



# ICAR-IISS Newsletter



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## Forthcoming events

- Women's Day on 8 March 2022
- World Water Day on 22 March 2022
- Foundation Day of ICAR-IISS, Bhopal on 16 April 2022
- World Environment Day on 5 June 2022
- International Day of Yoga On 21 June 2022
- National Campaign on Efficient and Balanced Use of Fertilizer on 21 June 2022

## Editors

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- Dr. Jitendra Kumar
- Dr. Abinash Das

## Director's Desk

### Natural Farming: Indian Traditional Agriculture

Indian agriculture is predominated by small and marginal farmers (85%) who have less than two hectares of land. Today India produces total food grain production of 316 million tonnes. The country is not only sustaining worlds 17 per cent population but also is now food surplus as well as has sufficient buffer food stock. Now we are in a position to think of quality food along with quantitative production. At the same time we are aware that agriculture has a strong inverse relationship with the environment and allied natural resources. Present agriculture is resource intensive and bears serious concerns towards soil health and environment. Therefore, a balance needs to be struck between growth and sustainability. Intensive agriculture is basically a vulnerable agriculture since there are many issues arising along with increasing food grain production. These include declining soil health, low input use efficiency, deterioration of ground water resources, increasing green house gas emission, soil erosion, erosion of genetic diversity etc. These issues warn us on revisiting the technologies for their long term impacts on soil, environment and human & animal health. India has a rich heritage of location specific traditional farming practices that hold potential to address these issues. Some of these ancient practices find place in our Vedas also. We know our farmers have raised food grain even when fertilizer, insecticides, fungicides or weedicides were not available to them. They could survive with use of traditional practices. Now a days, the farming community keep update of the new interventions in agriculture as well as government policies. There has been significant increase in area under organic farming during past two decades which was initiated with the objective to reduce dependence on chemical fertilizers and improve soil health. The small and marginal farmers have low purchasing power and low risk bearing capacity. In this background, a further refinement in the organic farming is seen in the form of Natural Farming (NF). Natural Farming is also farming without the use of chemical inputs such as fertilizers, pesticides or chemical growth promoters. It may be termed as traditional farming. Its main components include mixed cropping or intercropping, mulching, and use of certain traditional preparations such as jivamrita, ghangivamrita, bijamrita and Whapasa. It is a diversified farming system that integrates crops, trees and livestock with functional biodiversity. Main aim of NF is to adopt location specific traditional indigenous practices that help reduce the cost on external inputs. It also has focus on on-farm biomass recycling through mulching, use of on-farm cow dung and urine formulations. The main objective lies on reducing dependency of farmers on purchased inputs and to help ease smallholder farmers from credit burden. The principles of NF are rooted in the concepts defined by "Vrikshayurveda"- the ancient Indian science of



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plant life. It involves the use of locally available resources and livestock. It is easily adoptable by all categories of farmers (small, marginal to large scale). There is sharp reduction in the cost of inputs that make NF economically viable. Since use of locally available resources is recommended this makes NF practically feasible. The NF practice is also environmentally sound and resilient to changing climatic scenario. It has been reported that more than 2.5 million farmers and fruit growers in the country are already practicing regenerative farming practices in India. The adoption of these cattle based practices by the wider farming community would also help in reducing the problem of abandonment of unproductive cattle by the farmers. NF can also help achieve sustainable development goals through meeting food security in a sustainable manner, better job opportunities in rural area and enhancing soil quality. It would further meet the challenges of depletion of natural resources and arising human & animal health issues. Concept of mixed cropping in NF ensures better nutritional value, crop yield security and yield stability. Mulching techniques recommended in NF help

improve the water availability & minimize irrigation requirement, and reduces weed growth. Also, restrictions on use of chemical inputs will help reduce the burden on fertilizer subsidies on national scale and minimize use of other agrochemicals at farms scale will ultimately reduce farm input cost.

Initial surveys on adoption of NF indicate that farmers in many states have shown their inclination for adopting NF as documented by NITI Aayog. States such as Andhra Pradesh, Himachal Pradesh, Gujarat, Haryana, Karnataka and Kerala have started promoting natural farming. Implementation of natural farming at a large scale is noticed in the state of Andhra Pradesh. In this context all the State Agricultural Universities and ICAR Institutes must conduct intensive research on NF practices to generate research data base on all aspect of NF to ascertain its merit on crop productivity, ecological benefits, economics of the practices etc so that the marginal and small farmers could practice NF on sustainable basis.

## 1. Research Highlights

### New kit for assessment of soil biological health

AINP SBB has developed a novel kit for assessment of soil biological health based on substrate induced respiration. The kit contains assemblies to incubate soil with a defined substrate along with an indicator “Gel probe” which changes its color based on the amount of CO<sub>2</sub> evolved from soil. The color-change of the gel exhibited positive correlation with measured values of CO<sub>2</sub> evolved and soil biological quality index. The kit is a simple, quick and cost effective to monitor soil biological health without the need of much scientific skill and equipment.



*Soil biological health kit and flow diagram for soil health analysis.*



*Biofuel cell: Cathode driven CH<sub>4</sub> production from CO<sub>2</sub>*

### A novel Biofuel Cell developed using methanogenic consortia

Differential methanogenesis in soil ecosystem for enriching electrode dependent methanogens was evaluated. Methane (CH<sub>4</sub>) production from two sources (acetate and CO<sub>2</sub>+H<sub>2</sub>) was estimated. Soil exhibited higher acetoclastic methanogenesis than hydrogenotrophic pathway. CH<sub>4</sub> production was lower in CO<sub>2</sub>+H<sub>2</sub>. About 50-60 ng CH<sub>4</sub> produced per g of soil in 5000 ppm of H<sub>2</sub> and about 100 ng CH<sub>4</sub> produced per g soil in 10000 ppm of H<sub>2</sub>. Hydrogenotrophic methanogens were further evaluated to test their efficiency to produce CH<sub>4</sub> through electrode (cathode). CH<sub>4</sub> production was 2 ppm at 5000 ppm CO<sub>2</sub> and



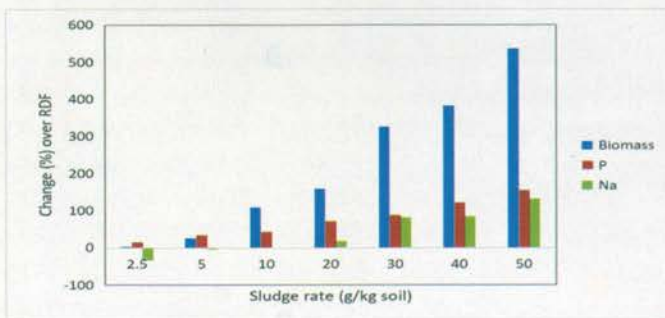


about 4.5 ppm with 10000 ppm CO<sub>2</sub>. Study highlighted that soil had higher acetoclastic methanogens followed by hydrogenotrophic and cathode dependent methanogens. Based on the cathodic methanogenesis, a biofuel cell was developed that can convert CO<sub>2</sub> to CH<sub>4</sub> using methanogenic consortia and setup criteria.

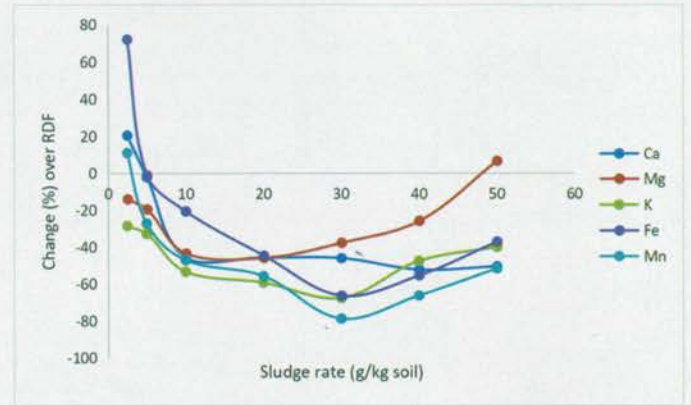
**Industrial sludge induced growth, but reduced nutritional quality of spinach**

Mineral composition of vegetables affects human health as such food items are considered as rich source of several essential mineral nutrients for human like Ca, Fe, P, Zn, Mn. A study was conducted to investigate the impact of sludge (generated from soft beverage industry) application on yield and quality of spinach biomass grown on vertisol. Increasing sludge rates from 2.5 to 50 g/Kg, enhanced leaf biomass growth and P and Na concentrations in leaf tissue progressively. However, application of sludge particularly at higher rates, decreased K, Ca, and Mg concentrations significantly, even though considerable amount of these plant nutrients were added to soil through sludge. Though sludge contained high amount of micronutrients, its application either reduced their (Fe and Mn) or didn't change (Zn and Cu) concentrations in spinach biomass. No significant change in their concentrations of Ni and Cr (considered essential elements for human at small amounts) in biomass tissue was observed due to sludge application.

Dietary Na:K is strongly associated with an increased risk of hypertension and cardiovascular disease. Ideally the ratio should be <1.0. Sludge application @ > 10 g/kg had considerably increased the ratio (1.2 to 3.2) to unsafe level. Sludge also contained high amounts of toxic heavy metals Cd and Pb. Increasing rates of sludge application progressively increased Cd and Pb concentrations in spinach leaves. Overall, the results indicated that the soft beverage industry sludge application decreases the spinach quality from human health point of view, even though it has potential to increase the biomass yield considerably without requiring any additional fertilizers.



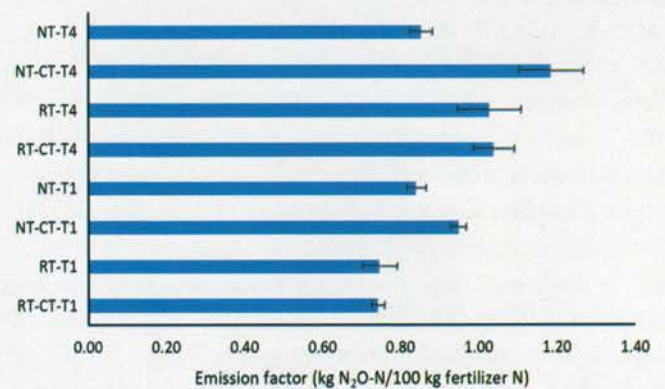
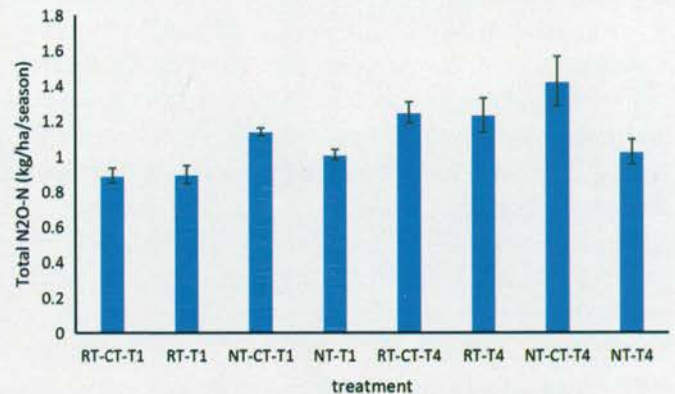
**Changes in biomass yield and P and Na Concentration in spinach due to sludge application**



**Changes in mineral nutrients concentration in spinach biomass due to sludge application**

**Effect of short-term tillage of long-term conservation till soil on nitrous oxide fluxes and yield in Vertisols**

Reducing anthropogenic emission of soil nitrous oxide (N<sub>2</sub>O) is essential to achieve net-zero non-CO<sub>2</sub> greenhouse gas emission. A study examined the short-term effects of tillage of long-term (12 years) conservation till-soil on soil



**Total growing season N<sub>2</sub>O emissions and emission factor for each applied nutrient and tillage combination. Error bars represent standard errors.**



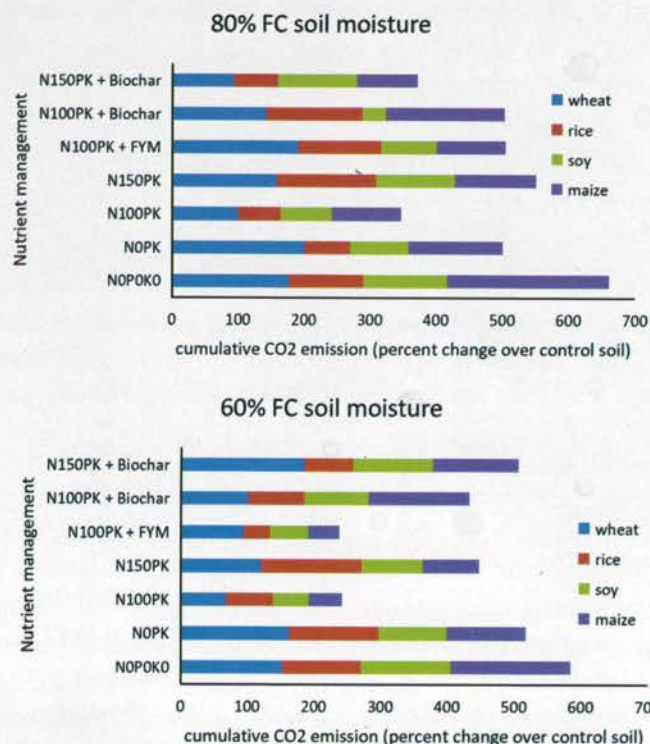


N<sub>2</sub>O fluxes, mineral N, and crop yield in Vertisols of Central India. Four years of tillage reversal on 8 years of conservation tillage experiment caused higher N<sub>2</sub>O emissions in NT-CT (no-tillage converted to conventional tillage) with 100% NPK + FYM @ 2.0 Mg-C/ha than NT (no-tillage) and RT (reduced tillage). Regardless of tillage, integrated use of nutrients was associated with higher N<sub>2</sub>O emissions and higher levels of soil mineral N. The N<sub>2</sub>O emission factors ranged from 0.75 to 1.20 (Fig. 1). The NT-CT treatment recorded highest seed and biomass yield (31% and 22% more than NT). The results suggested that the likely increase in soil N<sub>2</sub>O emission on tillage reversal in no-till plots (NT-CT) could offset the increased carbon sequestration in surface soil layers of no-till treatment but not in reduced till the soil.

### Nutrient management influenced residue and soil carbon mineralization under different soil moisture regimes in Vertisols of India

Crop residue, a key organic C input, has the potential for soil carbon sequestration. We used a laboratory-based soil incubation to test the response of soil carbon mineralization to crop residue type, soil moisture, and how nutrient management modulates these responses. We incorporated crop residues with different qualities (wheat, rice, soybean, and maize) at two soil moisture {80% field capacity (FC) and 60% FC} and under seven nutrient levels: N0P0K0 (no nutrients), N0PK, N100PK, N150PK, N100PK+manure@ 5 Mg ha<sup>-1</sup>, N100PK + biochar@ 5 Mg ha<sup>-1</sup>, N150PK+ biochar@ 5 Mg ha<sup>-1</sup>. The interactive effects of residue, moisture, and nutrient management significantly influenced SOC mineralization. Residue addition triggered the mineralization of SOC to CO<sub>2</sub>, which was significantly greater at higher (80% FC) than lower moisture content (60% FC). CO<sub>2</sub> release was higher by 2.3 (wheat), 2.0 (rice), 1.9 (soybean), and 2.4 (maize) times in residue returned soils compared with control soil. The order of CO<sub>2</sub> release was control < soybean ≈ rice < maize ≈ wheat. Nutrient addition increased the loss of SOC and CO<sub>2</sub> release to the atmosphere in control soil. The total residue C mineralized annually was the highest in wheat (39-86%) and maize (40-94%), followed by rice (32-74%) and soybean (17-58%) residue at 80% FC (Fig. 2). Regardless of soil moisture, the residue C mineralization decreased by 9% (N0PK), 36% (N100PK), 4% (N150PK), 19% (N100PK + Manure), 10% (N100PK + Biochar) and 30% (N150PK + biochar) over N0P0K0 treatment. The findings of the integrated residue–nutrient–moisture management on residue and soil C mineralization can be used to improve the feedback of

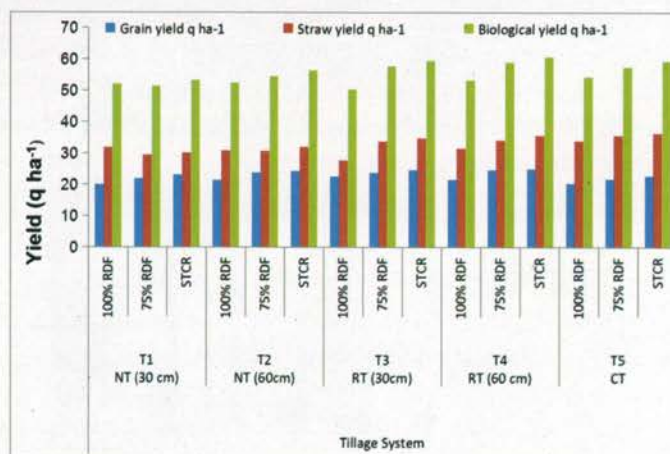
residue return on soil carbon cycle and climate change in agro-ecosystems.



Percent change in apparent residue C mineralization over control soil as influenced by residue types, nutrients, and soil moisture after 87 days of incubation.

### Effect of tillage and nutrient management practices on yield attributes, yield and economics in chickpea

Conservation tillage practices (RT and NT) with crop residue retention (30 and 60cm height) was found as effective as conventional tillage. The yield attributes were significantly influenced by T<sub>4</sub> (RT with 60 cm residue



Effect of tillage and nutrient management practices on grain, stover and biological yield of chickpea



height) followed by T<sub>3</sub> (RT with 30 cm residue height) (Fig. a) which ascribed to highest net return and BC ratio (₹ 60551 ha<sup>-1</sup> and 2.97) over the conventional tillage practice. The nutrient management treatments play a significant role in conservation agricultural management practices. The STCR (N<sub>3</sub>) recorded maximum value of seed pod<sup>-1</sup> (2.00), pod plant<sup>-1</sup> (34.53) and seed index (13.99) which were significantly higher than 100% RDF.

**Development of multi-nutrient mixtures for foliar application in rice, banana and vegetables in Kerala**

The high content of iron in Kerala soils result in the physiological deficiency of other cations such as zinc, copper and even potassium. Therefore, multi-nutrient mixtures were developed at RARS Pattambi (under AICRP-LTFE) using nutrient carriers. The mixture was developed through a number of trials with varied number of sources of nutrients such as Zn, Cu, B, Mo, Fe and Mn. Nutrient carriers were selected as the fillers for the mixture so that unnecessary cost for inert materials can be avoided. The multi-nutrient mixtures suitable for foliar application were developed for rice and banana. The technology is being demonstrated in large areas in different parts of the state.

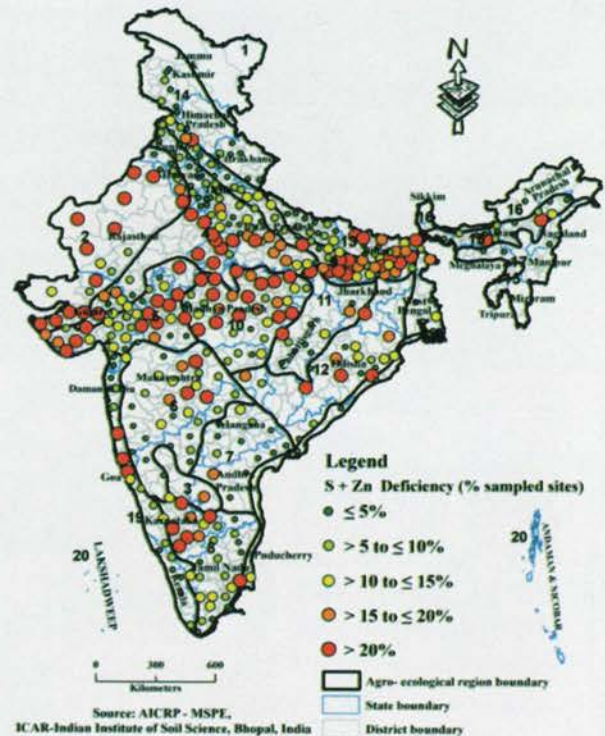


*Multi-nutrient mixtures for foliar application (Pattambi, Kerala under AICRP LTFE)*

**Emerging multi-micronutrients deficiency in agricultural soils**

A study evaluated the single and multi-nutrients deficiencies of sulphur (S) and micronutrients (Zn, B, Fe, Cu and Mn) in agricultural soils of India for their effective management to achieve sustainable crop production, improved nutritional quality in crops and better animal/human health. Analysis of 242827 surface soil samples from 615 districts of 28 states of India indicated variable and widespread deficiencies of S and micronutrients in soils of different states. The deficiencies of S, Zn and B were higher compared to the

deficiencies of Fe, Cu and Mn. There were occurrences of 2 or more micronutrients deficiencies in 0.10 to 9.30% of sampled sites. Number of samples showing multi-nutrients deficiencies followed the order S+Zn > Zn+B > S+B > Zn+Fe > Zn+Mn > S+Fe > Zn+Cu > Fe+B > S+Zn+B > S+Zn+Fe > Zn+Fe+B > Zn+Fe+Cu+Mn > Zn+Fe+Cu+Mn+B. The mean deficiency of S+Zn was in 9.30% (varying from 0.10 to 29.9%) of the sampled sites and was predominantly prevalent in different districts of Bihar, Gujarat, Karnataka, Madhya Pradesh, Odisha, Rajasthan, Uttar Pradesh and Maharashtra (Figure .....).



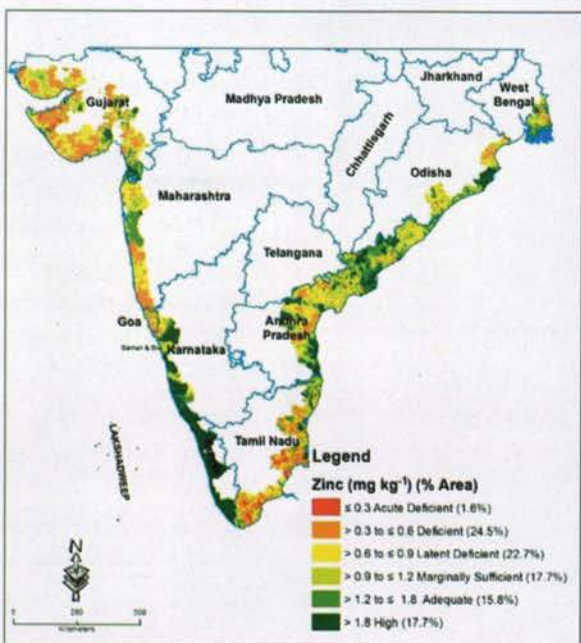
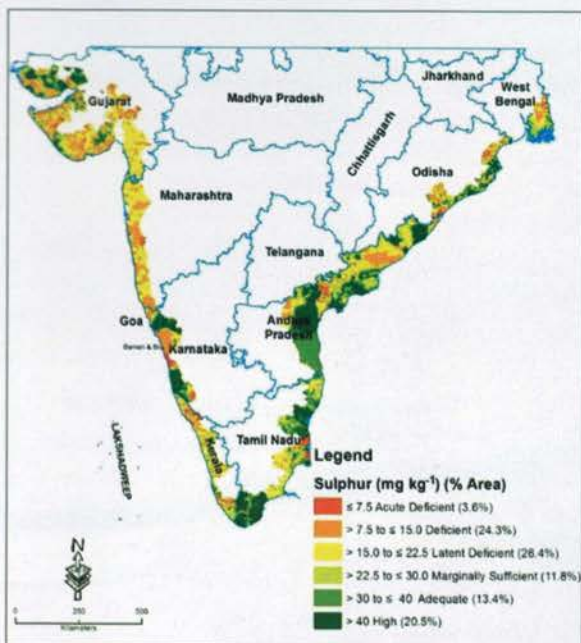
*Distribution of S+ Zn deficiency in soils (% of sampled sites) of different parts of India.*

**Analyzing spatial variability of available sulphur and micronutrients and associated properties in soils of coastal area of India**

Spatial variability in availability of S and micronutrients in soils of coastal area of India was assessed. Altogether 39097 surface soil samples from the farm lands of 68 coastal districts of India were analyzed during 2016 to 2018. Soil parameters had stable, exponential, K-Bessel and spherical semivariogram models with moderate to strong spatial dependence. Available S, Zn, Cu, Fe, Cu, Mn and B were differently correlated among themselves and with soil pH, EC and SOC. The study area had deficiency (including acute deficient, deficient and latent deficient) of available S, Zn,



Fe, Cu, Mn and B in 54, 49, 17, 6, 6 and 46% area, respectively. Site-specific soil-crop management practices could be adopted in the study area based on developed distribution maps of soil parameters.



Distribution maps of available S and available Zn in coastal soils of India

**Promising mustard cultivar under organic management practices identified**

Performance of 12 varieties of mustard was evaluated for their yield response to screen out promising varieties under organic management practices for central India. Plant height

of different varieties was not significantly affected; however, yield attributing parameters such as siliqua/ plant, seeds/siliqua, test weight and yields differed significantly under organic nutrient management. Among the varieties of mustard grown, the cultivar ARAVALI performed better in terms of seed yield (1988 kg ha<sup>-1</sup>) followed by CS-52, RH-749 and MAYA.

**Integrated plant nutrient supply (IPNS) modules improved SOC stock in Vertisols**

Low organic C content in soil is major reason of declining soil health and unsustainable productivity in Vertisols. A field experiment conducted at Bhopal investigated SOC build-up under diverse nutrient management modules (organic, inorganic and IPNS). Nutrient management modules included were chemical fertilizers (NPKZn), farmyard manure (FYM), poultry manure (PM), urban compost (UC) as a source of nutrients along with mulches using maize residue (MRM), glyricidia loppings (GLM). Results showed that the IPNS modules increased the SOC contents, different carbon fractions and their stocks with application of higher amount of FYM (25t ha<sup>-1</sup>) followed by 75% NPK based on STCR along with 5 t ha<sup>-1</sup> FYM as compared to GRD and 100% NPK based on STCR. Among the SOC pools, active pools of C storage contributed nearly 56% and passive pools about 44% in the upper layer (0-15cm) while at lower layer (15-30 cm) of soil, the active pools of C storage was reported about 46% and passive registered about 54% carbon storage. Maize yield was significantly highest with FYM based INM modules (FYM +STCR based 75% NPK) and followed by FYM at 20 t/ha and 75%NPK + poultry manure than general recommended dose (GRD) and 100% NPK based STCR alone. Adoption of STCR based INM modules is found to be the best technology to improve SOC stocks in Vertisols of Central India.

**Placement method influenced *in-situ* decomposition of crop residues**

Crop residue decomposition in field influences soil quality and organic matter formation. Decomposition and nitrogen dynamics from surface-placed and incorporated wheat (*Triticum aestivum* L.), maize (*Zea mays* L.) and soybean (*Glycine max* L.) residues were investigated for 8 months under soybean-wheat cropping sequence using the nylon mesh bag technique. Incorporated residues decomposed faster in comparison to surface retained. Mineralization of C from surface retained crop residues was 64%, 58% and 69% for wheat, maize and soybean respectively; while those



from soil incorporated residues was 75%, 74% and 79% respectively. Nitrogen concentration in surface residues of wheat and maize increased throughout the decomposition cycle due to microbiological immobilization; whereas, N immobilization occurred in first three months only in case of both surface placed and incorporated soybean residues, thereafter net nitrogen mineralization occurred. In case of subsurface incorporated wheat and maize residues, immobilization occurred in initial five months thereafter net N mineralization occurred.

**Performance of rice using different biochars**

Use of biochar is gaining importance for soil carbon sequestration and soil health improvement alongwith crop growth improvement. A field experiment was conducted in Vertisols of Central India to study effect of different biochars usage on rice productivity. Three biochars viz. Wood Biochar (WB), wood coconut husk biochar (WCB) and crop residue biochar (CRB) were used at three doses viz. 0, 4 and 8 t ha<sup>-1</sup> with or without fertilizer and manure. The mean grain yield of rice under WB, manure and fertilizer application varied between 1263 and 3539 kg ha<sup>-1</sup>. While it varied between 1197 - 2931 and 1197 and 2931 kg ha<sup>-1</sup> under WCB and CRB respectively.



Performance of rice under different treatments

**Soils of tribal inhabited areas in M.P. are fertile**

The quality of natural resources play a key role in ensuring the sustainability of any agroecosystem. In a this study, quality of soil and water resources in a tribal agro-ecosystem at south Balaghat forest range, Balaghat district, Madhya Pradesh were investigated. Soils from 22 tribal farmlands were found to be rich in organic C with moderate availability of N, P, K, Zn, Fe, Mn and Cu. Soil Health Cards were developed and nutrient recommendations were made for the rice-fallow organic farming systems. Water quality

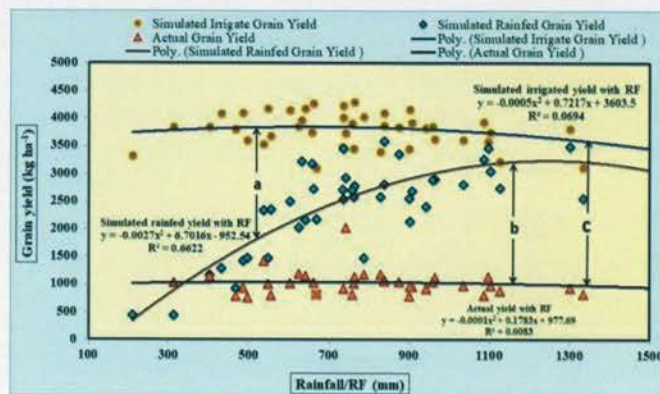
assessment was also attempted. We observed contamination of surface water resources near the tribal farmlands with disease causing fecal coliform bacteria.



Sample collection from different water resources of the tribal villages of Balaghat district.

**Soybean yield gap analysis using DSSAT crop model: A pan India analysis**

The DSSAT model was employed to assess the potential soybean yield and yield gap in different agro-ecological regions of India (total 43 districts). The average simulated yield under irrigated conditions was 3794 kg ha<sup>-1</sup> as against the simulated average rainfed yield of 2446 kg ha<sup>-1</sup>, which indicated a 35.52% reduction in grain yield due to adverse moisture conditions under rainfed ecosystems. However, the average actual (farmers) yield across 43 districts of India is 1025 kg ha<sup>-1</sup> under rainfed ecosystem and which was 2769 and 1421 kg ha<sup>-1</sup> lower than irrigated and rainfed potential yield, respectively.



Soybean Yield gap (a) between simulated water non-limiting and water limiting yield, (b) between simulated water-limiting and actual yield and (c) between simulated water non-limiting and actual yield or total yield gap)

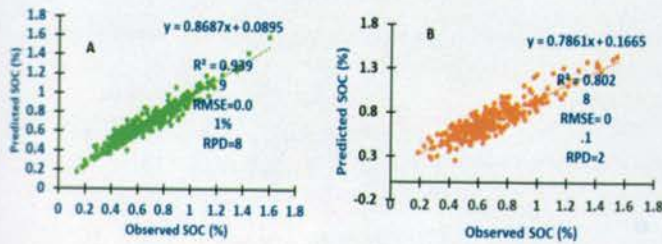
**Rapid soil organic carbon estimation using visible-near infrared (VNIR) spectroscopy**

Infrared spectroscopy (IR) is an emerging technology for rapid, repetitive, non-destructive characterization of soil health parameters. A machine learning-based chemometric model was developed for rapid estimation of soil organic





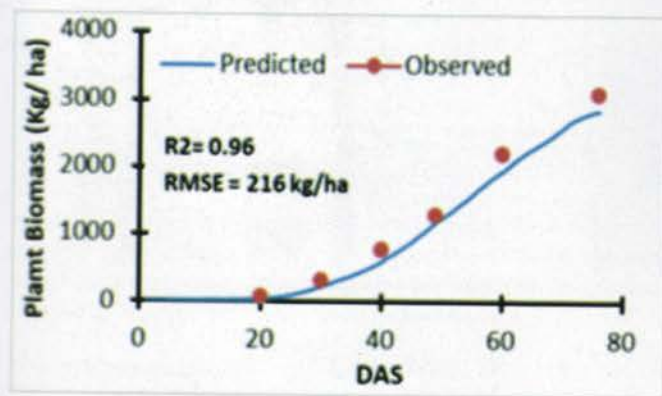
carbon (SOC) in Vertisol of central India using the Visible-Near Infrared (VNIR) spectroscopy on the basis of analytical results of 1036 random geo-referenced surface soil samples. Three chemometric regression techniques, viz., partial least square regression (PLSR), random forest (RF), and support vector machines (SVM) were compared to identify the model best suited for the prediction of soil organic carbon. Based on the coefficient of determination ( $R^2$ ), Root mean square error (RMSE), and the ratio of performance of deviation (RPD), the SVM based predictive models performed better than the other two regression techniques in SOC prediction



Observed and predicted SOC for (a) training, (b) testing datasets.

Calibration of APSIM model for simulating summer green gram yield in central India.

APSIM green gram module for IPM 205-7 (Virat) cultivar was calibrated for central India (Figure). The RMSE and  $R^2$  between the observed and predicted plant biomass were 216 kg/ha and 0.96. The difference between the observed and predicted days of flowering and maturity were reported as 1 and 2 days, respectively. It showed the model is well calibrated for the analysis of the different scenarios after the validation.

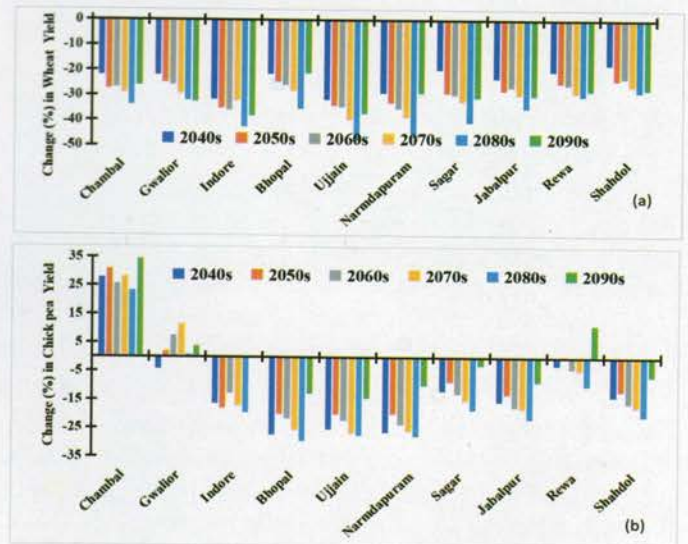


Relation between observed and simulated plant variables of green gram.

Variables	Observed	Predicted
Days of Flowering (DAS)	33	34
Days of Maturity (DAS)	76	78
Crop yield (Kg/ha)	1050	1133
Biomass (kg/ha)	2700	3100

Impact of climate change on wheat and chickpea production in Central India predicted.

The decadal impact of climate change on wheat and chickpea productivity was assessed using a well-calibrated and tested APSIM model in central India using the ensemble global climate models (GCM). The GCMs, namely BCC-CSM1-1, BCC-CSM1-1-M, GFDL-CM3, GFDL-ESM2G, GFDL - ESM2M, GISS - E2 - H, and GISS - E2 - R, were ensemble to generate future climate data (2040–2090) for central India, under scenarios RCP4.5 and RCP8.5. Overall, a decrease of up to 45% of wheat grain yield and 27% of chickpea yield was reported in varying decades under the RCPs studies. However, the chickpea yield was seen as an increasing trend in the Chambal division. The trend of decrease in wheat yield followed as Ujjain>Indore>Narmadapuram>Sagar>Jabalpur division; however, for the chickpea, the trend followed as Bhopal>Ujjain>Narmadapuram>Jabalpur>Indore.



Decadal change in (a) wheat (b) chickpea grain yield under the influence of different climatic scenarios.



## Program Held

## Training / Awareness Week / Field Day

Organized 01 days Mass Awareness Campaign on Organic Farming, Jointly by ICAR-IISS and ICAR-IIFSR, Modipuram on 6<sup>th</sup> August 2021.

Organized 01-day farmer's training under "International Year of Millets 2023" at ICAR-IISS, Bhopal on 17<sup>th</sup> September 2021

Organized 01 days Farmer's Scientists Interface Programme on "Climate Resilient Varieties, Technologies and Practices" Organized by ICAR-IISS Bhopal on 28<sup>th</sup> September 2021.

Organized 05 days training cum exposure visit at ICAR-IISS, Bhopal for the tribal farmers of Betul District from 25-29<sup>th</sup> October 2021.

Organized Soil Health Awareness Week during 1-7<sup>th</sup> December 2021

A field day was organized for the tribal farmers at Kaweli, Kulpa and Sarra villages of Balaghat district on 11<sup>th</sup> October 2021

ICAR-IISS, Bhopal and ICAR-IIFSR, Modipuram, Meerut-jointly organized an awareness campaign on organic farming among the state holders on 6<sup>th</sup> August 2021

Conducted a five days training-cum exposure visit programme for the beneficiary farmers of the Institute TSP project during 25-29<sup>th</sup> October 2021.

Seed (wheat, chickpea) and fertilizer were distributed to 21 SC farmers from different villages at . Tarasewania, Pipalia Chhapparband, Bagoniya and Jhapadia of Bhopal district for FLD on INM and Balance fertilizers.

## Program Organized under Azadi ka Amrit Mahotsav

An e-Gosthi organised on "Resource conservation technology for sustainable soil health management" 13<sup>th</sup> July 2021

"Advanced composting technology using microbial inoculants and earthworms" on 12<sup>th</sup> July 2021, at Rasuliya Pathar.

Female scientists of ICAR-IISS organized "Vriksharopan Karyakram" on 22<sup>nd</sup> July 2021, at IISS Farm under Van Mahotsav.

National Campaign on "Agriculture and Environment: the citizen face" on 26<sup>th</sup> Nov 2021

National Nutritional Week from 1-7<sup>th</sup> September 2021 by ICAR-IISS Bhopal in collaboration with the Bhopal Chapter of the NAAS

## Program organize under Swachhta Action Plan

A Special Swachhta Campaign was conducted in MGMG Group-3 villages namely Choprakala and Sukhi Sewania on 20<sup>th</sup> October 2021

"Organized a special national swachhta campaign on "Waste to Wealth" on 22<sup>th</sup> October 2021 at Village Golkhedi.

Organized "Van Mahotsav Week" from 10<sup>th</sup> to 16<sup>th</sup> July 2021 at ICAR-IISS, Bhopal.

Organized a Swachhta Campaign under MGMG Group I at Arvalia Village, Tehsil- Huzur, Block- Phanda, District- Bhopal on 12<sup>th</sup> October 2021.

Vishesh Sawachtha Abhiyan conducted on 6<sup>th</sup> October 2021 at Raipur village

Swachhata Pakhwara at SCSP village Distribution of agri-inputs to the SC farmers for front line demonstration



**Soil Health Awareness Week Celebrated at ICAR-IISS, Bhopal on the Occasion of World Soil Day**

Soil health awareness week was celebrated at ICAR-Indian Institute of Soil Science, Bhopal during December 01-07, 2021. This is on the occasion of World Soil Day (WSD) celebrated every year by Food and Agricultural Organization of the United Nations on December 05. This year's theme of WSD is "Halt Soil Salinization, Boost Soil Productivity". A massive March Past was organized by ICAR-IISS to spread awareness among the public on the importance of soils in human life and protection of this precious resource. On the occasion Dr Ashok K Patra, Director, told that as per FAO about 9% of the soils of the planet earth are affected by salinity or sodicity. In India there is about 6.73 million hectares of salt affected soils and it is increasing. If this is not corrected this will pose threat on the existence of future generations. He also gave TV and radio talks for mass awareness. Under this celebration series of farmer scientist interaction meet was organised at village Khamkheda, Dist Bhopal, (M.P.) and in the research farm of IISS, Bhopal.



**Fit India Freedom Run 2.0**

ICAR-IISS organized Fit India Freedom Run to commemorate the Azadi Ka Amrit Mahotsav during 13 August to 02 October 2021. All the staff of IISS walked daily in their best capacity and covered a distance of about 5800 km. Also a marathon was also organized on 15 September, 2022 in which all the staff participated with enthusiasm and showed solidarity to their concern to a sound physical health.



**Biochar Project Initiation Meeting**

Launching workshop of Biochar project on "Sustainable biochar production agroforestry systems and its application: A climate resilient soil management approach" was organized in Virtual Mode on 05 July 2021. It was attended by representative from GIZ, IIFOR-ICRAF and IISS Bhopal namely Dr. Jonas, Dr. Javed Rizvi, Dr. SK Dhyani, Dr. Aqeel Rizvi and Team members from ICAR-IISS Bhopal.





### Constitution Day

ICAR-Indian Institute of Soil Science celebrated the Constitution Day on 26<sup>th</sup> November 2021. All the staff of ICAR-IISS and students from Govt. Sardar Patel Senior Secondary School and Brigadier Trivedi Memorial Higher Secondary School, Bhopal attended to the live telecast on DD Sansad TV by the President, Vice President, Prime Minister and the Lok Sabha Speaker. There were more than 100 participants. A quiz competition was conducted for the students. A guest lecture was delivered by Mr. Shubham Upadhyay, Advocate and Co-Founder Judiciary Gold, Bhopal.



### 3. Awards/Honors/Recognitions

Dr. Dinesh K Yadav received “SPS India Best Ph.D. Thesis Award-2021” by Society of Pesticide Science India, ICAR-IARI, New Delhi (December 2021).

Dr. Dinesh K Yadav member of Technical Committee of 9<sup>th</sup> International Conference on Environment Pollution and Prevention (ICEPP 2021) from 19-21, November 2021 in Sydney, Australia organized by Hong Kong Chemical, Biological & Environmental Engineering Society (HKCBEEES), Hong Kong.

Dr Dhiraj Kumar, RH Wanjari, NK Sinha, Monoranjan Mohanty, Alok Tiwari, Vinay Bachkaiya and AK Patra received Best Oral presentation Award in the Virtual National Seminar on “Advances in Sustainable Management of Natural Resources for Food and Nutritional Security” from August 26 to 27th, 2021.

Dr. Arvind Kumar Shukla received Rafi Ahmed Kidwai Award for Outstanding Research in Agricultural Sciences

(Natural Resources Management and Agricultural Engineering) - 2020 from ICAR, New Delhi.

Dr. Arvind Kumar Shukla received NAAS Recognition Award 2021 (Soil, water and environmental sciences) from National Academy of Agricultural Sciences, New Delhi.

Dr. Arvind Kumar Shukla and Dr. Sanjib Kumar Behera received Dhuru Morarji Memorial Award for Best Article in Agricultural Sciences 2020-21 by Fertilizer Association of India, New Delhi.

Dr. J.K. Thakur received distinguished Scientist Award from Green Agri Professional Society, Dhanbad, Jharkhand-2021.

Dr. J.K. Thakur received best oral presentation awards in 3<sup>rd</sup> international conference on Food, Agriculture and Innovations (ICFAI) held during 24<sup>th</sup>-26<sup>th</sup> December, 2021 at Holiday Home, Ranchi, Jharkhand.

Dr. Asha Sahu Awarded “Young Scientist Award 2021” by National Environmental Science Academy during the International Conference on “Promoting Environmental Technologies for Waste Management and Sustainable Development (WMSD-2021)” during 12-13 December 2021 at Kalinga Institute of Industrial Technology, Bhubaneswar, Odisha.

Dr. Gurav Priya Pandurang received Best Young Scientist Award, EET CRS 10th Science and Technology Awards - 2021, Bangalore.

Dr. Gurav Priya Pandurang received NESA YOUNG SCIENTIST OF THE YEAR AWARD 2021, National Environmental Science Academy, New Delhi.

Dr. Gurav Priya Pandurang received Best PhD thesis presentation award in 23rd Annual Convention and National Conference on “Application of Clay and Allied Sciences in Agriculture, Environment and Industry” held during December 22-23, 2021 at ICAR-IARI, New Delhi 110012.

Dr. Gurav Priya Pandurang elected as a Councilor, Central Zone of the Clay Minerals Society of India (CMSI) for the years 2022 and 2023.

Dr. Narayan Lal received Innovative Article Award by Agriculture and Food –newsletter, Balurghat, Beltalpark, Dakshin Dinajpur, West Bengal, India.

Dr Nishant K Sinha received the ISSS- Dr J. S. P. Yadav memorial award for excellence in soil science during the 85<sup>th</sup> Annual convention of Indian society of soil Science, November 16-19, 2021 at Visva-Bharati (Central University), Sriniketan.

Dr Nishant K Sinha received the best oral presentation award during the 3<sup>rd</sup> International Conference on Food,





Agriculture, and innovations (3<sup>rd</sup> ICFAI), December 24-26, 2021 at Ranchi.

Dr Nishant K Sinha received the distinguished scientist award during the 3<sup>rd</sup> International Conference on Food, Agriculture, and innovations (3<sup>rd</sup> ICFAI), December 24-26, 2021 at Ranchi.

#### 4. International collaborations

An International collaborative project proposal entitled "Do agricultural micro plastics undermine food security and sustainable development in less economically developed countries?" granted by NERC-GCRE of UKRI, UK Govt. and approved by ICAR/DARE (F. No. GA-7/1/2021-IC-IV; dated the 12th January 2021)

An international project funded by DST India and CEFIPRA France on 'Phyllosphere methylotroph driven bioconversion of atmospheric greenhouse gas and volatiles to plant metabolites leveraging primary productivity in major crops and mitigation of climate change' has been initiated. Collaborator is Dr Francois Bringel, Director CNRS, University of Strausbourg, France. The project will be funded for 3 years.

#### 5. Staff news

##### Staff promoted

1. Smt Seema Sahu promoted to the CTO from ACTO w.e.f 01<sup>st</sup> April 2019.
2. Smt Nirmala Mahajan promoted to the CTO from ACTO w.e.f 15<sup>th</sup> March 2020.3. Shri Jai Singh promoted to the ACTO from STO w.e.f 22<sup>nd</sup> May 2020
4. Shri Sukhram Sen promoted to the TO from STA w.e.f 29<sup>th</sup> June 2021
5. Late Shri Vinod Choudhari promoted to the TO from STA w.e.f 29<sup>th</sup> June 2021
6. Shri Sant Kumar Rai promoted to the STA from TA w.e.f 22<sup>nd</sup> May 2019
7. Shri Janeshwar Prasad promoted to the Assistant from UDC w.e.f 27<sup>th</sup> Dec 2021
8. Shri Omprakash Yadav promoted to the Assistant from UDC w.e.f 27<sup>th</sup> Dec 2021
9. Shri Sanjay Katenga promoted to the UDC from LDC w.e.f 24<sup>th</sup> July 2021
10. Smt Raksha Dixit promoted to the UDC from LDC w.e.f 27<sup>th</sup> Dec 2021
11. Smt Babita Tiwari promoted to the AAO from Assistant w.e.f 26<sup>th</sup> July 2021
12. Smt Yojna Meshram promoted to the Private secretary from Personal Assistant w.e.f 24<sup>th</sup> July 2021

#### New Staff Joined the Institute

1. Shri Mahesh Kumar Mulani joined the institute as Sr. F & AO on 13<sup>th</sup> Oct 2021

#### Staff transferred from Institute

1. Shri Rajesh Dubey AF & AO transferred to ICAR CIAE as F & AO w.e.f 5<sup>th</sup> Nov 2021

#### Staff superannuated from Institute

1. Shri S. K Gupta, CAO, superannuated on 30<sup>th</sup> Sept 2021

#### 6. Transfer of technologies

##### Training for Tribal Farmers at ICAR-IISS Bhopal

A five days training-cum-exposure visit on "Resource



"Conservation Technologies for the Tribal Farmlands of Madhya Pradesh" was organized for the tribal farmers of Betul district (M.P.) during 25-29 October, 2021. The programme was organized under the STC/TSP project of the institute "Enhancement of soil health and livelihood of tribals in Central India".

#### Front line demonstration of vermicomposting of agrowastes

Thirty Front line demonstration (FLDs) of vermicomposting of agro-waste using Silpaulin Vermibeds were carried out at different villages i.e., Tarasewania,



Pipalia Chhparaband, Bagoniya and Jhpadia of Bhopal district

**Livelihood and ITK Survey in the tribal villages of Betul**

The Livelihood and ITK surveys were carried out in tribal dominated villages viz., Charban, Ghisi Bagla and Kanhegon of Betul district in Madhya Pradesh during July-September, 2021 revealed that agriculture is the sole source of livelihood for tribal population, where average farm land holding size is 1-2 hectares. In the hilly terrain, soils are shallow red/black type with low-medium fertility status. Low input agriculture systems in the area face the challenges of water scarcity, low productivity and low income. Average crop yields for major crops was recorded as 28 q ha<sup>-1</sup> for maize, 10 q ha<sup>-1</sup> for soybean, 10 q ha<sup>-1</sup> for groundnut, 23q ha<sup>-1</sup> for paddy, 33 q ha<sup>-1</sup> for wheat and 13q ha<sup>-1</sup> for gram crops. Average gross income of farmers ranged between Rs. 40000



**Indigenous agricultural technologies practiced by tribal farmers of Betul district (M.P.)**

and Rs. 60000/ha based on the marketed surplus. Major indigenous agricultural technologies in the area came out during the survey are: land preparation using traditional wooden plough locally known as *Bakhar*, sowing of seeds using bamboo pipe, construction of trenches for rain water harvesting and soil moisture conservation through mulching, dusting wood ash for the management of sucking pests in vegetable crops, spraying of tobacco decoction to control shoot and fruit borer in brinjal, and use of *Cleistanthus collinus* leaf extract to control yellow stem borer in rice. Tribal farmers use traditional fish trap made up

of bamboo splits to catch fish and use extracts of *Terminalia chebula* and *T.bellerica* to control some animal diseases.

**Field Day-cum-Farmer Scientist interface meeting at Balaghat**

A Field day was organized at Kaweli village of Balaghat district on 11 October 2021 and Sarra village on 12 October 2021. The scientists of ICAR-IISS visited the tribal farm fields to observe the performance of their traditionally grown rice crop. Field demonstration were done on the nutrient deficiency symptoms, pest infestations, and major weeds detected in field and farmers were informed about the causes and remedies for the same. A farmer-scientist interface meeting was also organized for the tribal farmers of the Kaweli, Kulpa and Sarra villages to understand about



**Farmer Field Day and Farmer-Scientist interface meeting organized for the tribal farmers at Balaghat district**



**FLDs on bio formulations for paddy and soybean in the tribal fields of Betul district (M.P)**





possible hurdles in adopting the soil health card based nutrient recommendation given by ICAR-IISS Bhopal. Soil health cards were distributed to tribal framers along with cuttings of Gliricidia and seeds of winter vegetables.

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

Under the STC (TSP) project of Indian Council of Agricultural Research, FLDs on bio formulations were carried out in 200 tribal farm fields of Betul district (MP) during the *Kharif* season of 2021 for three crops viz., soybean (40), maize (130) and paddy (30). Under the nutrient management intervention, a combination of farmyard manure (FYM), chemical fertilizers (CF) and different bio formulations (bio fertilizers, bio pesticides, and bio fungicides) were used. The yield advantage of the intervention was 27.5% in soybean, 21.5% in maize and 25.7 in paddy over the farmers' practice (FYM+CF).

**Frontline demonstrations in farmers' fields under Scheduled Caste Sub Plan (SCSP)**

Frontline demonstrations (FLD) were carried out in SCSP adopted villages for demonstration of Integrated Nutrient Management and Balanced fertilizer application for improvement of soil health and crop productivity during kharif season 2021. The adopted villages were Sahapur, Kuthar, Kachibadkhedi, Sagoni, Tarasewania, Pipalia Chhapparband, Bagoniya, Jhapadia, Raipur, Kanera, Khichital, karond Khurd, Khamkheda, Binapur, Ratua, Hinotisadak, Taraisewaniya, Bagoniya, Pipalia Chhapparband, and Jhapadia in Bhopal district. Agricultural inputs like seeds (Wheat and Chickpea), fertilizers, sprayers, pesticides and herbicides, mineral mixtures were distributed to about 800 farmers. To promote vermi composting of agri-wastes, Silpaulin vermibeds were also distributed to 66 farmers from Tarasewania, Pipalia Chhapparband, Bagoniya and Jhapadia villages of Bhopal district. A field day was also conducted on this technology.

**Input distribution, interacting with farmers and sensitizing school children about composting and swachhata under SCSP program**



**Distribution of soil health card and awareness campaign for climate smart technologies**

EPCO project team organized Farmers seminar on “Climate Smart Technologies” and “Soil Health Card Usage” to sensitize the farm men and women on adaptation and mitigation strategies in agriculture for climate change and site specific nutrient management based on soil health assessment for the forty adopted villages of climatically vulnerable district of Rajgarh and Sehore in Madhya Pradesh from 26<sup>th</sup> to 30<sup>th</sup> Oct. 2021 and 16<sup>th</sup> to 19<sup>th</sup> Nov. 2021.





**Demonstration on Agricultural Technology for conversion of Waste to wealth**

Swachta Pakhwada was celebrated during 16-31 December 2021. Under this program, technologies were demonstrated at the farmers' field for the purpose of demonstrating their potential to contribute to the cleanliness in the society. The technologies demonstrated were sprinkler irrigation, no-tillage, residue incorporation in the field, vermicomposting and nutrient management. A field day on Vermicomposting and nutrient management for safe disposal of the waste was conducted in the Raipur where approximately 20 farmers participated.



**Television programme:**

- Dr. A. B. Singh had delivered Radio talk on “Javik Kheti Me Poshak Tatva Prabandhan” 11<sup>th</sup> December 2021 at Prasar Bharati, All India Radio/Doordarshan Bhopal.
- Dr. A. B. Singh had delivered Radio talk on “HELLO GRAMA SABHA” dated 17<sup>th</sup> October 2021 at Prasar Bharati, All India Radio/Doordarshan Bhopal.
- Dr. A. K Patra had delivered Radio and TV talk on “Halt Soil Salinization, Boost Soil Productivity” dated 5<sup>th</sup> Dec 2021 at Prasar Bharati, All India Radio/Doordarshan Bhopal.



**Scientists Participation in Training / Seminar / Workshop**

Name	Programme attended/participated	Venue	Date
Dr. M.V. Coumar	International Conference on Innovative and Current Advances in Agriculture and Allied Science (ICAAAS-2001)	Meerut (UP)	19-21 July, 2021
Drs. AK Patra, A Sahu, S Bhattacharjya, JK Thakur, A Mandal, N.K. Sinha, M. Mohanty	22 <sup>nd</sup> World Congress of Soil Science 2022	Glasgow, U.K.	31 <sup>st</sup> July to 5 <sup>th</sup> August, 2021
All Scientists	Webinar on “Finalization of Protocol for Analysis of Soil, Water and Ash Samples”	ICAR-IISS, Bhopal	9-10 August, 2021





Dr. Nisha Sahu	International Webinar on "New Innovative Approaches for Improving Agriculture Productivity".	Eklavya University, Damoh, (M.P.)	10 <sup>th</sup> August, 2021
Dr. Nisha Sahu	Webinar on "Conquering Intricacies on Citations and References".	WILEY	24 <sup>th</sup> August, 2021
All Scientists	Farmer's Training on "Food and Nutrition for Farmers".	ICAR-IISS, Bhopal	26 <sup>th</sup> August, 2021
Dr. Nisha Sahu	Webinar on "Agricultural residues conversion to Biofuels through solar powered microwave pyrolysis".	ICAR-RCEC, Patna, Bihar	27 August, 2021
Drs. AB Singh, Dhiraj Kumar, Nisha Sahu, Asha Sahu, S Bhattacharjya, AK Biswas, PP Gurav, K Rani, DK Yadav, R Mishra, A Das	International Webinar on "Alternate Cropping Systems for Climate Change and Resource Conservation"	ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut	29 September to 01 October 2021.
Dr. Shinogi KC	National Seminar of Indian Society of Extension Education on "Transforming Indian Agriculture through Pluralistic & Innovation Extension Approaches for Self Reliant India"	BHU, Varanasi	4-6 October, 2021
Dr. Shinogi KC	3rd International Conference, Global Initiatives in Agricultural, Forestry	Shri Guru Ram Rai University, Dehradun, Uttarakhand	17-18 October, 2021
Drs. Nisha Sahu, Asha Sahu, S Bhattacharjya, K Rani, DK Yadav, A Das	Global Symposium on Salt affected Soils GSAS21	FAO	20-22 October, 2021
Drs. AK Biswas, Nisha Sahu, R Mishra	International Webinar on "Fighting the Hunger Using Smart Technology"	ICAR Indian Institute of Oil Palm Research, Pedavegi, Andhra Pradesh	26 October 2021
Dr. Nisha Sahu	Webinar on Crop Diversification: A way towards nutritional security	ICAR-Research Complex for Eastern Region, Patna	26 October, 2021



Drs. Lenka, NK Lenka, AB Singh, AK Biswas, Dhiraj Kumar, N Sahu, A Sahu, J Kumar, P Dey, MV Coumar, A Sarkar, NK Sinha, B.P. Meena, A.O. Shirale, K Rani, A Das, Mandal, S Bhattacharjya, R Elanchezhian, J Somasundaram, RH Wanjari	85 <sup>th</sup> Annual Convention of the Indian Society of Soil Science	Visva Bharati, Sriniketan, West Bengal	16-19 November, 2021
Drs. JK Thakur, Nisha Sahu, Narayan Lal, N.K. Sinha	3 <sup>rd</sup> International Conference on Food, Agriculture and Innovations	Ranchi, Jharkhand	24-26 December, 2021
Dr. JK Saha	Geo environment 2021: International Webinar on "Landfill Mining: Experiences in India and Global Perspectives"	IIT, Delhi	4-6 August, 2021
Dr. JK Saha	Webinar on Decentralized Management of Segregated Organic Waste	Centre for Science and Environment, New Delhi	12 <sup>th</sup> August, 2021
Drs. RH Wanjari, RK Singh, M Vassanda Coumar, Shinogi KC, Dhiraj Kumar and Mr. Rahul Mishra	Virtual National Seminar on " Advances in Sustainable Management of Natural Resources for Food and Nutritional Security"	Navsari Agriculture University	26-27 August, 2021
All Scientists	Mass Awareness Campaign on Organic Farming	ICAR-IISS, Bhopal and ICAR-IIFSR, Modipuram.	06 <sup>th</sup> August, 2021
Drs. RH Wanjari, BP Meena, AK Vishwakarma, Sangeeta Lenka, NK Lenka, M Mohanty N K Sinha, Immanuel C Hoakip	5 <sup>th</sup> International Agronomy Conference on "Agri-Innovations to Combat Food and Nutrition Challenges"	PJTSAU, Hyderabad	23-27 November, 2021
All Scientists	Webinar on "Relevance of Constitution in our life"	ICAR	25 <sup>th</sup> November, 2021
All Scientists	World Soil Day 2021 Celebration (online)	FAO, Rome	3 <sup>rd</sup> December, 2021
Dr. AK Biswas and Dr. Khushboo Rani	National Seminar on "Rice Fallow Management in Eastern India"	ICAR-RCER, Patna	26 <sup>th</sup> August 2021
Dr. BL Lakaria	Workshop under the project " <i>Sustainable Biochar Production Through Agroforestry Systems and Its Application</i> "	IIFOR-ICRAF, Balangir, Odisha	27-29 October, 2021
Drs. N K Sinha, J Somasundaram, Jitendra Kumar, Khushboo Rani, and Mr. Abinash Das	XV Agricultural Science Congress and ASC Expo 2021	BHU, Varanasi.	13-16 November, 2021





Drs. RH Wanjari, RK Singh, M Vassanda Coumar, Shinogi KC, Dhiraj Kumar and Mr. Rahul Mishra	Virtual National Seminar on "Advances in Sustainable Management of Natural Resources for Food and Nutritional Security"	Navsari Agriculture University	26-27 August, 2021
All Scientists	Mass Awareness Campaign on Organic Farming	ICAR-IISS, Bhopal and ICAR-IIFSR, Modipuram.	06 <sup>th</sup> August, 2021
Drs. RH Wanjari, BP Meena, AK Vishwakarma, Sangeeta Lenka, NK Lenka, M Mohanty N K Sinha, Immanuel C Hoakip	5 <sup>th</sup> International Agronomy Conference on "Agri-Innovations to Combat Food and Nutrition Challenges"	PJTSAU, Hyderabad	23-27 November, 2021
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Drs. N K Sinha, J Somasundaram, Jitendra Kumar, Khushboo Rani, and Mr. Abinash Das	XV Agricultural Science Congress and ASC Expo 2021	BHU, Varanasi.	13-16 November, 2021
Dr. Nishant K Sinha	3rd International Conference on Food, Agriculture, and innovations	Ranchi	24-26 December, 2021
Dr. Nishant K Sinha	National seminar cum workshop on "Application of Space Technology and Artificial Intelligence for Climate Resilient Agriculture and Disaster Management"	BIT Mesra, Ranchi	29-30 October, 2021
Dr. Jitendra Kumar	Webinar-cum-Training on "Modelling Soil Physical Processes for Improving Resource Use Efficiency in Agriculture	ICAR-Azadi Ka Amrut Mahotsav'	08 <sup>th</sup> December, 2021
Drs. AK Patra and Pradip Dey, AK Shukla, SR Mohanty	ICAR- Directors' Conference (virtual)	ICAR, New Delhi	02 <sup>nd</sup> July, 2021



Dr. Sangeeta Lenka	Workshop on the prevention of sexual harassment at the workplace	ISTM, New Delhi	19 -20 July, 2021
Drs RH Wanjari and Dhiraj Kumar	National Symposium on 'Role of Agricultural Engineering on Economic Development and Self reliance under circumstance emerged due to COVID-19 in the Country'	ICAR-CIAE, Bhopal	28 -29 July, 2021
All Scientists	ASCI webinar on 'Smart Water Technologies - Innovation and Adoption'	ICAR	30 <sup>th</sup> July, 2021
Dr. RH Wanjari	National Webinar on 'Weed Management'	BCKV Mohanpur	6 <sup>th</sup> August, 2021
Dr. RH Wanjari	Webinar on "The parthenium Weed Problem and its Management at the Global Level"	ICAR - DWR, Jabalpur	16 <sup>th</sup> August 2021.
Dr. Pradip Dey	EUROSOIL 2021 workshop "Regulatory Systems of Soil Protection in Europe – What works, what doesn't"	EUROSOIL	24 <sup>th</sup> August, 2021
Dr. Pradip Dey	International Webinar on "Natural Resource Management for Agriculture - Potentials and Prospects"	TNAU, Coimbatore	23-27 August, 2021
Dr. DK Yadav	National webinar on "Integrated Pest Management: A Paradigm Shift"	ICAR-NCIPM, New, Delhi	28 <sup>th</sup> August, 2021
Dr. R Elanchezhian	Lawrence Bogorad Memorial Symposium on "Current Research Trends in Photosynthesis"	Indian Society for Plant Physiology New Delhi	29 <sup>th</sup> August 2021
Dr. Nisha Sahu	Online training programme on "Strategies for Climate Risk Management and Resilient Farming"	ICAR-CRIDA, Hyderabad	20-24 September, 2021
Dr. M Vassanda Coumar	International Conference on Recent Advances in Agriculture, Engineering and Biotechnology for Food Security	Virtual	25-26 September, 2021
Dr. J K Saha	3 <sup>rd</sup> Virtual Conference under National Mission on Use of Biomass in Thermal Power Plants	CIMFRI, Dhanbad	12 <sup>th</sup> October, 2021
Dr. Pradip Dey	GLOSOLAN Soil Spectroscopy Webinar	Framework of the Global Soil Laboratory Network	14 and 28 October 2021
Dr. DK Yadav	9 <sup>th</sup> International Conference on Environment, Pollution and Prevention (ICEPP 2021), Sydney, Australia	HKCBEEES, Hong Kong	19-21 November, 2021
Dr. Pradip Dey	DST National online Training Program on "Integrated Nutrient Management and Nutrient Budgeting through Advanced Models to improve Crop Productivity"	ICAR-IISWC Research Center, Udhagamandalam Otty	29 <sup>th</sup> November, 2021 and 3 <sup>rd</sup> December, 2021





Dr. Pradip Dey	DST National online Training Program on "Integrated Nutrient Management and Nutrient Budgeting through Advanced Models to improve Crop Productivity"	ICAR-IISWC Research Center, Udhagamandalam Otty	29 <sup>th</sup> November, 2021 and 3 <sup>rd</sup> December, 2021
Dr. N K Lenka	Training program on "Advances in Web & Mobile Applications Development"	ICAR- NAARM, Hyderabad	6-10 December, 2021
Drs. R Elanchezhian and Sangeeta Lenka	National Conference of Plant Physiology	ICAR-NIASM Baramati	9-11 December, 2021
Dr. Priya Gurav and Abinash Das	23 <sup>rd</sup> Annual Convention and National Conference of "The Clay Mineral Society of India (CMSI)"	ICAR-IARI, New Delhi	22-23 December, 2021
Dr. AB Singh	Online Course in Organic Certification	UAS, Dharwad	26-28 July, 2021
Dr. AB Singh	ISAE Webinar – Automation in Agriculture	ISAE, New Delhi	25 <sup>th</sup> September, 2021
Dr. Asha Sahu, Dr. S. Bhattacharjya	Training workshop on "Analysis of Multi - Location Experiments"	ICAR-NAARM, Hyderabad	28-30 October, 2021
Dr. Asha Sahu	International Conference on "Promoting Environmental Technologies for Waste Management and Sustainable Development (WMSD -2021)"	KIIT, Bhubaneswar	12-13 December, 2021
Dr. JK Thakur	Online workshop cum training on Applications of Bioinformatics Tools in Agricultural Research	UBKV, West Bengal	20-30 September, 2021
Drs. Dinesh K Yadav, Khushboo Rani, Abinash Das	International Virtual Workshop on Soil Carbon for Sustainable Crop Production and Soil Health Management under the aegis of NAHEP	Sri Karan Narendra Agriculture University, Jobner, Rajasthan	4-5 October, 2021
Drs. Dinesh K Yadav, Khushboo Rani, Abinash Das	Online Training Programme on Statistical Designs and Analytical Methods for Multifactor Experiments	ICAR-CMFRI, Kochi	8-17 December, 2021
Dr. AK Patra	"Pre-Vibrant Gujarat Summit 2021: Agro and Food Processing: Entering in a new era of Co-operation".	Anand Agricultural University, AAU Gujarat	14-16 December, 2021

**Recently published book:**

**Conservation Agriculture: A Sustainable Approach for Soil Health and Food Security**

**Somasundaram, J., Dalal, R.C., Patra, A.K., Chaudhari, S.K., (Editors) (2021), Springer. P632.**

