climate change on soil physical processes in maize based cropping systems in Vertisols of Central India

Evaluation of the field water cycle for a winter wheat-summer maize double cropping system in the RCP 4.5 and RCP 8.5 future climatic scenario was conducted in order to estimate the field water dynamics for optimization of agricultural water management strategies to mitigate climate change. In this study, the agro-hydrological Soil–Water–Atmosphere–Plant (SWAP) model was used to evaluate the field water cycle. The model was first calibrated and validated using the field experimental data including soil water content and soil temperature. The root means square error (RMSE) for soil temperature was 0.22 and 0.78 at soil depth of 5 cm and 10 cm, respectively, and 0.53 for hydraulic conductivity. Model based field water balance showed reasonable accuracy under different climatic situations. This study also indicated that the soil profile temperature will be 2-3°C higher under RCP 4.5 and RCP 8.5 as compared to the present scenario. The net water balance in RCP 8.5 was -4.18 cm^3 cm^{-3} less as compared to present scenario (1.57 cm^3 cm^{-3}) during 2021-22.



Effect of crop residue retention and nutrient doses on yield of wheat crop

The maximum yield of wheat (kg ha^{-1}) was recorded in 90% residue retention treatment which was significantly higher than 60%, 30% and no residue retention. The highest grain yield was in 90% crop residue with 100% RDF which was statistically at par with other residue levels. The lowest grain yield was observed with 75% N, 100% P, K fertilizer doses without residue. The maximum grain yield in chickpea was recorded in 90% crop residue retention level which was at par with 60% and 30% crop residue retention and significantly superior over no residue retention treatment.



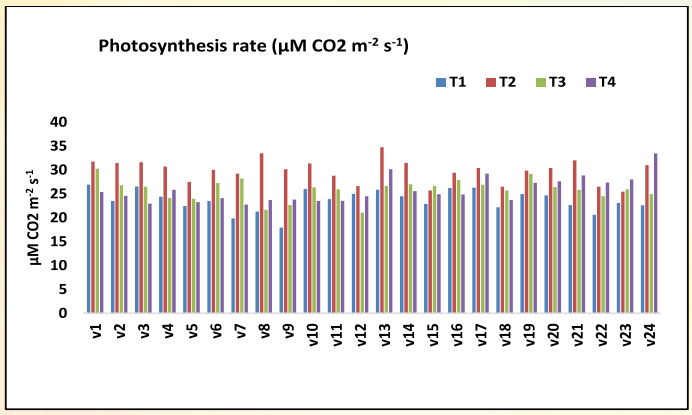
Effect of residue levels on yield of wheat and chickpea

Screening of wheat cultivars for enhanced grain yield under nutrient (N and P) constrained conditions

Experiment was carried out with 120 wheat genotypes under four levels of nutrient applications (0% NPK, 100% NPK, 50% N + 100% PK and 100% NK + 50% P). Agro-morphological, physiological and yield parameters including nutrient uptake, apparent nutrient recovery, agronomic and physiological efficiencies were assessed and 24 genotypes were selected, which exhibited varying degree of response w.r.t. leaf area, plant biomass, yield, chlorophyll content, nitrate reductase enzyme activity, photosynthetic rate and nutrient use efficiencies. The Genotypes HI 1663, HI 1544, HI 1605, DBW 88 had high net photosynthetic rate and HI 1544, HI 1605, HI 1531, HI 8498, HI 1500, Narmada 14, DBW 88 & BWL 5233 had high stomatal conductance under low N conditions. Lower transpiration rate was observed with HI 1531, HD 2687 under low N and HI 8663, HI 8713, HI 1605, HI 1531, GW 322 under low P plots. Some genotypes (HI 1563, HI 1605, HI 1531, HI 8498, and Narmada 14) had even lesser SPAD value but exhibited high grain yield indicating still more requirement for N. Among the genotypes, days to 50% flowering was observed to increase with reduced nitrogen/phosphorus supply (2-7 days). Higher biomass (>10 t ha^{-1}) and grain yield (>4 t ha^{-1}) of HI 8737, HI 1563, HI 1605, HI 1531, HI 8498, and Narmada 14 made them suitable for low N supply conditions. For low P conditions, HI 8713, HI 1544,

HI 1605, HI 1531, GW 322, HI 1500 were found to be suitable based on biomass/grain yield. These genotypes can effectively be utilized in breeding programs to better exploit the nutrient deficient/constrained ecosystem.

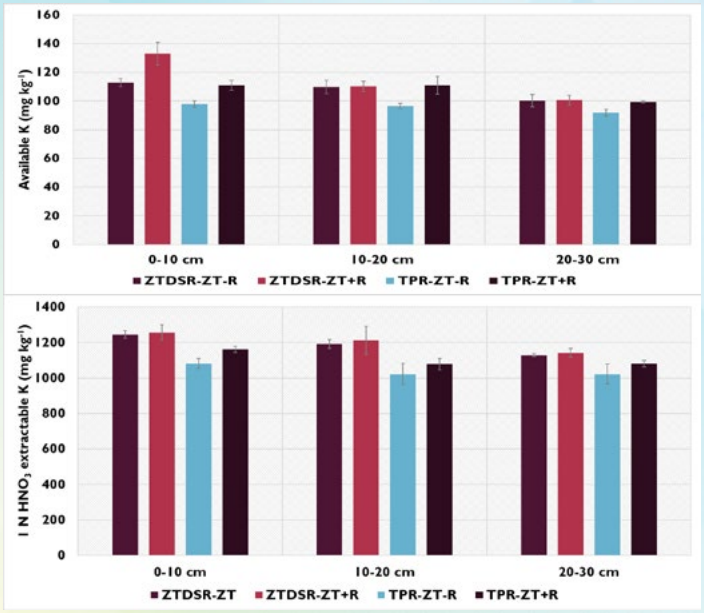
Selected genotypes HI 8737 and HI 1605 for nutrient constrained (N and P deficient) ecosystem



T1: Absolute control; T2: 100% NPK; T3: 50% N + 100% PK; T4: 100% NK + 50% P

Potassium fractions under conservation agriculture (CA) in rice based cropping system in Eastern IGP

Potassium fractions under CA (ICAR-RCER, Patna) in rice-chickpea and rice-mustard cropping systems was studied. Soil samples were collected from three depths (0-10 cm, 10-20 cm and 20-30 cm) of four treatments (T1: ZTDSR-ZT, T2: ZTDSR-ZT-R, T3: TPR-ZT, T4: TPR-ZT+R). Results indicated that zero tilled plots with residue retention (T2) was able to maintain significantly higher values of available K and non-exchangeable K as comparted to conventional tillage (TPR) plots with (T4) or without rice residue (T3). Addition of crop residue significantly added to available K and the increase was prominent in both the fractions of K. However, the effect was restricted to upper 0-10 cm of soil signifying that the effect of CA was mostly confined to the upper 0-10 cm soil depth. The absolute values of available K fractions showed high stratification between 0-10 and 10-20 cm and less difference were noted between 10-20 and 20-30 cm soil depth.

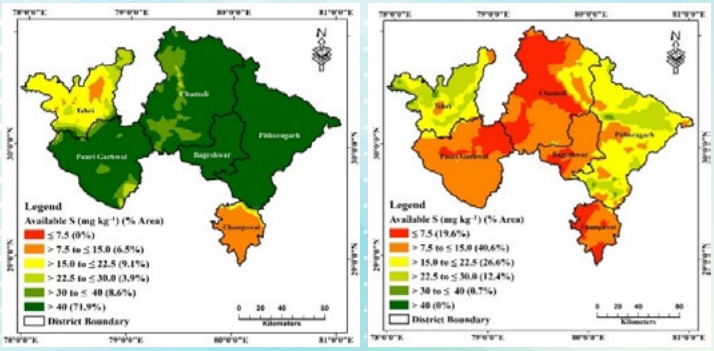


Changes in available K and non-exchangeable K in rice-chickpea cropping system

Spatio-temporal variability of secondary and micronutrients in soils of hilly region of Northern India

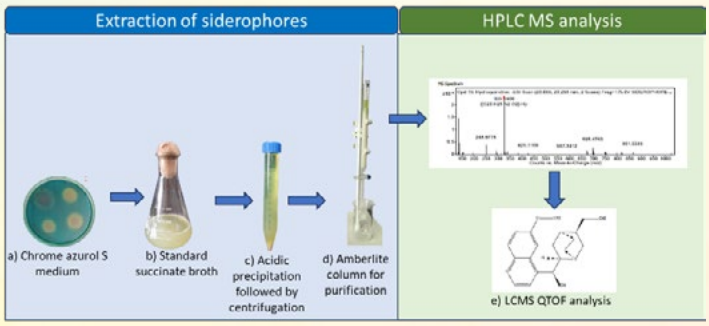
To assess and compare the status and spatial distribution pattern of available sulphur (AS) and available micronutrients in cultivated soils of a hilly region of India (Uttarakhand), total 2871 (1127 in 2015 and 1774 in 2021) georeferenced representative top soil samples were collected from cultivated areas. Results showed that the mean concentrations of AS (13.2 mg kg^{-1}), available iron (AFe) (36.5 mg kg^{-1}), available boron (AB) (0.92 mg kg^{-1}) and available molybdenum (AMo) (0.40 mg kg^{-1}) in 2021 were significantly lower than the concentrations of AS (44.7 mg kg^{-1}), AFe (42.8 mg kg^{-1}), AB (1.46 mg kg^{-1}), and AMo (0.94 mg kg^{-1}) in 2015. Significant positive correlation was observed in AS concentration with soil pH and significant negatively correlation with SOC in both the years. The exponential model best fitted for all estimated soil parameters with lower MSE values in both the years of estimation. The nugget/sill ratios indicated the moderate spatial dependence for all the soil parameters except AFe (nugget/sill ratio 0.14, strong spatial dependence) in 2015 and EC (nugget/sill ratio 0.24, strong spatial dependence) in 2021. The distribution patterns of AS, AB and AMo changed to a greater extent over the period of time. This

emphasized the need for adoption of revised site-specific AS and available micronutrients management strategies for higher crop production.



Siderophore based microbial formulation to improve nutrient utilization

A potential phosphorus solubilizing bacterium (igkv1) isolate was sequenced for the 16S rRNA gene. The sequence was homologous to *Paraburkholderia* sp. Inoculation of this bacteria with or without *Bradyrhizobium* sp BRP2 improved nodulation in soybean, chickpea and pigeonpea. It was hypothesized that metabolites secreted by strain igkv1 improved nodulation. Metabolites such as organic acids and siderophores were independently evaluated for their effect on nodulation in chickpea plants. There was about 1.6-fold increase in nodule number in plants treated with fumaric acid and gluconic acid, while nodulation increased by 2.4-fold with siderophores treatment. Siderophore was purified from broth using XAD amberlite column. Siderophore solubilized various insoluble phosphate compounds. Siderophore application as seed coating also improved nodulation in leguminous under field condition.



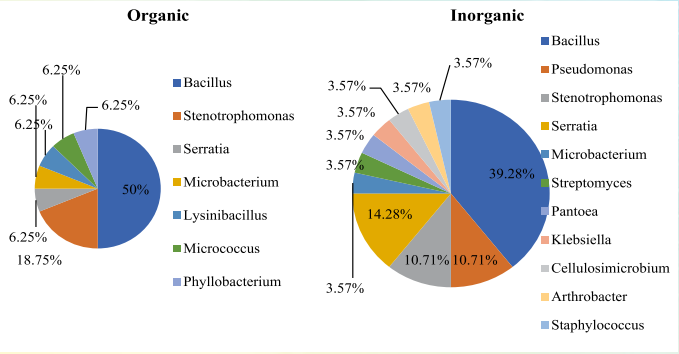
Evaluation of siderophore based bioformulation

Effect of silicon on wheat productivity in Vertisols of Central India

Effect of Si application on wheat (HI 1605) productivity was evaluated under field condition. T4 (P+ Si priming) produced the highest yield, while the control treatment resulted in the lowest yield. The yield increased over the control was observed as follows: T4, P+ Si priming (75%) >T6, P+ Si priming + Si foliar (63%) > T5, P+ Si foliar (54%)> T1, P (52%)> T2, Si priming (5%) ≥ T3, Si foliar (5%). The study indicated that using Si as seed priming, along with P fertilizer, can have a significant impact on wheat productivity in the Vertisols of Central India.

Diversity of bacterial endophytes in chrysanthemum

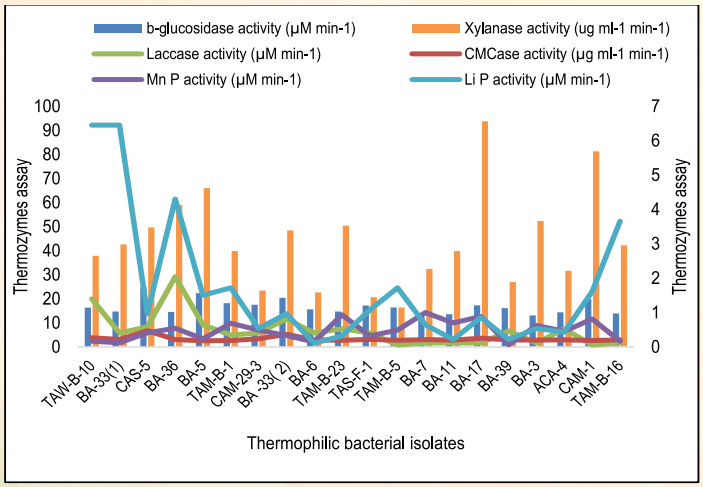
A study was conducted to evaluate endophytes of floriculture crop chrysanthemum (*Dendranthema grandiflora*) at the AINP SBB centre located at YSPUHF, Solan, Himachal pradesh. Crop was grown under organic and inorganic fertilizer treatments. A total 44 bacterial endophytes showing plant growth promoting traits were selected for sequencing of 16S rDNA. Amplification of all the bacterial isolates produced an amplicon of 1400 bp size. Sequence analysis revealed the presence of bacteria belonging to 14 different genera. The isolates exhibited nucleotide homology of 91 to 99.77 %. Bacterial isolates under organic treatment were dominated by *Bacillus* (50%), *Stenotrophomonas* (18.75%) and 6% each of *Lysinibacillus*, *Micrococcus*, *Phyllobacterium*, *Serratia* and *Microbacterium*. Isolates from inorganic treatment were 39.28% *Bacillus*, 10.71% *Stenotrophomonas*, 10.71% *Pseudomonas*, 14.28% *Serratia* and 3.57% each of *Cellulosimicrobium*, *Streptomyces*, *Klebsiella*, *Pantoea*, *Arthrobacter*, *Microbacterium* and *Staphylococcus*. Study highlighted that organic fertilizer enhanced endophytic bacterial diversity in floriculture crop compared to inorganic amendment.



Endophytic bacterial diversity of chrysanthemum crop under organic and inorganic amendments

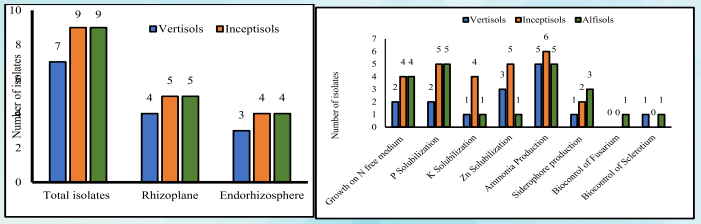
Deciphering thermophiles from hot springs of Central India for thermozymes production

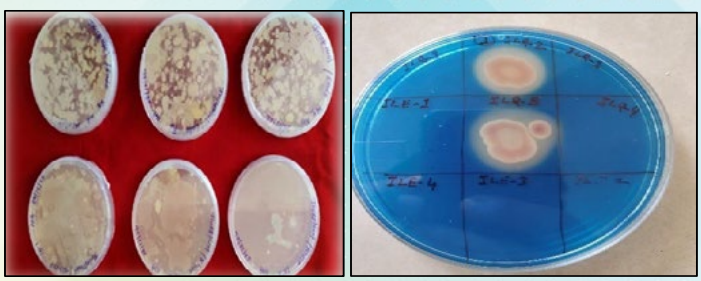
Samples were obtained from the three hot springs in Central India: Choti Anhoni (CA), Badi Anhoni (BA), and Tatapani (TA). These samples included water, mat, and soil samples. A total of 101 thermophiles were isolated from these hot springs. Following a qualitative screening for potential lignocellulolytic microbes, 19 bacterial isolates and 1 fungal isolate were selected. Subsequently, quantitative assessments were conducted to measure the activity of β-glucosidase, xylanase, CMCase, manganese peroxidase, lignin peroxidase, and laccase. Upon thorough analysis, CAS5, TAWB10, BA36, BA33 (ii), CAM1, and TASF1 were chosen for formation of consortia.



Plant growth promoting attributes and diversity of rhizoplane and endophytic bacteria of Linseed

Linseed (Flax) was grown in Rabi 2022-23 in soil representing three different order (Vertisols, Inceptisols and Alfisols). The rhizoplane and endorhizosphere bacteria were isolated and characterized based on PGP attributes. Amongst 25 isolates obtained, the highest PGP microbes were form Inceptisols followed by Alfisols.





Isolation of bacteria for linseed rhizoplane and endorhizosphere (left) and siderophore production ability of linseed isolates (right)

Evaluation of natural farming practices in different agro-ecology

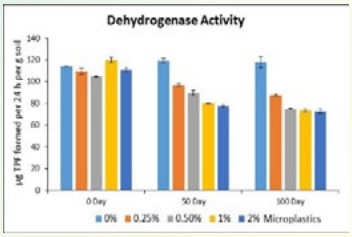
Field experiment was conducted during rabi season 2022-23 at ICAR-Indian Institute of Soil Science. Overall, the highest grain yield of wheat (main crop) and mustard (intercrop) was recorded in integrated nutrient management practices with chemical pesticide for plant protection (ICMP), which was at par with integrated nutrient management practices with natural farming measure as plant protection (ICMNF) followed by organic farming (AINPOF) package of practice. Increase in soil enzyme activity was observed in organic, natural and ICMNF treatment compared to control.

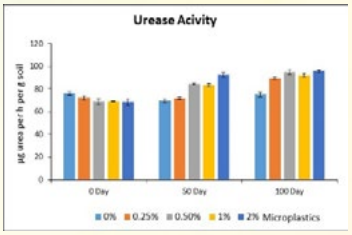
Field demonstration of non-contact nano sensor (MEGH)

A prototype named "MEGH" (Measuring Essential Good Hydration) was developed for measuring the soil water potential in a non-invasive manner. The nano sensor MEGH was fabricated using cellulose and cobalt chloride for the measurement of water potential of soil in a non-invasive manner. The relative humidity above the soil surface in equilibrium with the soil moisture for both hydrophobic and hydrophilic soil types revealed that the plant available water for hydrophobic soil is much higher than that of the hydrophilic soil. The nano sensor was installed in field to operate irrigation pump through cloud (IoT based).

Effect of plastic mulch residues or microplastics on soil enzymes activities

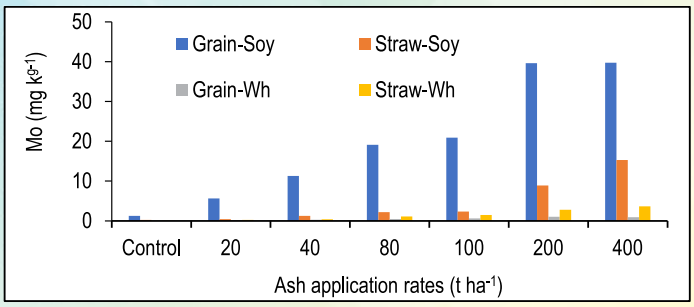
The effect of microplastics (MPs) on soil enzyme activities was evaluated in an incubation study. Pot experiments carried out in earthen cups filled with 100g processed soils amended with 0%, 0.25%, 0.5%, 1% and 2% MPs (<4mm LDPE plastic mulch film). Microplastics reduced soil dehydrogenase activity compared with control soil receiving no microplastics. This might be due to the release of chemicals like phthalate acid esters (PAEs) from film residues in the soil. However, urease activity found to be stimulated under the amendment of MPs.





Fly ash as a potential source of molybdenum for crops

Weathered fly ash received from Super Thermal Power Station, Gadarwara (M.P.) contained significant amount of Mo (3.3 mg kg^{-1}). Results from field experiment on soybean-wheat cropping system in Vertisol indicated that application of the fly ash along with recommended dose of fertilizers and manures caused significant increase in the concentration of Mo in the grain and straw biomass of both soybean and wheat crops. Uptake of Mo by soybean biomass was much higher as compared to wheat crop. Average transfer coefficient of Mo (ratio of Mo concentration in grain to that in straw) was >1 in soybean and <1 in wheat, which indicated that Mo was easily translocated from straw to grain in soybean crop.



Effects of crop residue return, placement and nutrient application on nitrous oxide emission in Alfisol

N_2O emissions in the Alfisol was measured under different wheat residue management. The treatments included application rates (R0: no straw; R5: @5 Mg ha^{-1}; R10: @10 Mg ha^{-1}; R15: @15 Mg ha^{-1}), management levels (surface and incorporated), and nutrient (NPK) application rates (N0: no nutrient and NL: nutrient addition to achieve 30% humification in residue level @ 5 t ha^{-1}: NH: 3 x NL). Experiment was conducted under laboratory-based soil incubation condition. The result demonstrated significant ($p<0.05$) interaction effect of residue, nutrient application rate, and residue placement on N_2O emission. The N_2O flux ranged from -2.3 µg N_2O-N kg^{-1} soil (R5 N0 surface) to 43.8 µg N_2O-N kg^{-1} soil (R10 NH incorporated). In R0, NL (cf. N0) increased the N_2O emission by 101%, and there was no difference between N0 and NH. However, in R5 and R10, surface retention of residue decreased the N_2O emission with increasing nutrient application (NL and NH) compared with N0. Irrespective of wheat residue rates, the incorporation of residue and nutrient application (cf. N0) significantly enhanced the N_2O emission.

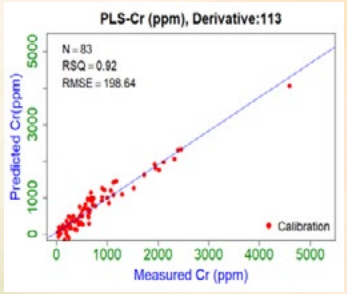
Modified steel slag on heavy metal stabilization in a contaminated soil and its uptake by spinach

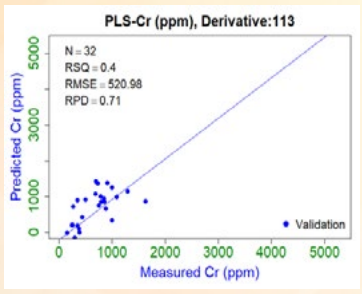
An incubation experiment was carried out to study the effect of spent wash and mineral acid on silica release from modified steel slag and heavy metal stabilization in a contaminated soil. The result indicated that the mineral acid type (HCl and HNO_3), concentration (5 N and 2.5 N) and ratio (1:1, 2.1 and 5:1 acid: steel slag ratio) significantly influenced pH, electrical conductivity and silica content of the slurry mixture. Silica solubility was highest with HNO_3 than HCl. Further, the result also revealed that steel slag and modified slag treated with mineral acid significantly reduced the bioavailable form of heavy metal (DTPA) in a Cu and Cd spiked Vertisol. At the end of incubation study (42 days), the % reduction in DTPA extractable Cu and Cd ranged

from 12.4% to 28.9% and 7.2% to 32.3%, respectively over control. The DTPA extractable Cu and Cd was significantly reduced in the steel slag treated with mineral acid treatment over untreated steel slag.

Prediction of chromium (Cr) content using visible near infrared (VNIR) spectroscopy

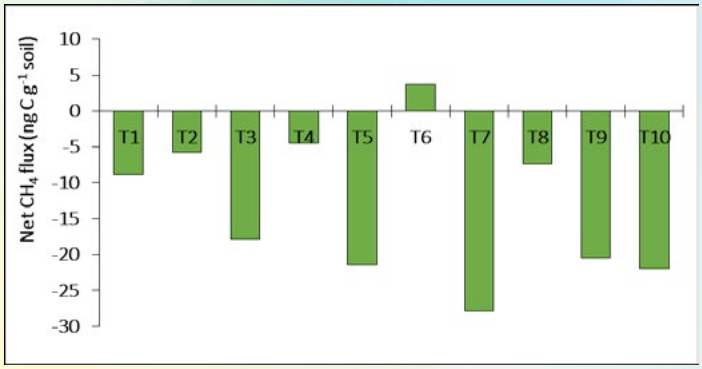
Geo-referenced surface soil samples (116 nos) were collected grid wise at an interval of 250 m in alluvial soil of Jajmau Industrial Area, Kanpur. Soil diffuse reflectance spectra were recorded for each soil sample using a Field Spec Pro FR spectroradiometer (Analytical Spectral Devices Inc., Boulder, Colorado) at wavelengths from 350 to 2500 nm with a spectral sampling interval of 1 nm. The spectral values were tagged to point data at 10 nm interval. The Partial Least Square Regression (PLSR) model was developed in R software to rapidly assess the Cr content (ppm) in soil. The model was evaluated with the independent dataset with first derivative using statistical criteria such as the ratio of performance of deviation (RPD), coefficient of determination (R^2) and root mean square error (RMSE). The R^2 (0.92 and 0.4) and RMSE (198.64 and 520.98) values for calibration and validation indicates that Cr could be predicted with reasonable accuracy using VNIR spectroscopy.





Pollution assessment of Singrauli opencast coal mine areas

The average concentration of sulfate and Mn in Singrauli coal mine and surrounding water samples exceeded the permissible limit by FAO and USEPA, while Cu, Fe, Zn, Ni and Pb fall behind their respective critical limit in water. Coal mine and agricultural soils were slightly acidic to neutral and non-saline in nature. Higher organic C and available P were found in mine soil compared to the agricultural soil. Total heavy metal concentrations were in the following ranges Fe: 0.35-1%, Mn: 100-737 mg kg^{-1}, Zn: 23-118 mg kg^{-1}, Cu: 16.7-55 mg kg^{-1}, Cd: 0.05-1.10 mg kg^{-1}, Cr: 20-105 mg kg^{-1}, Pb: 7-35 mg kg^{-1}, Ni: 11-77 mg kg^{-1}.



Development of fertilizer prescription equations under integrated plant nutrition system

The integrated supply of plant nutrients based target yield equation generated involving fertilizers, organic manures and biofertilizers are presented below:

Crop (variety)	Basic Data					Targeted Yield Equations
	Nutrient	NR	CS	CF	CO	
Green gram (BGS-9)	N	6.07	29.5	42.2	0.87	FN=14.36T–0.69SN–0.87ON
	P_2O_5	2.10	17.7	55.6	0.80	FP_2O_5=3.766T–0.318SP–0.8OP
	K_2O	5.20	52.8	113.3	0.76	FK_2O=4.58T–0.46SK–0.76OK
Little millet (GPUL6)	N	2.75	9.36	46.1	0.25	FN=5.97T–0.20SN–0.25 ON
	P_2O_5	1.27	11.3	63.1	0.11	FP_2O_5=2.01T–0.18SP –0.11 OP
	K_2O	3.78	24.3	237.5	0.10	FK_2O=1.59T–0.103 SK–0.11OK

Crop (variety)	Basic Data					Targeted Yield Equations
	Nutrient	NR	CS	CF	CO	
Radish (Japanee White)	N	0.27	17.0	25.7	6.68	FN=1.06T–0.66 SN–0.26 ON
	P_2O_5	0.09	40.7	52.9	2.5	FP_2O_5=0.17T–0.77SP –0.05OP
	K_2O	0.37	29.9	58.1	8.33	FK_2O=0.64T– 0.51SK–0.14OK
Jute (JRO M1)	N	2.13	19.9	37.9	16.02	FN =5.62 T –0.52 SN –0.42 ON
	P_2O_5	0.78	35.9	36.9	10.8	FP_2O_5= 2.11T –1.92SP–0.30OP
	K_2O	3.62	59.1	107.8	20.0	FK_2O=3.36T–0.55 SK –0.19OK

Where, NR is the nutrient required to produce 1 quintal of economic parts (kg q^{-1}), CS is the nutrient contribution from soil (%), CF is the nutrient contribution from fertilizer (%),CO is the nutrient contribution from organic sources (%); FN, FP_2O_5 and FK_2O are the fertilizer doses (N, P_2O_5 & K_2O) in kg ha^{-1}.

Post-harvest soil available nutrients prediction equation

A prediction equation for a post-harvest soil test value was framed which can be used to make a fertilizer recommendation for entire cropping system. This is a very useful equation because, under intensive agriculture, in most of the developing countries as farmer's fields cannot be tested between each season for each constituent crop for practical reasons. The relationships between post-harvest soil test values, fertilizer applied initial soil test values and fresh fruit yield from the treated plots, for radish crop is presented below:

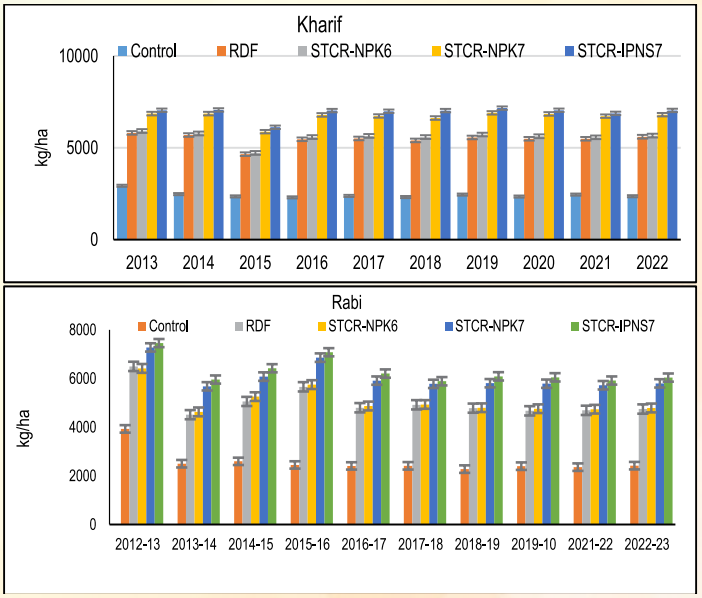
Nutrient	R^2	Multiple regression equation
N	0.95**	14.75336 -0.29847 RY**+1.196025SN**+0.057495FN*
P	0.85**	3.49601 +0.07987 RY*+0.141967 SP**0.017162 FP**
K	0.93**	47.70546 -0.17663RY**+1.00343 SK**-0.00457 FK

Where, PHN, PHP and PHK stand for the post-harvest soil test values of N, P and K (kg ha^{-1}); Y is the fresh fruit yield of crop (t ha^{-1}), SN, SP and SK represent the initial soil test values of N, P and K (kg ha^{-1}), respectively.

Appreciably large R^2 values (significant at 1%) were obtained for these equations. Result suggested that such regressions can be used with confidence for the prediction of available N, P, and K after harvest of Radish crop for making soil test-based fertilizer recommendation for succeeding crops.

Crop yield and sustainability under long-term STCR experiment at Coimbatore

Data from a 10-years experiment suggested that maximum yield was observed under STCR-IPNS with target yield of 7 t ha^{-1} kharif rice and 6 t ha^{-1} rabi rice whereas minimum yield was observed from control in both kharif as well as rabi seasons. The highest sustainable yield index (SYI) was 0.87 and 0.78 in kharif and rabi rice, respectively under



STCR–IPNS, and lowest was observed in control.

Treatments	Sustainable yield index (SYI)	
	Kharif	Rabi
Control	0.77	0.53
RDF	0.89	0.68
STCR-NPK6	0.89	0.71
STCR-NPK7	0.93	0.76
STCR-IPNS7	0.93	0.77

Effect of long-term application of nutrients on soil enzymatic activity, sustainability and soil quality in an Alfisol

Long-term application of 100% NPK+ FYM significantly increased the dehydrogenase, acid phosphatase and urease activities followed by 100% NPK + lime. Further, balance nutrient application through fertilizers and integrated nutrient management (INM) sustained crop productivity through sustainability index (SYI). Results indicated that application of urea alone (i.e., 100% N) had deleterious effect on crop productivity. The soil quality index (SQI) values were maximum with INM i.e. 100% NPK+FYM followed by 150% NPK and 100% NPK + lime. Thus, it has been illustrated that balance and INM / amendment improved soil biological parameters and sustainability indices (SYI, SQI) under long term intensive cropping in Alfisols.

Treatment	Soil biological activities			Sustainability indices		
	Dehydro-genase (µg TPF g^{-1} 24 h^{-1})	Acid phos-phatase (µg PNP g^{-1} h^{-1})	Urease (µg NH_4^+-N g^{-1} h^{-1})	Finger millet (SYI)	Maize (SYI)	SQI
Control	40.39	80.93	27.66	0.29	0.05	0.59
100% N	32.96	89.72	26.95	0.25	0.03	0.62
100% NP	43.10	90.13	27.99	0.17	0.08	0.72
100% NPK	56.49	94.37	29.96	0.49	0.22	0.73
150% NPK	58.49	97.38	30.65	0.56	0.24	0.88
100% NPK + Lime	59.50	90.24	31.40	0.52	0.24	0.77
100% NPK + FYM	67.81	99.85	34.46	0.49	0.23	0.90

EXTENSION ACTIVITIES

Training and demonstrations under SCSP Programme

Drs. Ajay, Sangeeta Lenka, Nisha Sahu, Abhijit Sarkar, Dinesh K. Yadav, Madhumonti Saha and Rahul Mishra (SCSP Project Team,Cluster I) organized Farm Women Training on Waste2Wealth under SCSP on January 12, 2023.

Drs. Abhijit Sarkar, Dinesh K. Yadav and Madhumonti Saha (SCSP Project Team,Cluster I) distributed fertilizers (NPK-12:32:16 and Urea) to the Scheduled Caste farmers from the adopted villages viz. Sahapur, Kuthar, Badkhedi and Sagoni.

Distribution of seeds of improved variety of soybean crop, neem-coated urea, and few small farm inputs was undertaken for Schedule caste (SC) farmers under the SCSP programme before the sowing of the kharif season crops from June 1-30, 2023.

Mass multiplication and distribution of worm culture

Worm mother culture was multiplied in the worm mother culture unit established at ICAR-IISS, Bhopal. 60 kg mother culture was prepared for distribution to the beneficiary farmers under the project in the adopted villages. Worm mother culture distribution programs were organized at farmers field in Khamkheda, Rasuliya Pathar and Khajuri villages.

Distribution of microbial cultures for in-situ crop residue management

The microbial cultures were multiplied on large scale in laboratory, for preparation of capsules. The farmers visiting the institute were elaborated about use of decomposer capsules for composting in field. The technology has been

demonstrated in 16 farmers field in 0.5-acre areas each belonging to different villages like Khajuri, Bhairopur, Beenapur, Khamkheda and Kanchvabli.


Demonstration of CA technologies in wheat, chickpea and soybean crop in farmer's field

Wheat, chickpea and soybean crops were demonstrated at different farmer's field to study the yield difference under zero tillage and reduced tillage conditions.


Demonstration of Ekcel decomposer

In-situ crop residue decomposition technology (Ekcel decomposer) was demonstrated in farmers' field under Farmers FIRST, Swachhta Action Plan and SCSP after the harvest of wheat crop in Kalyanpur and Khamkheda on May 16, 2023, Kanchvabli and Bhairopur on May 17, 2023 and Resource Management at Kanchvabli and Bhairopur villages on April 18, 2023.


Farmer FIRST Programme

- Under the farmer FIRST program, frontline demonstrations (FLDs) on 'conservation agriculture (CA) based technologies' were carried out in the adopted villages for Rabi season crops wheat (50 farmer fields in an area of 20.23 ha) and chickpea (10 farmer fields in an area of 4.04 ha).
- Farmers' training on nursery management and vegetable seed distribution programmes were organized at Khamkheda, Bhairopur and Kalyanpur villages during March 30-31, 2023.
- Three exposure visits carried out for the beneficiary farmers to the worm-mother culture unit and experimental/demonstration fields of ICAR-IISS on February 01, 06, and 08, 2023.





MAJOR EVENTS

ICAR-Central Zone Sports Meet

ICAR-Central zone sports meet was held at ICAR-Indian Institute of Soybean Research, Indore during January 3-6, 2023 where the scientists and staff of IISS participated with full enthusiasm and bagged many inter institutional prizes in different sports activities.

74th Republic Day

The 74th Republic day was celebrated in the institute with lots of enthusiasm and joy on January 26, 2023. Dr. A.B. Singh hoisted the flag and addressed the gathering on this occasion. He greeted all the staffs of Institute and motivated all to work together for the progress of the nation.

13th International Women's Day

The International Women's Day (IWD) program was held at village Borkhedi, Phanda Tehsil, Bhopal District, on March 6, 2023. A one-day training cum workshop was organized to sensitize and train the farm women on "Improving the livelihood of farm women through managing soil health, waste to wealth and women nutrition". About 150 farm women, including scientists and technical staffs of the Institute participated in the program.

36th Foundation Day

The 36th Foundation Day of the institute was celebrated on April 25, 2023. Dr. S.K. Chaudhari, DDG, NRM graced the occasion as Chief Guest and Dr. A. Sanyal, Director, ICAR-NIHSAD, Bhopal and Dr. C.R. Mehta, Director, ICAR-CIAE, Bhopal graced the occasion as the special guests. During the programme progressive farmers and the IISS staff completing 20/30 years of service were felicitated by the chief guest and two new infrastructure facilities i.e. ICP-OES and Farmers Convention Facility was inaugurated by the Chief Guest. All the staffs of IISS participated in the programme with full enthusiasm.

8th International Day of Yoga, 2023

International Yoga Day was celebrated with fervor at ICAR-Indian Institute of Soil Science, Bhopal on 21 June, 2023 with the theme "Yoga for Vasudhaiv Kutumbakam". Ms. Jyoti Bisnoi, Yoga Instructor gave lecture and supervised the various yoga exercises. The session was attended by all the staffs of the institute.

राजभाषा हिंदी पर एक दिवसीय कार्यशाला

भाकृअप.–भारतीय मृदा विज्ञान संस्थान, भोपाल द्वारा राजभाशा हिंदी पर एक दिवसीय कार्यशाला का आयोजन दिनांक 30.06.2023 को किया गया। कार्यशाला की अध्यक्षता संस्थान निदेषक एवं अध्यक्ष हिंदी समिति डॉ. एस.पी. दत्ता द्वारा की गयी।

Swachhta Action Plan

Nine swachhata awareness campaigns were organized at adopted villages. About 220 farmers participated in these

programs in different villages (Ratibad, Beenapur, Khajuri, Khamkheda and Rasuliya Pathar) between January to June, 2023. Farmers were made aware about harmful effect of crop residue burning on soil health, ways to manage crop residues through vermicomposting and microbial decomposer, importance of sanitation in farm, village and surroundings.


Exposure Visit under NASF- Nano Sensor Project

Dr. Tapan Adhikari, PS & PI, visited Indian Institute of Technology, Kharagpur for "Exposure Visit" (March 16 to 22) as a part of the ICAR-NASF project entitled "Development of Nano Sensor and its Application through Cloud-Based Network for Real-Time Irrigation to Soil and Plant".

Training-cum-Farmer's visit programme

The Training-cum-Famer's visit programme on Soil Health Management was organized by the ICAR-IISS, Bhopal at KVK, Barwani on March 21, 2023 under TSC-TSP project where 50 tribal farmers were trained. In this training programme, the awareness amongst farmers was created regarding agricultural techniques and practices like soil testing, organic farming, integrated nutrient management, conservation agriculture and soil health, and soil health card. Vermibeds were also distributed.


Demonstration of nutrient management technologies in farmer's field

Under the SCSP project, the technologies for balanced use of fertilizers and integrated nutrient management were demonstrated for the wheat and chickpea crops from June 1-30, 2023 at farmers' fields of the Raipur, Kanera, Khichital and Karand Khurd villages.

Biofertilizers demonstration for tribal millet farmers

Biofertilizers effective for millets were developed at the All India Network Project on Soil Biodiversity Biofertilizers (AINP SBB) centre located at TNAU Coimbatore. A nutrition deficiency awareness camp organized for the tribal peoples of Sathyamangalam reserve forest tribal villages by ICAR-Sugarcane Research Institute, Coimbatore. Under this program, Azospirillum and Phosphobacteria biofertilizers and millet seeds (Pearl millet, finger millet, kodo millet, and little millet) were supplied as input for the Tribal farmers. For this, 250 ml-sachet of biofertilizers were specially made and supplied to them. Nearly 450 tribal families from seven villages (Ittarai, Thallamalai, RamarPalam, Kuttikumam, Nagalur, Kottadi, Hasanur) received these bioinputs. The method of application of biofertilizer for millets was also demonstrated.


Biofertilizer sachets (Azospirillum and Phosphobacteria) for millets (Left) and demonstration of biofertilizer usage for millets to the tribal farmers (Right)

Soil Biological Health Kit- Evaluation at the farmers field

Soil biological health kit or SRI gel probe developed by AINP SBB centre located at TNAU Coimbatore. The kit was demonstrated and distributed to farmers in Tamil Nadu for evaluation during April 2023. One hundred thirty farmers each with four soil samples tested about 600 soil samples using this kit. The farmers showed positive responses to use the kit and did not find any difficulties using the kit. They felt that the kit was a simple tool, easy to interpret the results, and recommends organic amendments and management practices to improve soil health.

Demonstration of soil biological health kit or SRI gel probe's efficiency in the farmers' field

TRAINING/SEMINAR/WORKSHOP ORGANIZED

Drs. Ajay, Sangeeta Lenka, Nisha Sahu, Dinesh K. Yadav and Rahul Mishra as organizing team organized Farm Women Training on Waste to Wealth under Scheduled Caste Sub plan (SCSP) on January 12, 2023.

Drs. A.K. Biswas, R.K. Singh, Shinogi K.C., A.K. Tripathi, Sanjay Srivastava, K. Bharati, N. K. Sinha, Asha Sahu, B.P. Meena, Abhijit Sarkar, Madhumonti Saha, M. Homeshwari Devi, Immanuel C. Haokip organized a training on "Enhancement of soil health and livelihood of tribals in Central India" during January 23-27, 2023 under TSP for tribal farmers of Betul district.

Dr. J.K. Thakur organized one day farmers' training on "Natural farming and crop residue management" and delivered lecture on IISS decomposer capsule for crop residue management on January 17, 2023 at IISS, Bhopal. The program was sponsored by ATMA, Bhopal.

National Symposium on 'Digital Farming: The Future of Indian Agriculture' was organized by the Indian Society of Agrophysics during February 2-3, 2023 at ICAR-IISS, Bhopal. This symposium was chaired by Dr. S.K. Chaudhari, DDG (NRM) & President (ISAP). Dr. A.K. Singh, Former Vice-Chancellor, RVSKVV, Gwalior and former DDG (NRM); Dr. Ashok K. Patra, Former Director (ICAR-IISS, Bhopal), Dr A.B. Singh, Director (Acting), ICAR-IISS and other distinguished delegates graced the occasion. The symposium was attended by about 150 delegates, including Scientists, Research Scholars and Students across the country.

Drs. Pramod Jha, B.P. Meena and Khushboo Rani coordinated a 5 days training program on Soil Health Assessment and Management for the officials of Department of Farmers Welfare & Agriculture Development, Bhopal, Govt. of M.P during February 20-24, 2023.

Drs. Nishant K Sinha, J. Somasundaram, Jitendra Kumar, Dhiraj Kumar, Rahul Mishra, Nisha Sahu, K.M. Hati and R.S. Chaudhary organized 7 days Training Programme on "Application of Geo-Spatial tools in Soil Science" under the NAHEP-CAAST in association with JNKVV, Jabalpur during February 27- March 5, 2023.

Dr. J.K. Saha organized 2nd Annual Review Meeting of the NTPC funded project 'Use of Fly Ash in Agriculture for Sustainable Crop Production and Environmental Protection' on March 2-3, 2023 at IISS, Bhopal.

Soil Physics Division organized 5 days NICRA-sponsored training program on "Soil Health Management through Climate-Smart Agriculture" during March 15-19, 2023.

Drs. A.B. Singh, R. Elanchezhian, P. Tripathi, M. Vassanda Coumar, Nisha Sahu, Narayan Lal and D.K. Yadav organized workshop cum training programme with 300 farmers at Rajnandgaon, Chhattisgarh during March 27-29, 2023.

Drs. R Elanchezhian, Prabhat Tripathi, M.V. Coumar, Nisha sahu, N. Lal and D.K. Yadav organized Krishi Mela cum Krishak Sangosthi on Natural Farming during March 27-29 at KVK Surgi, Rajnandgaon district, Chhattisgarh. Padmashri Smt. Phoolbasan Bai Yadav, President of the Maa Bamleshwari Janhit Karya Samiti graced the Krishi Mela cum Krishak Sangosthi as Chief Guest on March 28, 2023 and emphasized on importance of organic and natural farming practices for crop and soil health improvement.

Drs. A.K. Vishwakarma, Brijlal Lakaria, Sanjay Srivastava and A.K. Tripathi coordinated a 3 days training program on Soil Health Assessment and Management for the officials of

Department of Farmers Welfare & Agriculture Development, Bhopal, Govt. of M.P during April 5-7, 2023.

Drs. Sudeshna Bhattacharjya, M. Homeshwari Devi and Immanuel C. Haokip organized a student visit from Kumari Devi Choubey College of Agriculture and Research Station, Saja (KDC-CARS) on May 01, 2023.

Drs. Sanjay Srivastava and Immanuel C. Haokip with Director, Dr. S.P. Datta organized review meeting of all the centers of AICRP on STCR (via Zoom) on May 3, 2023.

Drs. S.R. Mohanty and M. Homeshwari Devi with Director S.P. Datta organized review meeting of all the centers of AINP SBB (via Zoom) on May 9, 2023.

As one of the coordinators Dr. Asha Sahu organized a National Campaign on Lifestyle For Environment (LiFE) with theme Soil Health Management (Nutrient use efficiency, SOC management) on May 23, 2023 at Khamkeda Village.

Drs. M. V. Coumar, Sangeeta Lenka, Nisha Sahu and Rahul Mishra organized three days training programme sponsored by the Environmental Training Unit, Central Pollution Control Board (CPCB), New Delhi during May 23-25, 2023.

ICAR-IISS, Bhopal and OUAT organized XXIX Biennial Workshop of AICRP on Micro- and Secondary Nutrients and Pollutant Elements in Soils and Plants at OUAT, Bhubaneswar during June 23-25, 2023.

AWARDS & HONORS

- Dr. Narayan Lal was honoured with Best Scientist Award during 12th Science and Technology Awards-23 by EET CRS, Bangalore, India.
- Dr. Narayan Lal served as Editorial board member of Plant Biology Soil Health Journal.
- Dr. S R Mohanty received Fellowship of National Academy of Biological Sciences, Chennai, Tamil Nadu on January 25, 2023 at Periyar University
- Dr. Sanjib Kumar Behera received Fellowship of National Academy of Biological Sciences, Chennai, Tamil Nadu on January 25, 2023 at Periyar University
- Dr. Tapan Adhikari was conferred "Fellowship of Indian Society for Plant Physiology (FISSP)" by Indian Society for Plant Physiology, New Delhi.
- Dr. Tapan Adhikari received best paper (Oral Presentation) for presenting a paper in national webinar on March 24, 2023 of 10th Annual Convention of Society for Fertilizers and Environment, Kolkata (authors: Ria Ghosh, Tapan Adhikari and Samir Kumar Pal).
- Mrs. Madhumonti Saha and Dr. D.K Yadav received Fellowship for Training of Young Scientists (FTYS) in 38th M.P. Young Scientist during March 2023.
- Dr. Asit Mandal acted as External Advisory Board Member at the SYMBIOREM Consortium Meeting I held on 1st May 2023.
- Dr. Asit Mandal has been recognized as Guest Editor for the Frontier in Microbiology.
- Dr. Asit Mandal has been recognized as Academic Editor in the International Journal of Plant and Soil Science.
- Dr. J.K. Thakur acted as External Member for assessment and upgradation of IARI Student (Ms. Elakkya M., Ph.D. student, Roll No. 11811), from JRF to SRF on 17.01.2023, convened at IARI (online).
- Dr. J.K. Thakur acted as Rapporteur in technical session on theme "Conservation Agriculture and Organic Farming" in National Symposium on "Digital Farming: The Future of Indian Agriculture" during February 2-3, 2023 at ICAR-IISS, Bhopal, Organized by Indian Society of Agrophysics, New Delhi.
- Dr. J.K. Thakur acted as Jury member of a technical session in Annual convention and National Webinar on March 24-25, 2023 organized by Society for Fertilizers and Environment, Kolkata.
- Dr Asha Sahu delivered a talk (virtual mode) in 3rd International Conference on Plant Science and

Molecular Biology during 17-19, May 2023 at Lisbon, Portugal.

- Dr. Asha Sahu won Silver Medal in Carrom and Bronze Medal in the 4×100 m Relay Race in the "ICAR-Central Zone Sports Meet" during January 02-06, 2023.
- Dr Asha Sahu was invited as External Examiner for practical viva of M.Sc. Microbiology students of Department of Microbiology, Barkatullah University on June 17, 2023.
- Dr. Sudeshna Bhattacharjya has been recognized as Academic Editor of PLOS ONE.
- Dr. Sudeshna Bhattacharjya was invited for expert talk by Planet A channel at Deutsche Well in Berlin, Germany in May, 2023.
- Dr. Abinash Das received Dr. S.P. Raychaudhuri Gold Medal for Best Ph.D. Dissertation from Delhi chapter of Indian Society of Soil Science for the year 2023.
- Drs. Asha Sahu, Khusboo Rani, Rahul Mishra and Sudeshna Bhattacharjya participated in the "Science Fiesta" organized by Regional Science Center, Bhopal during January 10-12, 2023. Institute technologies and products were demonstrated to around 3000 students.
- Drs. Abinash Das and Narayan Lal attended Pusa Krishi Mela held at ICAR-IARI, New Delhi during March 02-04, 2023.

- Drs. Abhijit Sarkar and D.K Yadav represented ICAR-IISS, Bhopal in the Kisan Mela programme at RLBCAU, Jhansi from February 26-27, 2023

INTERNATIONAL COOPERATION

Indo-France Collaborative Project

Dr Francois Bringel, CNRS Research Director, University of Strasbourg, France visited the institute during February 11-24, 2023 under Indo-France collaborative project funded by DST- CEFIPRA.

STAFF NEWS

Joining

- Shri P. S. Sunil Kumar, Senior Administrative Officer joined on March 31, 2023.

Foreign deputation

- Dr. Tapan Adhikari, Principal Scientist attended "Agriplastic Project Work Package-4 Workshop and Work Package-2" from February 27 to March 03, 2023 at Hanoi, Vietnam
- Dr. Sangeeta Lenka, Principal Scientist received Indo-US visiting Fellowship at Iowa, United States from May 08 to Aug 7, 2023.

Promoted

- Dr. Narayan Lal promoted as RRL-11 to RRL-12 (Rs. 7000- Rs. 8000) w. e. f. 1st January, 2023.

Transferred

- Dr. Pradip Dey, Principal Scientist and I/c PC, STCR is appointed as Director, ICAR-ATARI, Kolkata and transferred on February 03, 2023.
- Dr. Kuntal Mouli Hati, Principal Scientist is transferred to ICAR-NBSSLUP, Kolkata on March 24, 2023.
- Shri Ashish Chobey, Administrative Officer is transferred to ICAR-NIHSAD, Bhopal on April 03, 2023.
- Dr. Priya Gurav P., Scientist is transferred to ICAR-Central Research Institute for Dryland Agriculture, Hyderabad on June 23, 2023.

Retired

- Shri Rajesh Kumar Mandloi, Chief Technical Officer retired on March 31, 2023.
- Shri Khilan Singh Raghuwanshi, Technical Officer retired on April 30, 2023.
- Smt Seema Sahu, Chief Technical Officer retired on June 30, 2023.

SCIENTISTS' PARTICIPATION IN TRAINING/SEMINAR/WORKSHOP/MEETING

Name	Program Attended/Participated	Venue/Organizer	Date/Duration
Dr. R. Elanchezhian	5th International Plant Physiology Conference and iFANS-2023 organized by ISPP at NABI	ISPP at NABI	January 8
All Scientists	Lecture by Dr. (Mrs.) N. Kalaiselvi, Secretary, DSIR and DG, CSIR virtually	ICAR, New Delhi	January 12
Dr. A.B. Singh	National conference on Agro-Ecology based Agri-Food Transformation Systems	FSRDA and IIFSR, Modipuram, Meerut	January 27-28
Dr. Asit Mandal .	Laboratory Biosafety and Biosecurity	ICAR-NIHSAD, Bhopal	January 30 - February 3
All Scientists	National Symposium on Digital Farming: The Future of Indian Agriculture at ICAR-IISS, Bhopal	Indian Society of Agro-physics	February 2-3
Dr. J.K. Saha	1st and 2nd JCC meeting of Japan International Cooperation Agency (JICA) sponsored project Capacity Enhancement for Management of Sewage Sludge (Bio-solids) in India	National River Conservation Directorate (NRCD)	February 2 and May 10
Dr. Narayan Lal	7th International Conference on Multidisciplinary Research in Rural, Agriculture & Industry Development at Bhopal	SSMWA	February 12-13
Dr. J.K.Saha	Online meeting on Discussion on off-take of city compost	SBM-Urban & Mission Director, Ministry of Housing & Urban Affairs	February 17
Drs. Narayan Lal, Homeswari Devi, Immanuel C. Haokip	Short course on Integrated precision agriculture tools with conservation agriculture for improving input use efficiency, resource conservation and farmers income	ICAR-IISS, Bhopal	February 15–24

Name	Program Attended/Participated	Venue/Organizer	Date/Duration
Dr. Dhiraj Kumar	7 days Training Programme on Application of Geospatial Tools in Soil Science	ICAR-IISS, Bhopal & JNKVV, Jabalpur	February 27- March 5
Dr. Abinash Das	Special Lecture on National Science Day through virtual mode	ICAR-IARI, New Delhi	February 28
Dr. J.K. Saha	Webinar on Union Budget on Urban Development, Sanitation & Urban Planning - Strategies for Implementation- Waste to Wealth	SBM-Urban & Mission Director, Ministry of Housing & Urban Affairs, Govt. of India	March 1
Drs. A.B. Singh, B P Meena, and J. K. Thakur	National Conference on Production processing and marketing of millets: issues & solutions	JNKVV, Jabalpur & NABARD Bhopal	March 1-2
All scientists of Environmental Soil Science Division	Annual Review Meeting for the NTPC sponsored Research Project Use of fly ash in agriculture for sustainable crop production and environmental protection	ICAR-IISS, Bhopal	March 2-3
Drs. M.V. Coumar, Abhijit Sarkar, Homeswari Devi, Immanuel C. Haokip and Madhumonti Saha	National Webinar on Next-gen Management of Agro-chemicals for Achieving Sustainable Development Goals	Society for Fertilizers and Environment, Kolkata	March 24-25
Dr. M.V. Coumar	Training Programme on Multivariate Data Analysis	ICAR-NAARM, Hyderabad	March 20-27
Dr. Dinesh K.Yadav	One-day Workshop on Alternatives to Single Use Plastic (SUP)	Central Pollution Control Board, Regional Directorate, Kolkata	March 23
Dr. Dinesh Kumar Yadav	15th IUPAC International Congress of Crop Protection Chemistry at NASC Complex, New Delhi.	Society for the Promotion of Sustainable Agriculture (SPSA)	March “14-15
Drs. Khusboo Rani, Abinash Das and Asit Mandal	National Training Workshop on Big Data Analytics in Agriculture (Online Mode)	ICAR-NAARM, Hyderabad	March 9 – 10
Dr. Dinesh Kumar Yadav	5 days training programme under NICRA project on Sustainable soil health management through climate smart agriculture	ICAR-IISS, Bhopal	March 15-19
Dr. Immanuel C. Haokip	International Conference on ”Natural Farming for Revitalizing Environment and Resilient Agriculture (NF-RERA – 2023)” at CAU, Imphal, Manipur	CAU, Imphal, Manipur	March 17-19
All scientists	Lecture on Innovations and Intellectual Property Rights (Online Mode) on World IP Day	ICAR-IISS, Bhopal	April 26
Dr. Dhiraj Kumar	Working Group Meeting WG 1: Integrated Nutrient Management under Panel on Agricultural resource management, by-product management and other integrated system management (FAD 22/Panel IV)	Bureau of Indian Standards	April 13
Drs. R.H. Wanjari and Dhiraj Kumar	Meeting of AICRP LTFE at ICAR-Indian Institute of Soil Science, Bhopal with all the centre I/c along with Scientists/Faculties of AICRP LTFE	ICAR-IISS Bhopal	May 1
Dr. Dhiraj Kumar	Meeting of FAD 22/Panel IV: Panel on Agricultural resource management, by-product management and other integrated system management, Bureau of Indian Standards	Bureau of Indian Standards	May 12
All Scientists	National Campaign on Soil Health Management (Nutrient Use Efficiency and Soil Organic Carbon Management)	ICAR-IISS Bhopal	May 22- 23

Name	Program Attended/Participated	Venue/Organizer	Date/Duration
Dr. Asha Sahu	3rd International Conference on "Plant Science and Molecular Biology" at Lisbon, Portugal (online)	International Association for the Plant Protection Sciences (IAPPS)	May 18-19
Dr. Sangeeta Lenka	Iowa Smart Climate Agriculture Conference in Des Moines, USA, organized by the College of Agriculture and Life Science, Iowa State University.	College of Agriculture and Life Science, Iowa State University	June 6-7
Dr. Asha Sahu	Interactive session on Women Social Status in the aftermath of Independence	ICAR-IIWBR, Karnal	June 7
Dr. Dhiraj Kumar	Meeting of FAD 22/Panel IV/WG 1: Integrated Nutrient Management	Bureau of Indian Standards	June 9
Dr. Sangeeta Lenka	APSIM Workshop 2023 at Department of Agronomy, Iowa State University, Ames, USA	Iowa State University, Ames, USA	June 12-14
Dr. Sangeeta Lenka	Iowa Soil Water Conservation Society Summer Meeting on "Shallow Lake and Wetland Restoration in Northwest Iowa" at Lost Island Nature Center, 3267 350th Ave. Ruthven, Iowa	Iowa Soil Water Conservation Society, Iowa, USA	June 16
Dr. Sangeeta Lenka	Training on Windrow Composting at Midwest Compost School, Iowa State University, Dairy Farm and Composting Facility, Ames, USA	Iowa State University, USA	June 20-22

Published by

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