भाकृअनुप
ICAR

ICAR-IISS

NEWSLETTER

VOLUME 20, NUMBER 2 JULY-DECEMBER, 2017

CONTENTS

Forthcoming events

- Feed The Future India Triangular Training (FTF-ITT) Program during 30 January – 13 February, 2018
- National conference on organic waste management for food and environmental security during 8-10, February, 2018
- National Productivity Week during 12-18 February, 2018
- Foundation day celebration on 16 April, 2018
- South-East Asia Laboratory NETwork – 2nd meeting 19 - 23 November, 2018
- World Soil Day on 5 December, 2018

Compiled and edited by M. Mohanty, J.K. Thakur, B.P. Meena, Sonalika Sahoo

From the ***Director's Desk***

Soil Solution to Climate Change

"The soil is the great connector of our lives, the source and destination of all" - Wendell Berry

Global warming is caused by the increased levels of carbon dioxide (CO_2) and other greenhouse gases like methane (CH_4) and nitrous oxide (N_2O) in Earth's atmosphere which traps heat, and thus, increases global temperature. The current CO_2 concentration in the atmosphere is more than 400 ppm which is in excess than the desired level of 350 ppm. The United Nations (UN) during CoP-21 conference in Paris (2015) have taken a global initiative called "4 per 1000" (4 PT), to increase soil carbon (C) content worldwide by 0.4% per year. The Paris Accord recommends limiting global warming to less than 2 °C above pre-industrial levels and this can only be achieved by removing excess CO_2 from the atmosphere.

Sequestering C in soils is a natural way of removing CO_2 from the atmosphere with less energy and costs. Healthy soils rich in carbon (c), provide a biologically-based low cost solution to global climate change. Better agricultural management practices could enhance the ability of soils to store C and help combat global warming. A small change in C pools will really have significant impact on soil health and ecosystem services. Among the different pools of SOC, the stable pool comprised of humus is well protected from microbes and can retain C for centuries. How much soils can absorb and how long they can store C varies depending upon the soil types, climate and management practices. As per the estimates by Professor Rattan Lal, Ohio State University, soils to a depth of 1 m contains 1500 Gt of SOC (1 Gt = 1 billion tonne). The atmosphere contains 800 Gt of C while that of the plants and biota on the earth's surface contribute 620 Gt of C. The soil contains more C than the atmosphere and plants combined together. When consider 3 m depth, it contains 3000 Gt of C. Because of mismanagement of land resources, there is a loss of SOC to the atmosphere to the tune of 135 Gt. Good management practices have the potential to reduce 65-75 ppm of CO_2 from the atmosphere through SOC sequestration processes and provide the solution to climate change.

Some scientists believe that following soil and crop management strategies, soils could continue to sequester C for more than 20-40 years before they attain saturated values. Long-term fertilizer experiment in India have suggested that balanced fertilizer application to any cropping systems can enhance carbon sequestration potentials of the soils. Using simulation

modelling approaches, it has been revealed that Vertisols under soybean-wheat cropping system of central India can store as much as 23 t ha^{-1} soil C in top 30 cm of profile and it can go up to 46 t ha^{-1} if FYM is applied at the rate of 10 t ha^{-1} regularly.

Another key way to protect soil C is through development of soil aggregations. *Mycorrhizal* fungi can produce sticky substances that facilitate aggregation processes in soils. They are able to transfer 15 % more C into soil than other microbes. Soil management practices such as no-tillage, reduced tillage, residue retention at the surface and crop diversification are some options that can help in storing more C than conventional farming practices. Organic farming is another way of putting C back into soils by applying organic manures and composts regularly.

Crops especially those with deeper root systems add more biomass, thereby facilitating more C addition in soils. Planting more perennial crops or in combinations with annual as in case of agroforestry systems could store more C and reduce erosion by allowing roots to reach deeper into the soil. Other strategies to increase the soil C pool include soil restoration, cover crops, nutrient management, manuring and sludge application, improved grazing, water conservation and harvesting, efficient irrigation and growing energy crops on spare lands.

Thus, retaining and restoring SOC helps farmers grow better crops, purifies water and keeps the atmosphere cleaner. Our motto should be promoting healthy soil that's full of life and resilient to climate change. Building momentum on soil C research will enhance our understanding for solving both climate and land sustainability problems on earth.

Ashok K. Patra
Director


Newly developed water harvesting structure at ICAR-IISS Bhopal


Swatchata Pakhwada being organised by ICAR-IISS Bhopal

Research Highlights

"Ensuring food security, sustainability and soil health through resource conservation based farmer first approach in Central India"

The team from IISS Bhopal successfully demonstrated the microbial enriched rapid compost at Khamkheda village. The consortium of ligno-celllulolytic microbes was used to accelerated decomposition of farm waste.

Plate A: Farmer of Khamkheda village showing matured compost

Effects of long term use of fertilizer and manure on soil functional diversity and nutrient supplying capacity

In LTFE-Parbhani and Barrackpore SOC, microbial biomass carbon (MBC), permanganate oxidisable carbon (POXC), potential nitrogen mineralization was found to be the highest in 100% NPK + FYM treatment.

Characterization of chlorpyrifos degrading bacterial community in a Vertisol

Chlorpyrifos biodegradation rate in the studied Vertisol was 0.34 ± 0.04 µg g^{-1} soil d^{-1}. Culturable bacteria were isolated and identified by 16S rRNA gene sequencing. The bacterial community was predominated by *Arthrobacter phenanthrenivorans* (23%) followed by *Arthrobacter globiformis* and *Bacillus flexus* (15%) each. *Microbacterium paraoxydans*, *Bacillus megaterium*, *Bacillus soli* strain R, *Bacillus drentensis*, and *Bacillus koreensis* represented 8% of total bacteria. Correspondence analysis outlaid decarboxylase, catalase, and oxidase as the key enzymatic activities of the bacterial isolates for chlorpyrifos biodegradation.

Reversal of conservation tillage to conventional tillage affects dry matter distribution in soybean at maturity

The experiment was conducted with four tillage treatments (NT-CT, NT, RT-CT and RT) with three levels of fertilizer (T1: NPK (RDF), T2: NPK + 1.0 FYM-C (t ha^{-1}) every year and T3: NPK + 2.0 FYM-C (t ha^{-1}) every year) at three replications in soybean-wheat crop rotation. The results showed that the interaction effect of tillage and fertilizer was statistically significant ($p<0.05$) for dry matter distribution in all plant organs at maturity. The grain yield of soybean increased from 1076 kg ha^{-1} under NT to 1279 kg ha^{-1} under RT. Fertilization with NPK+FYM (T3, T4) increased the yield compared with NPK fertilization (T1). The mean soybean grain yield ranged from 845 to 1546 kg ha^{-1}. The grain yield response to fertilizer followed the order T3>T2>T1 (Fig. 1).

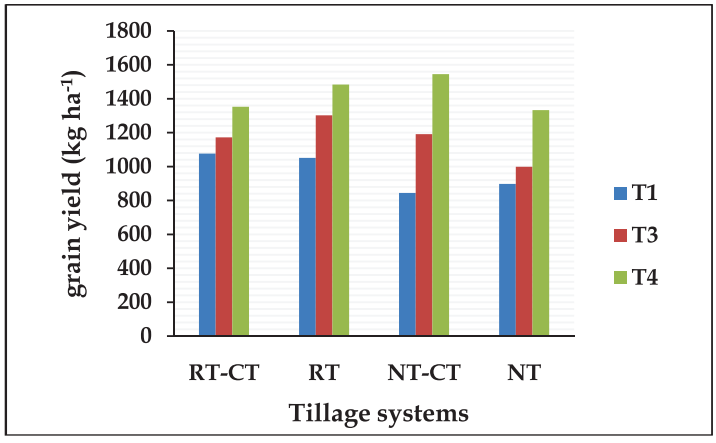


Fig. 1 Soybean grain yield as influenced by reversal of tillage system in a Vertisol

Exploring endophytic microbial diversity for improving crop production

Four morphologically distinct endophytic bacterial isolates from maize root was characterized for their plant growth promoting attributes. Isolates, MER 4 was able to solubilize tricalcium phosphate in media (phosphate solubilization index 2.86) and release potassium from glauconite to the extent of 6.0 µg/ml broth containing 10^7 viable cells/ml. The isolate also recorded very good IAA production ability ($p<0.05$; 12.7 µg/ml broth). Microscopic and biochemical characterization revealed the isolate being Gram - negative rod, catalase-negative, oxidase-positive and motile. The isolate may be potential bioinoculum for improving nutrient use efficiency.

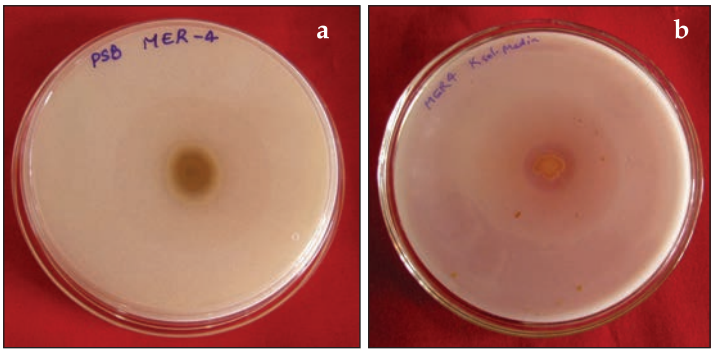


Plate B: Solubilization of (a) tri-calcium phosphate and (b) Glauconite by endophytic bacterial isolate MER4

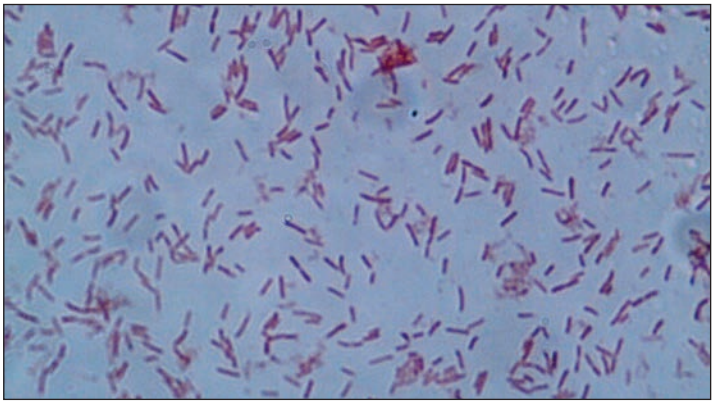


Plate C: Micrograph of Edophytic isolate MER 4 (100X)

Nitrification under the influence of long term fertilizer application

The potential nitrification rate (PNR) was the highest in no fertilizer control and the lowest in fallow. The PNR

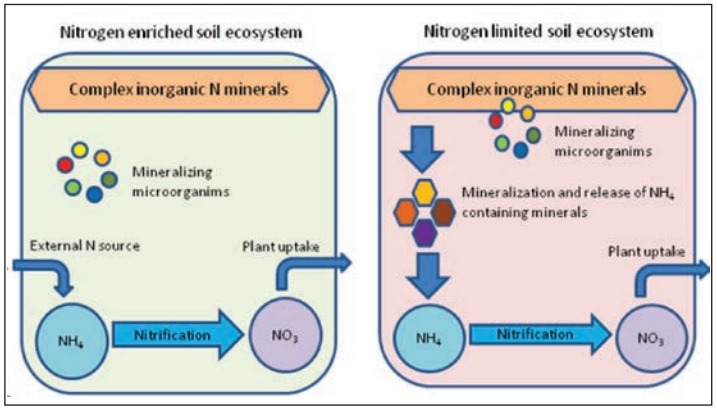


Fig. 1 Schematic representation of hypothetical microbial nitrogen mineralization and nitrification in nitrogen fertilized (left) and nitrogen limited (right) soil ecosystem. In a condition of continuous external nitrogen supply and cropping, the supplied nitrogen (NH_4) is nitrified and taken up by plants. In a soil managed under limited N source and continuous cropping probably activates microorganisms those mineralize complex inorganic nitrogen minerals. The complex inorganic nitrogen (NH_4) minerals are then nitrified for plant uptake.

($\mu g\ NO_3^-$ produced g^{-1} soil d^{-1}) was 0.887 in fallow, 1.866 in control, 1.278 in NPK 100%, and 1.493 in NPK 100% + FYM. Real time PCR quantification of abundance of bacterial amoA gene (x 10^4 amoA gene copies g^{-1} soil) was 19.33 in fallow, 43.33 in control, 30.33 in NPK 100%, and 29.33 in NPK 100% + FYM. The gene copies (x10^4 gene copies g^{-1} soil) of amoA of archaea ranged from 11.67 to 38.67. The abundance of ammonia oxidizing bacterial amoA gene and ammonia oxidizing archaeal amoA gene was stimulated during nitrification. The X ray diffraction (XRD) of soils indicated occurrence of NH_4 containing minerals. The intensity of the NH_4 minerals was highest in control and lowest in fallow. Based on these observations, a hypothetical process of N mobilization under N limited and N enriched condition was depicted.

Impact of conservation tillage and crop residue retention on nutrient status in Vertisols

Reduced tillage (RT) with residue retention showed a positive effect on macro- and micronutrient distribution and availability in soils after four crop cycles. In the surface soil layer (0-5 cm), the major- and micro-nutrients concentrations were higher compared to sub-surface layers, regardless of tillage and cropping systems. Available N concentration in RT was significantly higher than that in conventional tillage (CT) in 0-5, 5-15 and 15-30 cm soil layers. However, available P and K concentrations were significantly higher in RT than CT only in the top 5 cm soil depth. DTPA extractable Zn concentration was significantly higher in RT compared to CT up to 45 cm soil depth while for DTPA extractable Mn and Fe, the differences were significant only up to a soil depth of 30 cm and 15 cm, respectively (Fig. 2).

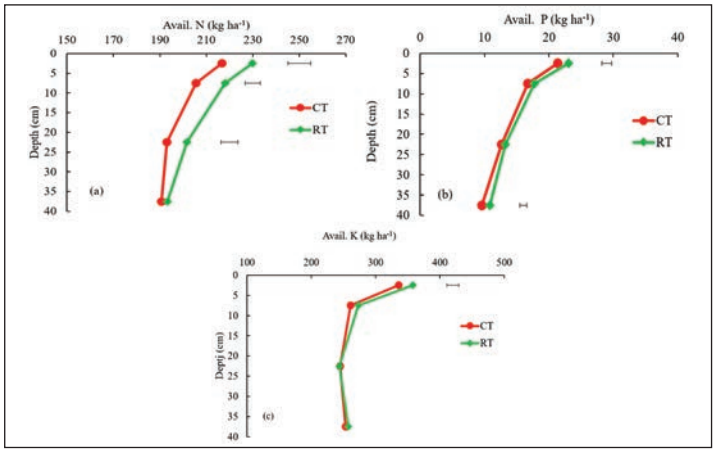


Fig. 2 Effect of tillage on (a) Available N, (b) P and (c) K after four crop cycles; Horizontal bar indicate significant difference at LSD at $p \leq 0.05$.

Weed management in Soybean-Wheat system under conservation agriculture in Vertisols

In soybean, pre emergence application of Pendimethalin @ 1000g ai. /ha + Glyphosate @ 1000g ai. /ha followed by post Emergence application of Imazethypr @100g ai. /ha or Propaquizafop +Chlorimuron ethyl @9 gm ai/ha at 30DAS fb can provide season long weed control. Similarly, pre emergence application of Pendimethalin @ 1000g ai. /ha + Paraquat @ 480g ai. /ha fb post emergence application of Mesosulfuron + Idosulfuron @ 1000 g /ha at 30DAS fb was found to provide season long weed control in wheat crop grown under conservation agriculture.

Plate D: Control of weeds in soybean with herbicides

Development of soil regional zones for precise micronutrient prescription

The investigation was performed to delineate regional zones (RZs) in a Deccan Plateau Region (DPR) of India by considering spatial variability of some soil properties and available micronutrients for efficient management of micronutrients. Altogether, 4939 representative soil samples (with geographical coordinates) from surface (0-0.15 m depth) layers were collected from Telangana state lying in DPR of India. Soil samples were analysed for pH, electrical conductivity (EC), soil organic carbon (SOC), and available zinc (Zn), copper (Cu), iron (Fe), and manganese (Mn). Geostatistical analysis divulged different distribution pattern of soil properties and available micronutrients with strong to moderate spatial dependency. Six RZs from the study (Fig. 3) area were created through geostatistical, principal component and clustering analysis.

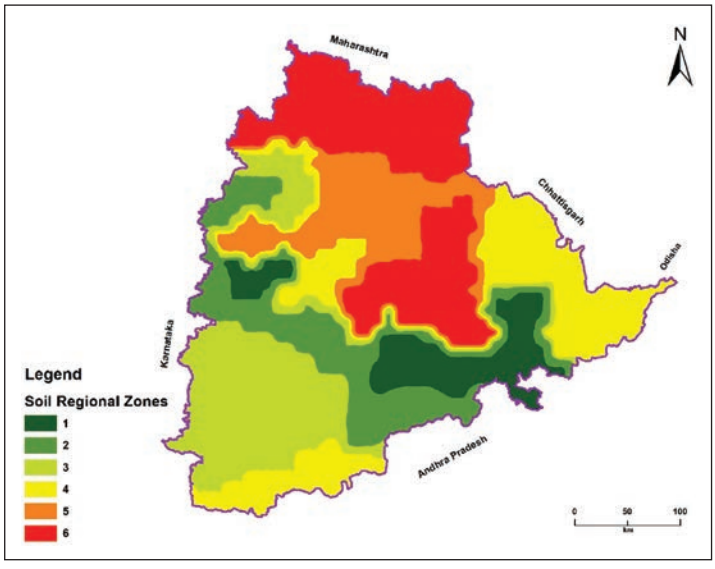


Fig. 3 Soil regional zones for micronutrients management in Telangana state

Resource conservation technology to evaluate soil chemical and biological properties under rice-wheat cropping system

All together 10 treatment combinations comprising of conventional, reduced and no tillage were evaluated with and without residue for changes in soil organic carbon, water soluble carbon, available phosphorus and potassium and dehydrogeanse activity in 0-5 and 5-15 cm of soil depths. Highest concentration of soil organic carbon (8.8 g kg^{-1}) was recorded in 0-5 cm of soil depth in treatments of zero tilled rice (direct seeded) and wheat plots which retained of 1/3rd residue of the previous crop. However, it fails to improve soil carbon concentration (5.4 g kg^{-1}) in 5-15 cm of depth (Fig. 4). In treatments of zero tilled rice and wheat plots, concentration of water soluble carbon was higher (75 mg kg^{-1}) in 5-15 cm of soil depth in comparison to 0-5 cm of soil depth (45 mg kg^{-1}). In general available potassium was higher in plots receiving higher input of residues. It was observed that conventional tilled rice and wheat plots with 1/3 rd of residue incorporation (both rice and wheat) maintained higher concentration of exchangeable potassium (333 kg ha^{-1}) in soil.

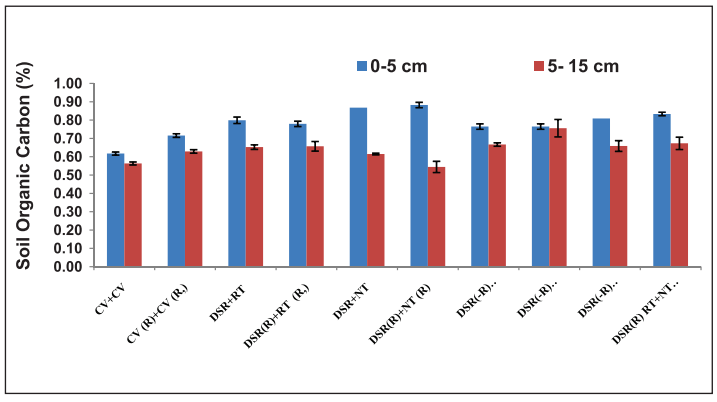


Fig. 4 Soil organic concentration at different soil depths under various tillage and crop residue management practices.

Integrated nutrient management modules for sustaining crop productivity and soil health in Vertisols

Maize grain yield was significantly highest with STCR based integrated nutrient management module i.e. 75% NPK of STCR along with FYM at 5 Mg ha^{-1} and followed by integration of 75%NPK + poultry manure at 1 Mg ha^{-1} as compared to general recommended dose (GRD) and 100% NPK alone (Fig. 5). However, the integration of NPK fertilizer with urban compost (UC), maize residue (MR) and Glyricidia loppings (Gly) could not keep the sustained maize yields like in FYM and poultry manure. The response to urban compost (UC) and maize residue (MR) at 5 Mg ha^{-1} was nearly equal and their application along with 75% NPK of STCR based fertilizer. There were conspicuous improvements in various soil health parameters including chemical, biological and physical properties in all INM modules over the initial status in surface soil (0–15 cm). Continuous balanced use of NPK along with FYM or poultry manure treatments gave the highest values for the analyzed soil parameters.

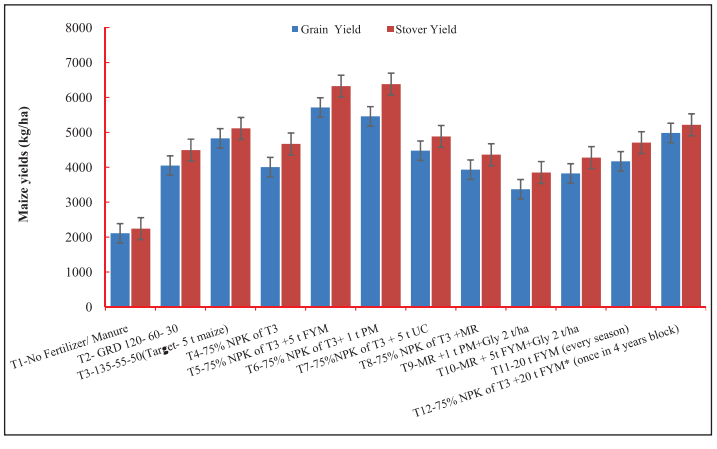


Fig. 5 Yield performance of maize under different integrated nutrient management modules in maize-chickpea cropping sequence of Vertisols

Sustaining pulse based cropping system in central India

An experiment was undertaken to enhance crop productivity in soybean based intercropping system (pigeon pea, urd bean, sesame, maize and sorghum) during *Kharif* in flat bed and broad bed land configurations. These crops were followed by lentil during Rabi. Study showed that BBF had distinct advantage for both *Kharif* and *Rabi* crops due to enhancement in crop productivity to the tune of 21.3, 25.7 and 23.6 per cent in soybean alone, SEY based on *kharif* inter crops and total productivity during *Kharif*, respectively. When comparison was made on total system productivity for both *Kharif* + *Rabi* (soybean + intercrop - lentil), significantly higher total soybean productivity were recorded with soybean + pigeonpea - lentil followed by soybean + urd bean - lentil.

Plate E: Soybean+ Intercrop during *kharif* season at Phanda research farm

Effects of lead and nickel contamination on soil enzyme activities

Lead and nickel are the toxic metals adversely affecting soil fertility by modifying the soil enzyme activities and plant nutrient supply capacity of soil. From the results, increasing levels of Pb from 0, 100, 150 and 300 mg kg^{-1}

soil significantly reduced the dehydrogenase activity (DHA), acid and alkaline phosphatase activities in soil. Among the soil enzymatic activities DHA was more sensitive to Pb application. These types of finding can be used by the wastewater management agencies in better planning of safe use of wastewater for sustainable crop production.

Critical limits of Cadmium for major soil orders of India

The results from pot culture experiments involving Major soil Orders (Alfisol, Vertisol and Inceptisol) of India showed that cadmium application had significant yield reduction over control. The dry weight of above biomass of spinach at highest level (40 mg kg^{-1}) of cadmium application was 49.7%, 39.7% and 38.5% as compared to control in alluvial, lateritic and black soil, respectively. Phytotoxicity limit of cadmium for spinach biomass was more in alluvial soil of Kanpur as compared to black soil of Indore. Plant accumulation of cadmium increased with increasing levels of cadmium in all the 3 soil types. At their corresponding levels, cadmium accumulation in spinach biomass leaf was more in lateritic soil followed by alluvial and black soil.

Bio availability of Cd under different extractants

Different extractants (0.01M $CaCl_2$, 1M $CaCl_2$, DTPA and 0.43M HNO_3) were evaluated to predict the bio-available concentration of Cd in soil. Among the different extractants, the magnitudes of bio-available fraction were highest in 0.43 $MHNO_3$ followed by 1M$CaCl_2$, DTPA and 0.01M $CaCl_2$ extractant. Among the soil types, the bio-available concentration was significantly higher in lateritic soil followed by alluvial and black soil in all the extractants used. Significant linear relationship were observed in all the soil types between the extractable fraction by 1M $CaCl_2$ extractant and total Cd content in soil with R_2 value of 0.985, 0.982 and 0.962 in lateritic, alluvial and black soil (Fig. 6).

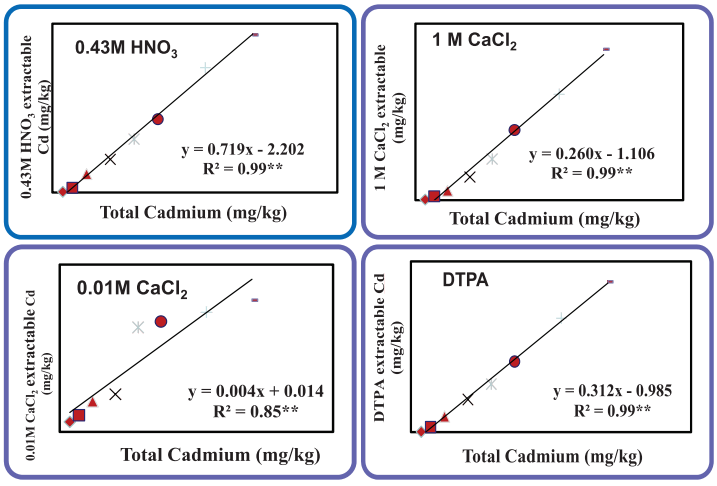


Fig. 6 Different extractants for predicting bioavailable fractions of Cd in Black soil

Phosphorus management strategies in soybean-wheat cropping system in Vertisols of Jabalpur

From the results obtained from field demonstrations, it was learnt that reduction in P dose by half did not affect soybean and wheat yield in soil having high P status (Table 1; Plate 1). Results also revealed that application of FYM over and above of NPK dose resulted increase in yield of both soybean and wheat yield. The low yield under farmers' practice is due to imbalanced nutrient application. Thus, from the results it can be concluded that P can be saved by reducing the quantity of applied P in soils with high P status; it will increase the profit by reducing the cost of cultivation. The study also indicated that an attention is required to monitor S status of soil which could pose threat to sustainability of system in future.

Table 1 Effect of P application on soybean and wheat yields (kg ha^{-1}) on farmers' field (2015-16)

Treatments	Soybean	Wheat
100% NPK + 5 t FYM ha^{-1}	1393	4058
100% NPK	1298	3642
100% NK + 50% P	1160	3575
100% NPK - S	962	3405
Farmer's Practice	897	3210
CD at 5%	182	32

Note: 100% NPK (Soybean = 30 kg N, 60 kg P_2O_5, 40 kg K_2O and Wheat= 120 kg N, 60 Kg P_2O_5, 40 kg K_2O per ha); Farmers' practice (Soybean = 20 kg N and 40-45 kg P_2O_5 ha^{-1}; Wheat = 70 -80 kg N and 50 kg P_2O_5 ha^{-1} and no application of K)

Extension Activities

A group of ICAR-IISS scientists conducted a pilot survey in five tribal villages of Balaghat district of Madhya Pradesh (Khursodi, Dhuti, Budiyagaon and Takabarra villages of Balaghat Block and Butte Hazari village of Lalbarra Block) during 17-18 November, 2017 to identify suitable localities for the implementation of the project entitled Enhancing the Productivity of Major Crops through Improving the Natural Resource Base of Tribal Inhabited Areas of Madhya Pradesh. The group visited the villages and conducted group discussions with the farmers as well as village heads to collect

information about the crops and cropping patterns, livelihood strategies, adoption of agricultural technologies and the constraints crop production and framing.

Vigilance Awareness week

Vigilance awareness week was celebrated during 29 October to 04 November 2018. All the staff members, SRFs and students participated in this event through various completions. The chief guest of the function Mr. D.C. Sagar, IPS, distributed the prizes to the winning participants on the concluding day of the event.

Chief Guest of the Function giving away the prize to a participant in the Vigilance Awareness Week

Awards, Honors and Recognition

- Dr. A. K. Shukla received Dhiru Morarji Best Paper Award-2017 by Fertilizer Association of India, New Delhi on December 05, 2017
- Dr. K.M. Hati and Dr. Pramod Jha awarded Endeavor Research Fellowship at University of Queensland, Brisbane, St Lucia, Qld, Australia
- Dr. A.K. Biswas inducted as Fellow by the Indian Society of soil Science, New Delhi in its 82th Annual Convention at Kolkata on 11th Dec., 2017.
- Brij Lal Lakaria inducted as Fellow of the Indian Association of Soil and Water Conservationists for the year 2017.
- Dr. N.K. Lenka elected as the Counicllor of the Indian Society of Soil Science, New Delhi for the biennium 2018-19.
- Dr M. L. Dotaniya got Young Scientist Award-2017 by Astha foundation, Meerut, in International Conference on "Global Research Initiatives for Sustainable Agriculture & Allied Sciences at MPUAT, Udaipur.
- Dr. Asha Sahu received certificate for participation and successful completion of "Soil Health Quiz" on 17 November, 2017 by mygov.in.

Dr. A. K. Shukla received Dhiru Morarji Best Paper Award-2017

- Dr S. Lenka invited as a speaker in training programme on "Climate Change Issues" on 11th Oct., 2017 at State Institute of Agriculture Extension and training, Bhopal.
- Dr S. Lenka invited as aspeaker to school students attending "Nature study Camp for Children" organized by Science Centre, Bhopal on 6-12 October, 2017.

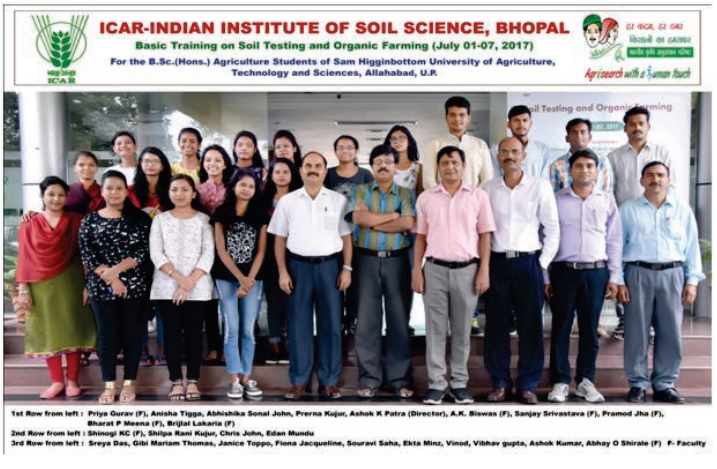
- Dr S. Lenka invited as a speaker in training programme on "Climate Change Issues" on 21st Nov. 2017 at State Institute of Agriculture Extension and training, Bhopal.
- Dr S. Lenka as member expert committee examined the Ph.D. proposals for scholarship on Climate Change on 20th Nov. 2017 at Environmental Planning and Coordination Organization, Bhopal.
- Dr. A.K. Biswas participated in CAS meeting at NRC Cashewnut, Puttur, CAFRI, Jhansi, and IISWC, Dehradun.
- Dr. S. Srivastava visited Tunis, Tunisia, Africa for assessing the suitability of site for establishing of Soil Water Tissue laboratory in Tunisia under India-Africa Forum Summit-III (IAFS-III) during 19-21 July, 2017.
- Dr R. Elanchezhian acted as External Examiner for evaluation of Ph.D. viva-voce of Ms. Shabnam Khan, Ph.D. Plant Physiology from IGKV Raipur on July 12, 2017 and acted as Examiner for evaluation of comprehensive exam of three students from Plant Physiology department of IGKV Raipur on July 12, 2017.

Major Events

Summer School/Winter School/ MTC Organized

- Dr. M. C. Manna, Dr. Asha Sahu and Dr. Sudeshna Bhattacharjya organized the Model Training Course on "Advances in Rapid Composting Techniques for Efficient Bio-waste Utilization vis-a-vis Enhancing Soil Health" held during 20 - 27 November, 2017, at ICAR- Indian Institute of Soil Science, Bhopal.
- A Two days Group Meeting cum Workshop on 'Mid Infrared Spectroscopy Application in Soil Research' were organized at ICAR-IISS, Bhopal during 27 - 28 November, 2017. The meeting was chaired by Dr. S. K. Chaudhari, ADG (SWM), ICAR, New Delhi. Dr. Keith Shepherd, Leader, Land Health Decisions, ICRAF, Nairobi, Dr. Javed Rizvi, Regional Director, South Asia Regional Programme, ICRAF, Dr. A. K. Patra, Director and MIR Spectroscopy project team of ICAR-IISS participated in this meeting.

Programme	Course Directors/ Organizers	Duration	Sponsored by
ICAR Short course on "Advances in nutrient dynamics for improving nutrient and water use efficiency of crops"	Dr. R. Elanchezhian, Dr. A.K. Biswas and Dr. A.K. Patra	5-14 September, 2017	ICAR, New Delhi
Training-cum-Exposure Visit "on Soil Testing and Organic Farming"	Dr. Shinogi KC, Dr. B.P. Meena, and Dr. A. O. Shirale	1–7 July, 2017	Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh



Model training course on "Advances in rapid composting techniques for efficient bio-waste utilization vis-a-vis enhancing soil health during 20-27 November, 2017.

Organized training cum workshop on "Methodological Framework for Implementation of FFP" conducted at ICAR-IISS, Bhopal during 18-21, September, 2017.

Group Meeting Cum Workshop on Mid-infrared Spectroscopy Application on Soil Research 27-28 November, 2017

Training Programme Organized (For ARS/ Students /Farmers)

Drs A.K. Patra, S. Kundu, K. Bharti, M.L. Dotaniya, S. Rajendiran organized summer training for B.Sc. forestry students of SHUATS, Allahabad on "Forest Soils and Their Management" at ICAR-IISS, Bhopal during 05-14 June, 2017.

Drs J.K. Saha, N.S. Bhogal, M. L. Dotaniya, Sonalika Sahoo organized one day kisansangosthi on "Best Crop Management Practices for Enhancing Farm Income" organized by IISS Bhopal at Bheropura under MGMG on 6 June, 2017.

International Cooperation

Dr. Mario Aguilar, Director of Centre for biotechnology and molecular biology, Argentina, visited ICAR-IISS during 21-28 August, 2017 under Indo-Argentina bilateral project.

Dr. Ashok K. Patra and Dr. S. R. Mohanty visited Department of Plant Sciences, University of Oxford during 11-13 September 2017 under Indo-UK Nitrogen fixation project.

Dr. Keith Shepherd and Dr. Javed Rizvi visited IISS Bhopal during 27-28 November, 2017 under ICRAF-ICAR project on Mid-infrared spectroscopy application on soil research.

Dr. Sanjay Srivastava attended the Discussion with Secretary, ICAR on SWTL proposal in Tunisia at Delhi during 13 -15 December, 2017.

The 2nd Annual Meeting took place at Department of Plant Sciences, University of Oxford on 11th-13th Sept. 2017.

Dr Mario Aguilar, Director of Centre for biotechnology and molecular biology, Argentina visited to ICAR-IISS during 21-28 August, 2017

Dr. Keith Shepherd, ICRAF, Nairobi, Kenya during his visit to IISS Bhopal to attend the Group Meeting cum Workshop on Soil Spectroscopy

Dr. Ashok K. Patra, Director IISS, Bhopal attending SEALNET Group Meeting in Bogor, Indonesia

Distinguished Visitors

Name	Organization	Date
Mr. S. K. Singh Additional Secretary & Financial Advisor (DARE/ICAR	ICAR, New Delhi	30 July, 2017
Mr. Chhabilendra Roul, Additional Secretary DARE and Secretary ICAR	ICAR, New Delhi	18 August, 2017
Dr. Mario Aguilar, Director	Centre for biotechnology and molecular biology, Argentina	21-28 August, 2017
Mr. D.C. Sagar, Additional Director General (P)	ICAR, New Delhi	03 November, 2017
Dr. Sudam P. Khade,IAS	Collector, Bhopal,	05 December, 2017
Dr. Navin Chandra, Director General	Madhya Pradesh Council of Science and Technology, Bhopal	05 December, 2017
Dr. V. P. Singh, Director	ICAR-NIHSAD, Bhopal	05 December, 2017
Prof. Sunil Kumar Gupta, Vice- Chancellor	Rajiv Gandhi Pradyogiki Vishwa Vidyalaya, Bhopal	06 December, 2017

Distinguished QRT members visiting Soil Spectroscopy Laboratory

Mr. Chhabilendra Roul, Addl Secretary DARE and Secretary ICAR visiting Spectroscopy laboratory in Soil Physics Division

Distinguished RAC members visiting newly developed water harvesting structure at IISS research farm

Honourable DDG (NRM) Dr. K. Alagusundaram at Soil Chemistry laboratory to discuss about the performance of Mrida Pariskhak in Soil Health analysis

Staff News

Sl. No.	Name	Joined/Promoted
1.	Dr Ankush Lala Kamble, Scientist	09.10.2017
2.	Dr. Utkarsh Tiwari, Scientist	12.10.2017
3.	Shri Rakesh Kumar Sen, SSS financial upgraded from pay matrix level -2 to level-3	08.09.2017
4.	Shri Janak Singh, SSS financial upgraded from pay matrix level-2 to level-3	08.08.2017

Other Activities

ICAR-IISS and Bhopal Chapter of Indian Society of Soil Science jointly celebrated 'World soil day and farmers Scientist intrection meeting on 5 December 2017 at IISS Bhopal.

Retirement

Dr N. S. Bhogal, Pr. Scientist (Soil Science), superannuated on 31 August, 2017

Participation of Scientists in Conferences/Workshops/ Symposia/ Meetings/ Discussions

Name	Programme	Venue	Period
Dr. A.K. Patra and Dr. A.K. Shukla	Attended a brain storming session on "Reclamation of acid soils in eastern region of India"	ICAR-NBSS & LUP regional centre Kolkata.	11 August, 2017
Dr. A.K. Patra	Presented an invited paper in the International Potassium conference at IPNI, Gurgaon and delivered an invited lecture to the participants of Summer School	ICAR-IARI, New Delhi.	29 August, 2017
Dr. A.K. Patra, Dr. J. K. Saha, Mr. Neeraj Tahiliani	Attended a MoU meeting between ICAR-IISS and NTPC regarding the project on "Use of Fly-ash in agriculture for sustainable crop production and environmental protection"	New Delhi	30 August, 2017

Name	Programme	Venue	Period
Dr. A.K. Patra	To participated in a Selection Committee Meeting at UPSC and attended a meeting in the MEA regarding establishment of Soil Water & Tissue Testing Laboratory	Tunisia.	6 September, 2017
Dr. A.K. Patra	To attended National Workshop on "Developing a Roadmap for Agricultural Knowledge Management in India"	NASC Complex, Pusa, New Delhi	26 August 2017
Dr. A.K. Patra	To participated in the "First lab managers' meeting of the South - East Laboratory NET work (SELNET) - Quality improvement in Asian soil laboratories: towards standardization and harmonization of analyses and their interpretation" held	Bogor, Indonesia	20-24 November, 2017
Dr. A.K. Patra	National Workshop on "Developing a road map for agricultural knowledge management in India"	NASC Complex, Pusa, New Delhi	27-28 September, 2017
Dr. A.K. Patra and Dr. S.R. Mohanty	Second Annual Review meeting of India-UK Nitrogen Fixation Centre Project funded by BBSRC and DBT	University of Oxford, UK	11-14 September, 2017
Dr. A. K. Shukla	International Conference on "Advances in potassium research for efficient soil and crop management"	NASC complex, New Delhi	28-29 August, 2017
	National Seminar of Fertilizer Association of India.	New Delhi	05-07 December, 2017
Dr. A. K. Shukla and Dr.S. K. Behera	82nd Annual Convention of ISSS	ISSS annual convention at Amity University, Kolkata	11-14 December, 2017
Dr. S. K. Behera	International Symposium on Horticulture: Priorities & Emerging Trends	IIHR, Benagluru	05-08 September, 2017
Dr. AK Biswas and Dr. K. M. Hati	Review meeting of all centers of CRP on CA	KAB-II, New Delhi	11 September, 2017
Dr. Brij Lal Lakaria and Dr. Pramod Jha	Brainstorming session on "Recent advances in biomass energy research and management"	ICAR-CIAE Bhopal.	09 November, 2017
Dr. N K Lenka	Annual Convention of the ISSS	Amity University, Kolkata	11-14 December, 2017

Dr. Shinogi KC, Dr. B. P. Meena, Dr. A O Shirale, and Dr M. V. Coumar	3rd International Conference on "Bioresource and Stress Management"	Society for bio-recource and stress management and Indian Council of Agricultural Research (ICAR) at Jaipur	8 –11 November, 2017
Dr. B.P. Meena and Dr. A O Shirale	SCIENCE FIESTA on Science for Global Understanding	Regional Science Center, Bhopal	20–21 December, 2017
Dr. Priya Pandurang Gurav	Young scientist oral presentation award at state level seminar on "Soil and Plant health sustainability scenario towards changing needs	Parbhani, Maharashtra	07-08 October, 2017
Dr. R. Elanchezhian	Workshop for Review and Revision of Curricula of 100 Job roles for Agriculture sector under RMSA of MHRD GOI as expert	PSS Central Institute of Vocational Education Shyamala Hills, Bhopal	28-29 June, 2017
Dr. R. Elanchezhian	Invited lecture in National Congress of Plant Physiology	IGKV, Raipur	23-25 November, 2017
Dr. K. M. Hati	First Brainstorming Workshop on "National Soil Management Policy"	MANAGE, Hyderabad	20-21 July, 2017
Dr M. L. Dotaniya, Dr. M.V. Coumar and Dr., V.D. Meena	International Conference on "Global Research Initiatives for Sustainable Agriculture & Allied Sciences (GRISAAS-2017)"	Society for Scientific Development in Agriculture & Technology (SSDAT) at MPUAT, Udaipur	02-04 December, 2017
Dr. K. M. Hati, Dr. P. Jha, Dr. M. Mohanty, Dr. M. V.Coumar, Dr. J. K.Thakur, and Dr. N. K. Sinha,	Group Meeting cum Workshop on " Mid Infrared Spectroscopy Applications in Soil Research"	ICAR-IISS, Bhopal	28-29 November, 2017

Training attended

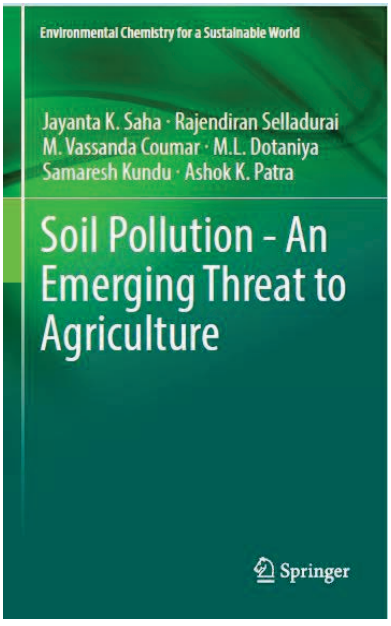
Name of employee	Title	Organizer	Duration
Dr. N.K. Sinha	Advanced Remote Sensing and GIS Applications in Integrated Land Resource Management	ICAR-NBSS & LUP, Nagpur	17- 28 July, 2017
Dr. A. B. Singh	Stability/Combined Analysis Methodology for Network Project on Organic Farming Experimental data	ICAR-IIFSR, Modipurum	25-26 July, 2017

Name of employee	Title	Organizer	Duration
Dr. Priya Gurav	Developing winning research proposals in agricultural research	NAARM, Hyderabad	1-5 August, 2017
Dr. Priya Gurav	ICAR Short course on Advances in nutrient dynamics for improving nutrient and water use efficiency of crops	ICAR-IISS, Bhopal	5-14 September, 2017
Dr. Priya Gurav	Winter school on Advanced statistical tools and techniques for modeling and forecasting agricultural data	ICAR-IARI, New Delhi	08-28 November, 2017
Dr. Dolamani Amat	MTC on advances in rapid composting techniques for efficient Bio- waste utilization *vis-a-vis* enhancing soil health	ICAR-IISS, Bhopal	20-27 November, 2017
Dr. Tapan Adhikari	MDP Training Programme	NAARM, Hyderabad	10-24 December, 2017
Mr. Jai Singh and Mr. Hukum Singh	Precision agriculture technologies	ICAR-IARI, New Delhi	18-23 September, 2017

Career College students at ICAR-IISS, Bhopal

Children participated in a race on Independence Day organized by SRC, IISS Bhopal.

World Soil Day (5 December 2017) organised at ICAR-IISS Bhopal. Honourable DG (MPCST) Dr. Navin Chandra has graced the function as Chief Guest.



The book provides reader with a comprehensive up-to-date overview of various aspects of soil pollutants manifestation of toxicity. The book highlights their interactions with soil constituents, their toxicity to agro-ecosystem & human health, methodologies of toxicity assessment along with remediation technologies for the polluted land by citing case studies. It gives special emphasis on scenario of soil pollution threats in developing countries and ways to counteract these in low cost ways which have so far been ignored. It also explicitly highlights the need for soil protection policy and identifies its key considerations after analyzing basic functions of soil and the types of threats perceived. This book will be a useful resource for graduate students and researchers in the field of environmental and agricultural sciences, as well as for personnel involved in environmental impact assessment and policy making.

Published by
Dr. Ashok K. Patra
Director
ICAR-Indian Institute of Soil Science
Nabibagh, Berasia Road, Bhopal, Madhya Pradesh- 462 038
Web: www.iiss.nic.in
Email: director.iiss@icar.gov.in
Ph.: +91 755-2730946 Fax: +91 755-2733310