ICAR-IISS Newsletter

Volume 18, Number 1 January - June 2015

From the Director's Desk

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Forthcoming Events

- Regional Workshop on "Soil Health Assessment" August 07, 2015
- Short Course on "Geoinformatics in Natural Resource Management and Climate Change Mitigation" November 20-29, 2015
- Kisan Mahasammelan on "World Soil Day" December 05, 2015
- Model Training Course on "Advances in Soil Health Assessment and Preparation of Soil Health Cards for Enhancing Crop Productivity and Improving Soil Quality" December 14-21, 2015

HEALTHY SOILS FOR A HEALTHY LIFE

Soil is one of the most important non renewable resources. According to Food and Agricultural Organization (FAO), almost 95% of the food is produced on the soils. It is a precious resource because it takes thousands of years to form an inch of soil. Hence, its preservation is essential for food security and sustaining life on earth. The most important characteristic feature of soil is that it is a living body. Millions of micro flora and fauna are present in one gram of soil which gives life to every particle of soil. However, in the past, soil has been looked upon just as a medium to produce crop yields or building structures. Devoid of due recognition from the general public, it has remained a subject of study and research by either Soil Scientists or Agronomists. Recognizing this, the 68th UN General Assembly has declared the year 2015 as the International Year of Soils (IYS). This official recognition emphasizes the importance of soils beyond the soil science. The main objective of IYS 2015 is to enhance the awareness of the society as a whole regarding importance of soil in day-to-day life and overall well-being. However, this also reposes a greater responsibility to Soil Scientists towards not only their usual role of doing research on the management of soil resources but also towards creating an awareness among people on the roles of soils in the sustenance of whole civilization.

The mandate and objectives of ICAR-Indian Institute of Soil Science are very much in sync with the goals of IYS 2015. Since its inception, the institute has been making concerted efforts to develop technologies for improving soil productivity with focus on minimum soil and environmental degradation. The current issue of the IISS Newsletter provides brief highlights of research & development, and capacity building activities undertaken at the Institute during January-June 2015. During this period, the institute has developed a quick and portable mini laboratory named *"Mridaparikshak"* which can determine the important soil health parameters and prescribe fertilizer nutrient rates for different crops and soils based on computed parameters. The institute has also developed a Rapo-composting technique which involves a bioreactor for accelerated decomposition of vegetable waste. The institute has also done basic work on nanoparticle delivery into the plant root system. Also, the institute scientists studied the impact of biochar on N dynamics in soil; standardized the Integrated Nutrient Management (INM) module for chickpea in Vertisols; evaluated several modified urea materials for increasing the N use efficiency; and computed the carbon sequestration potential of fodder crops in Alfisols. Besides, in continuation of earlier work, the institute has made an assessment of status of heavy metals content in and around Singrauli (M.P.) and Sonebhadra (U.P.) industrial area; and explored the culturable diversity of actinobacteria in rhizosphere of crops for using them as inoculants.

This Newsletter also includes the work done on farmers' participatory research and demonstration of the technologies at farmers' fields. Notably, the institute has worked in some tribal districts of Madhya Pradesh namely Dhar, Alirajpur and Jhabua. Soil quality indices in these tribal districts were determined and field demonstrations on balanced and integrated use of nutrients were conducted. In the extension front, contingency planning meetings were organized in different villages and farmers were educated about the management of soils.

In this period, our scientists also have been bestowed with honours including prestigious international fellowships like Endeavour Fellowship of Australia, NAAS Fellowship and NAAS Associateship, International Zinc Association Award etc. The institute has also received an India- Argentina bilateral international project (DST India and MinCyt Argentina) and initiated work on soil resource characterization using spectral reflectance in collaboration with ICRAF, Nairobi. Two new scientists have joined the institute during the period, and we welcome them to ICAR-IISS family. As a part of celebration of IYS 2015, the institute has organized several educational programmes on soils including the school children's awareness programme. Overall, the six month period has been quite productive. The institute would continue to put it's best efforts to address the challenges and deliver to the expectations of the farming community and to protect our most precious natural resource, the soil.

(Ashok K. Patra)

RESEARCH HIGHLIGHTS

MRIDAPARIKSHAK: (A MINILAB for Soil Testing and Fertilizer Advisory)

The institute has developed Mridaparikshak, a MINILAB that can determine soil health. The development of the MINILAB is an outcome of the initiative taken by the NRM Division of ICAR and the concerted efforts by a team of scientists of ICAR-IISS, Bhopal in collaboration with M/s Nagarjuna Agrochemicals Pvt. Ltd., Hyderabad to meet the need for having a quick, portable, scientific, and economical system of determining soil health. The MINILAB was released by Shri Radha Mohan Singh Ji, Hon'ble Union Minister of Agriculture (Government of India) in Annual General Meeting (AGM) of ICAR on 18th February, 2015.

Features of MRIDAPARIKSHAK

- Mridaparikshak is a digital mobile quantitative minilab/soil test kit to provide soil testing service at farmers' doorsteps
- It determines all the important soil parameters i.e. soil pH, EC, organic carbon, available nitrogen, phosphorus, potassium, sulphur and micronutrients like zinc, boron and iron
- It also provides crop and soil specific fertilizer recommendations directly to farmer's mobile through SMS.
- It is highly compatible with soil health card
- Mridaparikshak comes with accessories such as balance, shaker, hot plate, and a Smart Soil Pro, an instrument for determining the soil parameters and displaying of fertilizer nutrient recommendations
- It can be operated by young educated farmers/rural youths (11-12 Pass) with short training

Impact of nanoparticles (NPs) on growth and metabolism of maize

The impact of nano-micronutrient fertilization on growth and metabolism of maize was studied under hydroponic as well as sand culture systems using NPs of ZnO, CuO and Fe_3O_4. The morphology of NPs was analyzed through transmission electron microscope (TEM). Most of NPs analyzed were within the size range of 50 nm. It was observed that NPs didn't affect the root growth of maize up to 45 days after sowing (DAS) but shoot growth was variably influenced at 30 DAS. The application of NPs of CuO produced taller plants with more biomass in maize whereas the NPs of Fe_3O_4 did not show any favourable effect. The data on the activity of antioxidant enzymes i.e., superoxide dismutase, catalase and peroxidase indicated that the NPs induced moderate oxidative stress in plants. The TEM analysis indicated that the NPs were found to enter the root cortical cells and were found near the plastids of mesophyll cells at the junction of root and stem (Fig.1).

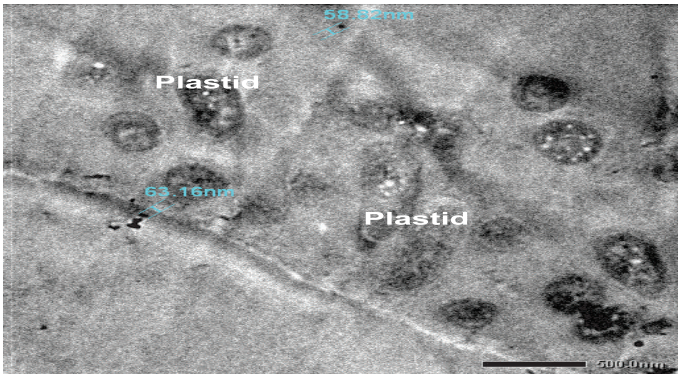


Fig.1. Integration of Cu-nanoparticle into maize plant root cells

Long- term trends in productivity of maize – chickpea system under integrated plant nutrient supply (IPNS) modules

A field experiment was conducted to evaluate the effect of different IPNS modules for sustainable crop productivity of chickpea in Vertisols during *rabi* 2015. Total yield and nutrient uptake of chickpea differed significantly with the application of different IPNS modules. The highest chickpea grain yield was recorded with residual fertility of GRD (General Recommended Dose) and STCR (Soil Test Crop Response) based recommended dose of fertilizers to *kharif* season crop (maize) and 100% P only to chickpea. The application of 5 t FYM/ha in every season also improved the grain and straw yield of chickpea as compared to treatment that received nutrients from the residue management (mulching by maize residues). The soil test based recommended dose of fertilizers and FYM based INM (Integrated Nutrient Management) modules continued to perform better than any other nutrient supply system in chickpea. Nutrient uptake (N, P and K) in chickpea grain and straw also improved by residual fertility of the different INM modules. The total nutrient uptake in chickpea (grain+ straw) was highest with the residual fertility of GRD and application of 100% P directly to chickpea followed by residual fertility effect of 20 t FYM/ha in every season.

Application of chemical fertilizers do not affect the activities of microorganisms in the soil

Higher soil microbial biomass carbon (SMBC) and soil microbial biomass N (SMBN) are the key indicators for the biological health of soil. However, there is a perception among certain farmers that the application of chemical fertilizers affect the soil microorganisms. On the contrary , the studies conducted at long term fertilizer experiments revealed that the application of fertilizer nutrients to the soil increased the activities of soil microorganisms, SMBC and SMBN (Table 1). Further, the increase in dose of fertilizers from 100% to 150% and the application of NPK + FYM also increased the activities of microorganisms in soil.

Table 1. Effect of long term application of fertilizers and manure on SMBC and SMBN

Treatment	Vertisols (Jabalpur)		Alfisols* (Bangalore)	
	SMBC (ug g^{-1} soil)	SMBN (ug g^{-1} soil)	SMBC (ug g^{-1} soil)	SMBN (ug g^{-1} soil)
Control	167.7	20.5	216.4	23.4
100% N	222.6	21.1	206.9	23.9
100% NP	251.4	27.9	204.9	23.6
100% NPK	293.8	35.8	241.1	25.1
150% NPK	311.3	37.5	264.2	26.7
100% NPK+Zn / Lime*	292.9	34.9	236.4	25.0
100% NPK+FYM	339.8	41.8	262.5	27.2
CD (P=0.05)	27.2	5.0	9.0	4.3

***Lime was applied in Alfisols of Bangalore**

Evaluation of modified urea materials and agronomic interventions for enhancing nitrogen use efficiency and sustaining crop productivity

Various modified urea materials i.e., neem coated urea (NCU), biochar coated urea (BCU), zeolite coated urea (ZCU) and pine oleoresin coated urea (POCU) were evaluated for enhancing nitrogen use efficiency and sustaining productivity for chickpea. Total yield and nutrient uptake of chickpea significantly differed due to the residual effect of different modified urea materials applied during *kharif* season. Residual effect of NCU has resulted in higher grain and straw yield besides higher nutrient uptake and was followed by BCU and POCU. The results of the experiment to screen the best agronomic interventions for enhancing crop yield and nitrogen use efficiency during *rabi* season in chickpea indicated that total dry matter yield and nutrient uptake of chickpea significantly differed with the residual fertility of different split doses of nitrogen and application of biochar to the *kharif* season crop. The study showed that grain and straw yield and N uptake was significantly higher where biochar was incorporated @10 t/ha.

Interactive effect of native soil carbon and biochar amendment on nitrate leaching in two soil types (clay and loamy soils) of India

A laboratory column study was conducted to study the interactive effect of native soil carbon and biochar amendment (@ 0, 5, 10 and 20 g kg^{-1} soil) on nitrate (NO_3^--N) leaching in clay and loam soils. Although there was a significant effect of native soil C ($P < 0.01$) and biochar ($P < 0.01$) on NO_3^-- N leaching for both soil types, the interaction effect of the two factors was significant only for the clay soil. In general, NO_3^-- N leaching was higher in low carbon (C_3) treatment and decreased with increase in native SOC level in the loam soil. As compared to high carbon soil (C_1), NO_3^--N leaching was higher by 6.74% under C_2 and by 33.66 % under C_3. However, a reverse trend was observed in the

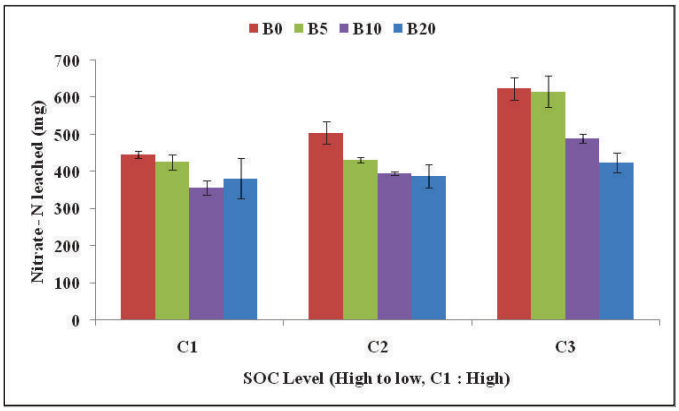


Fig.2. Effect of soil carbon and biochar on total N leached (mg) in loamy soil

clay soil. Although biochar amendment decreased NO_3^-- N leaching in both the soils, the effect was higher in the loam soil. Averaged over native SOC levels, NO_3^--N leaching was lower by 6 - 24% and 5 - 9% with biochar in the loam and clay soils, respectively (Fig.2).

Nanoporous zeolites in soil and crop management

Zeolites are natural crystalline aluminosilicates. They are among the most common minerals present in sedimentary rocks and occur in rocks of diverse age, lithology, and geologic setting, and represent valuable indicators of the depositional and postdepositional (diagenetic) environments of the host rocks. Studies on the keeping quality of the zeolite coated urea indicated that coating of urea with zeolites did not make caking of urea due to moisture absorption over six months which could be useful to the fertilizer industry where caking of urea granules is a recurrent problem.

Assessment of ICAR-IISS technologies in farmers' fields

Four technologies developed by ICAR-Indian Institute of Soil Science viz., integrated plant nutrient supply system (IPNS), soil test based fertilizer recommendation for targeted crop yields (STCR), biofertilizers and phospho-sulpho-nitro (PSN) compost were demonstrated as three treatments (IPNS-I, IPNS-II, STCR) and compared with the farmers practice (FP) in two varieties of wheat (C 306 and GW 322) in fields of nine farmers in Mengra Kalan village. The highest yield was recorded in IPNS-II (41.5 q/ha) followed by STCR (39 q/ha), IPNS-I (37 q/ha) and FP (34 q/ha).The second season wheat crop showed better performance over the first year (Fig. 3).

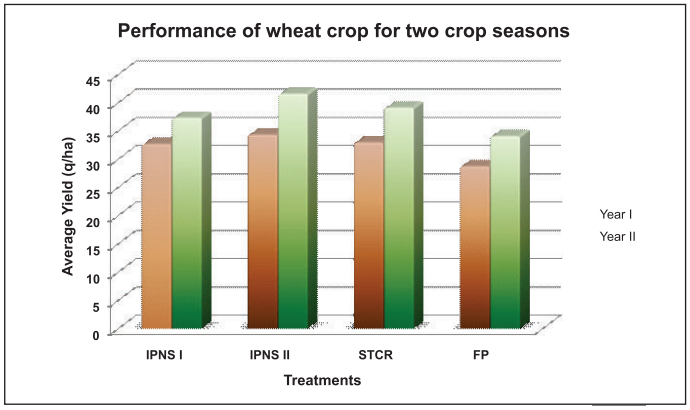


Fig.3. Performance of wheat crop for different treatments under Farmers' field condition over a period of two years

Validation of APSIM (Agricultural Production Systems sIMulator) maize module for central Indian conditions

APSIM maize module was used to validate maize crop from multi-year and multi-model experiments grown on vertisols at Bhopal. The observed grain yields from the control (0% N), 50% N, 100% N and 150% N plots were compared with the predicted yields of maize using APSIM maize module

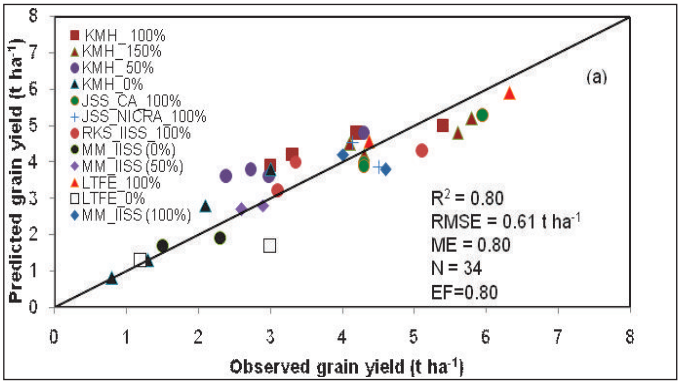


Fig. 4. Relationship between observed and predicted maize grain yield (t ha^{-1}) as simulated by APSIM model (R^2= coefficient of determination; RMSE= root mean square error; ME=mean error and EF= modelling efficiency).

The model realistically predicted grain and biomass yields with a ME of 0.80 and 0.91, respectively (Fig. 4). This is also related to the RMSE of 0.61 t ha^{-1} and 0.74 t ha^{-1} for grain and biomass yield, respectively. There was a good correlation between observed and predicted grain and biomass yields (R^2: 0.80 and 0.70, respectively). The observed grain yield was 3.61 t ha^{-1} while the simulated yield was 3.67 t ha^{-1}. Similarly, the observed biomass yield at harvest was 9.2 t ha^{-1} while the simulated yield was 8.56 t ha^{-1}. The EF value of 0.80 and 0.91 between observed and predicted grain and biomass yield of maize indicated a close agreement between them.

Simulation of potential yield and yield gap analysis for maize in Madhya Pradesh under rainfed condtions

The APSIM has also been used to simulate potential yield and yield gap analysis for maize. As a rainfed crop, the sowing of maize in India depends on the onset of the monsoon. The seasonal arrival of the monsoon in the target region is between 10th and 30th June. Depending on the weather conditions over 30 years, considerable variation in maize yield was observed. The maximum simulated maize yield of 7.6 t ha^{-1} was recorded in Mandsaur district while the minimum yield of 0.8 t ha^{-1} was recorded in Damoh district. When averaged over the simulation period, the grain yield ranged between 3.3 and 5.2 t ha^{-1}. The average potential yield of maize under limited water conditions was 4.3 t ha^{-1} while the yield from the farmers' field was 1.3 t ha^{-1}. The yield gap was minimum for Chhindwara and Damoh districts (1.7 t ha^{-1}), while it was maximum in Indore and Mandsaur districts (3.9 t ha^{-1}). The yield gap for the state hovered around 3.0 t ha^{-1} as observed from this study.

Status of heavy metal content in and around Singrauli (M.P.) and Sonebhadra (U.P.) industrial area

Geo-referenced soil samples (upper 15 cm) were collected from agriculture field and forest lands from the nearby industrial and mining area (impact zone) as well as from

areas far away (reference samples) from Singrauli and Sonebhadra and investigated the build up of heavy metals. The results indicated that there was not much change in the heavy metal content in the soils in impact zone compared to the soils of reference zone (Table 2). Only one soil sample from the forest area of Murdhwa nalla in Sonebhadra (U.P.), which is about one kilometer away from a caustic soda plant, contained high Cd (2.57 mg/kg Cd). Only red mud sample (a waste product of the Hindalco aluminium industry of Renukoot, Sonebhadra) indicated that it contained high level of Cr (647.33 mg/kg) and therefore, may contaminate the soil if gets discharged into the agricultural fields.

Table 2. Status of heavy metal content in and around Singrauli (M.P.) and Sonebhadra (U.P.) industrial area

Name of the heavy metal	Heavy metal content in reference soil samples (mg/kg soil)		Heavy metal content in impact zone soil samples (mg/kg soil)	
	Range	Average	Range	Average
Cd	0.1 – 1.1	0.39	0.03 – 2.6	0.42
Cr	4.5 – 68.7	30.0	8.3 – 38.3	33.1
Cu	1.6 – 52.7	20.2	3.7 – 43.6	18.0
Ni	2.5 – 42.1	21.5	3.7 – 52.3	22.5
Pb	4.6 – 40.6	19.1	7.6 – 42.9	15.3
Zn	30.3 – 115.2	67.7	24.0 – 132.6	61.5

Soil fertility status of tribal District (Dhar), Madhya Pradesh

Geo-referenced soil samples (840) from (0-15 cm) were collected from farmers' fields of tribal district (Dhar) and analysed for physico-chemical properties. The soils were clayey loam in texture with moderately alkaline to neutral soil pH. About 25% soil samples showed low; 57% medium and 18% high dichromate oxidizable organic carbon content. Further, the data on available P indicated that, 22% contained low, 37% medium and 41% high in available P content. In case of available K, 72% of the soil samples were under high category.

Preparation of standard reference soil material for heavy metal analysis

A standard reference soil material for the determination of heavy metal content in the soil has been prepared. About 250 kg soil sample was collected from 0-20 cm depth from the Institute's farm (N 23°18' 33.6"; E77° 24' 27.2") Later, the soil was air dried and processed and passed through 2 mm sieve. The soil (160 kg) thus obtained was mixed by hand and split by coning and quartering till 40 kg soil was obtained. Then it was pounded manually using wooden pestle and mortar and homogenized for 72 hours using plastic rolling drum. After homogenization, 10 samples were taken from the centre of the drum immediately upon stopping the rotation of the mixing drum. To prevent segregation of fine particles, samples of 100 g each were placed in 10 pre-cleaned brown glass bottles. The drum was again rotated for ten minutes and 10 more samples were sub-sampled and placed in precleaned bottles. The sub-sampling and bottling operation was continued until 250 bottles of the soil were obtained. At the end, 25 bottles were randomly selected over the whole bottling procedure for homogeneity and stability testing. The moisture content of final soil sample was 1.07% (w/w), has clayey texture with 42.37% clay content, 0.46% SOC, pH 7.98 and $CaCO_3$ 5.76%. The average total content (mg/kg) of Cu, Cd, Pb, Cr, Ni and Zn in the soil was 53.46, 0.12, 20.68, 74.91, 60.89 and 61.02, respectively. From the homogeneity test, it was found that heavy metals viz., Cu, Pb, Cr, Ni, Zn had less than 10% co-efficient of variation (CV) and Cd had 27.45% CV.

Carbon sequestration potential of fodder crops in Alfisols

Soil samples from an experiment conducted at ICAR-Indian Grassland and Fodder Research Institute, Jhansi were assessed to study the soil carbon pools and C-sequestration potential under different fodder cropping systems i.e., *Leucaena*, *Desmanthus*, *Sesbania* and *Sorghum* + *Cowpea-Chickpea* with conservation agricultural practices. Five years after cultivation, surface soils (0-15 cm) were collected from different fodder

cropping systems. The interaction effect of cropping systems and resource conservation practices showed that highest particulate organic matter carbon content was recorded in *Sorghum* + *Cowpea-Chickpea* with life saving irrigation followed by *Desmanthus* with in-situ moisture conservation. The mineral associate carbon, humic acid carbon and fulvic acid carbon were greater in *Sesbania* with life saving irrigation followed by *Sorghum* + *Cowpea-Chickpea* with *in-situ* moisture conservation. The C-sequestration rate and potential were found to be greater in Sorghum+Cowpea-Chickpea with in–situ moisture conservation practice followed by Desmanthus. This study clearly suggested that fodder cultivation with water conservation practices substantially improved soil C-sequestration potential in a long run.

Rapo-compost technique

A new technique i.e., "Rapo-compost technique" has been developed by ICAR-IISS in collaboration with ICAR-CIAE, Bhopal and ICAR-NBAIM, Mau to decompose kitchen and vegetable wastes. Using consortium of ligno-cellulolytic thermophilic organisms, the period of decomposition has been considerably reduced to 30 days from 120 days. The samples were collected at the beginning, 15 and 30 days after decomposition and were analysed for their physical, chemical and biological properties. At 30 days of decomposition, the colour of the compost was dark brown and there was no foul smell. The C:N ratio narrowed down to 14:1 from 62:1 and, the CEC reached 94 cmol (p^+)/kg. The lignin/cellulose ratio increased from 0.5 to 2.4%. The CEC/TOC and water soluble carbon were 4.56 and 0.5% respectively. The dehyrogenase activity, fluorescent di acetate (FDA) assay and alkaline phosphase activity increased from 111 to 413 µg TPF/ g compost/ day, 98-260 µg fluorescein/ g compost/ h and 94-171 µg PNP/g compost/ h respectively.

Interactive effect of biochar and organic manures (Vermicompost, Poultry manure, Farmyard manure) on mitigating N_2O emission from Vertisols

An experiment was conducted in a laboratory condition to study the effect of two different sizes (<0.25 mm and 0.25-2.00 mm) of biochar (BC) amended with different organic manures viz. vermicompost (VC), poultry manure (PM) and farmyard manure (FYM) in mitigating nitrous oxide (N_2O) emission from vertisols. BC and organic manures were added to the soil @ 10 % w/w and 80 kg N ha^{-1} respectively. Both the BC and organic manures enhanced the emission of N_2O from the soil. The N_2O production potential of soil (µg N_2O g^{-1} soil d^{-1}) was greater in the larger sized BC (0.25 – 2.00 mm). Of the three organic amendments, PM emitted the highest N_2O (0.380 µg N_2O g^{-1} soil d^{-1}) followed by FYM (0.240 µg N_2O g^{-1} soil d^{-1}) and VC (0.210 µg N_2O g^{-1} soil d^{-1}). On the other hand, BC (<0.25 mm) + PM was found to be most effective in decreasing the N_2O emission (0.377 µg N_2O g^{-1} soil d^{-1}). The population of heterotrophic and ammonia oxidizing bacteria was lower in control and highest in soil + PM + BC (0.25-2mm). The study highlighted that the smaller BC particles (<0.25mm) could be effective to mitigate atmospheric N_2O production in vertisols.

Rise in atmospheric methane (CH_4) can influence redox metabolism and methanotrophs diversity in Vertisol

Experiments were carried out to examine the effect of positive CH_4 feedback response on CH_4 consumption potential, population dynamics of methanotrophs and reductive biogeochemical processes in a tropical vertisol. Soil samples with different CH_4 uptake potential were prepared by repeated CH_4 consumption cycle. Soil samples were further incubated to determine sequential reduction of terminal electron acceptors (NO_3^-, Fe^{3+}, SO_4^{2-} and CO_2). The diversity of methanotrophs was estimated by terminal restriction fragment length polymorphism (TRFLP) targeting the pmoA gene. Results revealed that rise in soil CH_4 consumption rate enhanced terminal electron accepting processes (TEAPs). Apparent CH_4 consumption rate 'k' (µg CH_4 consumed g^{-1} soil) increased from 0.49 to 1.09 over three repeated CH_4 feeding cycle. Potential denitrification rate (PDR), potential iron reduction rate (PIR), potential sulfate reduction rate (PSR) increased in response to 'k'. Abundance of methanotrophs and heterotrophs varied significantly with soil CH_4 uptake. TRFLP indicated significant ($p<0.0001$) bacterial community shift in response to CH_4 feedback activity (Fig. 5). Study provided comprehensive information on the complex interaction between CH_4 feedback response and biogeochemical activity, to predict ecosystem processes for now and future climate.

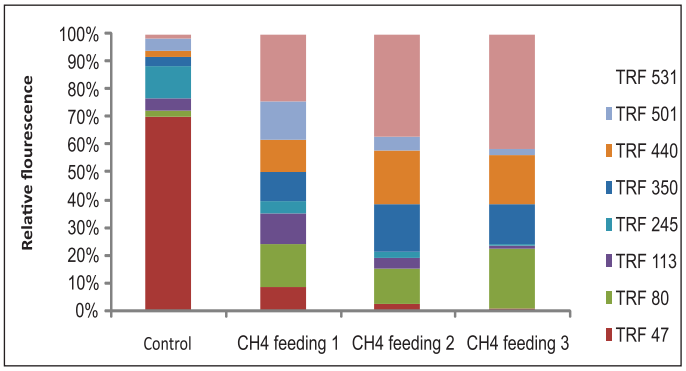


Fig.5. Terminal restriction fragment length polymorphism (TRFLP) pattern of methanotrophs community in soil samples under different CH_4 consumption cycles.

Diversity of Arthrobacter in Vertisols

Actinobacteria are a ubiquitous group of microorganisms involved in the decomposition of organic matter and suppression of soil borne plant pathogens. The culturable diversity of actinobacteria was assessed in rhizosphere of

various crops in Vertisols and their plant growth promoting potential was assessed for deploying them as inoculants. The soils had high abundance of Arthrobacter (10^4/g soil) (Plate 1). Cultural diversity of Arthrobacter based on morphological variations and growth characters showed the following trend: Chickpea (Jabalpur, Bhopal) > Maize (Chhindwara) = Wheat (Chhindwara, Geelakhedi) > Soybean (Geelakhedi) = Soybean (Bhopal) > Rice (Jabalpur) (50, 30, 20, 4). Around 200 isolates were screened on maize in vitro out of which 12 were short-listed for field evaluation based on origin, growth promotion, indole acetic acid production, phosphate solubilization and siderophore production.

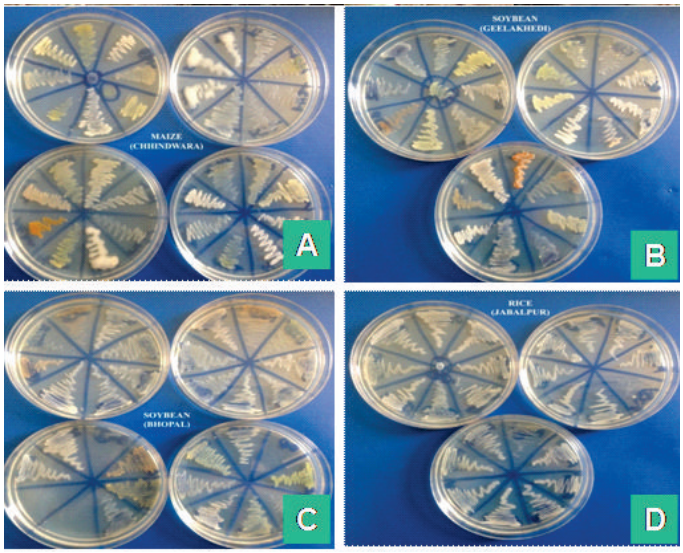


Plate 1. Cultural diversity of Arthrobacter spp in different cropping systems A- Maize (Chhindwara), B- Soybean (Geelakhedi), C- Soybean (Bhopal), D- Rice (Jabalpur)

Awards/Honours/Recognitions

- Dr. A.K.Patra (Director): Awarded Bioved Agri-innovation award 2015 for his outstanding contribution in the area of sustainable crop production
- Dr. M.C. Manna (Principal Scientist & Head): Conferred with Fellowship of National Academy of Agricultural Sciences (NAAS)

- Dr. N.K. Lenka (Principal Scientist): Awarded Associate of the National Academy of Agricultural Sciences (NAAS)
- Dr. S. Rajendiran (Scientist): Conferred with Fellowship for Young Scientist Training, 2015 by Madhya Pradesh Council of Science and Technology (MPCST), Bhopal
- Dr. Asit Mandal (Scientist): Received Best Oral Presentation Award in the Second International Conference on Bio-resource and Stress Management held at Hyderabad, Telangana State, during 7-10 January, 2015
- Dr. S.R. Mohanty (Senior Scientist): Received Young Investigator Award 2015 – India Bioscience, at Young investigators' meet (YIM 2015) held at Gulmarg, Kashmir
- Dr. Asha Sahu (Scientist): Received "Bharat Gaurav Award 2015" by India International Friendship Society, New Delhi
- Dr. K.C. Shinogi (Scientist) and team (Dr. Jayasree Krishnankutty, Dr. Sanjay Srivastava, Dr. I. Rashmi, Dr. Renu Balakrishnan and Dr. Reshma Gills): Received the Best Paper Award for the paper "Market-led Extension and Empowerment of Rural Farmers: The Case of Self Help Groups" in Kerala in the ISEE National Seminar 2014, held at Rajmata Vijayaraje Scindia Krishi Viswa Vidhyalaya, Gwalior, Madhya Pradesh during 26-28 February, 2015
- Dr. A. K. Vishwakarma (Senior Scientist): Received the best paper of the year award of the IASWC during International conference on "NRM for Food Security and Rural Livelihoods" held at NASC Complex, New Delhi during 10-13 February, 2015
- Dr. A. K. Vishwakarma (Senior Scientist): Received the AGRIINNOVATION award at "National Conference on Reinvigorating Agricultural Innovations for Farmers' Empowerment and Development, RAINFED-2015" at PJTSAU, Hyderabad-500030, during 3-4 May, 2015
- Dr. A.K. Patra (Director):Acted as a member in a selection committee meeting at union public service commission (UPSC) on 2nd January 2015
- Dr. A.K. Patra (Director): Acted as a panellist in the Mahindra Samriddhi India Agri Awards 2015 Jury Convention–Phase II at New Delhi on 23rd January, 2015
- Dr. K. Ramesh (Senior Scientist): Nominated as guest faculty (Agronomy), RKDF University, Bhopal
- Dr. K. Ramesh (Senior Scientist): Elected as Councillor of Indian Society of Agronomy for the biennium 2015-17
- Dr. K. Ramesh (Senior Scientist): Elected as member of Executive council of Association of Agro-

meteorologists, Anand for the biennium 2015-17

- Dr. Pradip Dey, PC (STCR): Chaired a Technical Session on "National resource management for enhancing and sustaining agricultural productivity" of section of Agriculture & Forestry in 102nd Indian Science Congress at University of Mumbai
- Dr. D.L.N. Rao, PC (BF): Visited NBAII, Bangalore Karnataka as chairman for conducting the assessment of Senior Scientist (Microbiology) on 6th January 2015
- Dr. D.L.N. Rao, PC (BF): Invited for a brainstorming session on ICAR Vision 2050 organized by IFPRI, India on 29th January, 2015
- Dr. A.K. Patra (Director):Acted as a member in a selection committee meeting JNKVV, Jabalpur during 20-21 February, 2015
- Dr. D.L.N. Rao, PC (BF):Delivered a lead lecture on "Future Challenges in BNF Research" at Workshop on "Reviewing and prioritizing the microbiological research under AICRP-chickpea, pigeonpea and MULLaRP "at IIPR, Kanpur on 3rdMarch, 2015
- Dr. D.L.N. Rao, PC (BF): Delivered an invited lecture on "Recent Advances in Soil Biodiversity, Genomic Indicators and Integrated Measurement of Soil Biological Health" at Assam Agricultural University, Jorhat on April 27, 2015 organized by Jorhat chapter of Indian Society of Soil Science to mark the International Year of Soils 2015
- Dr. A.K. Patra (Director):Acted as a member of award committee meeting at UPCAR, Lucknow, during 1-5 June, 2015

International Cooperation

Dr. S.R. Mohanty received India- Argentina bilateral international project (DST India and MinCyt Argentina) on "Metagenomic mapping of microbial diversity in rhizosphere of major crops of India and Argentina offsetting production potential".

Extension Activities

- A field visit cum farmer-scientist meeting was conducted on 05 February, 2015 in Mengra Kalan Village, Berasia, Bhopal district. The scientist of our institute interacted with a group of 15 farmers to understand their perception and constraints about the institute's technologies demonstrated in their village

- Dr. A.K. Patra, Dr. Sanjay Srivastava, Dr. A.K. Vishwakarma, Dr.I. Rashmi and Dr. K.C. Shinogi participated in *Pusa Krishi Vigyan Mela* held at ICAR-IARI, New Delhi during 10-12 March, 2015.
- Contingency planning meetings were organized at village Sangoni kalan, Raisen road on 18.06.2015 and at Parwalia sadak, Airport road on 20.06.2015. Around 100 farmers had participated in the meetings
- The scientists of our institute participated and interacted with the farmers at Krishi Sanghosti organized by KVK, Raisen, M.P. on 30.06.2015. About 110 farmers from different parts of the district participated in the sanghosti cum mela

Participation of Institutes scientist in Krishi Sanghosti at Raisen, M.P.

Workshops / Training Programmes Organized

Zonal Project Directorate (ZPD-VII) Conducts Annual Action Plan-cum-Workshop of KVKs

Annual action plan cum workshop was organized by Zonal Project Directorate (ZPD-VII), Jabalpur at ICAR-IISS Bhopal during 20-21st April, 2015 to review the work carried out on soil fertility management by different Krishi Vigyan Kendra (KVKs) for the states of Odisha, Madhya Pradesh and Chhattisgarh. Dr. A.K. Patra, Director, ICAR-IISS inaugurated the workshop. Dr. Muneshwar Singh as Organizing Secretary welcomed the delegates and the Chief Guest. All the KVKs presented the work done during previous year and also proposed the activities to be taken up during the current year.

AICRP (STCR) Conducts Tribal Sub Plan (TSP) Programmes

The AICRP(STCR) had organized several TSP programmes at different centers under its jurisdiction. It had organized a training programme during February 9-10, 2015 at Krishi Vigyan Kendra, Ambikapur (Surguja district) under the jurisdiction of Indira Gandhi Krishi Vishvavidyalaya, Raipur (Chhattisgarh). In this programme, training was given to farmers on soil testing using portable, farmers' friendly, rapid soil testing kit developed by STCR centre at IGKV, Raipur. This was followed by a field day-cum-interaction programme where in front line demonstrations on STCR based fertilizer application to achieve yield target of wheat were shown. On March 17th 2015, a tribal farmers' meet was organized at Farmers' Academy and Convention Centre, Kalyani (West Bengal). Prof. Chittaranjan Kole, Hon'ble Vice-Chancellor presided over the meeting and Mr. Shubashis Batabayal, Parisadio Sachib, Department of Agriculture, GoWB was the chief guest. On June 16, 2015, a capacity building cum field day was also organised in collaboration with AICRP-LTFE at Purani Pod, BR Hills (Chamarajanagara district). During this programme, 98 soil health cards as well as seeds and fertilizer material were distributed to the tribal farmers.

Tribal farmers meet at Purani Pod, BR Hills (Karnataka)

Tribal farmers meet at Farmers Academy and Convention Centre, Kalyani (West Bengal)

TSP workshop conducted at Ambikapur, IGKV, Raipur (Chhattisgarh)

- Organized a Model Training Course (sponsored by DAC, Ministry of Agriculture) on Climate Change and Conservation Agriculture, during 28th January to 4th February, 2015

- Organized a 5-day International Training Programme on MIR Spectroscopy by experts from ICRAF, Nairobi, Kenya, during 9-13 March, 2015

Distinguished Visitors

Name	Designation	Date
Dr.Alok K.Sikka	DDG(NRM), ICAR, New Delhi	19-01-2015
Dr.P.K.Ghosh	Director, ICAR-IGFRI, Jhansi	22-01-2015
Dr.Evis Weullow and Dr.Andrew Sila	Experts from World Agroforestry Centre (ICRAF), Nairobi, Kenya	09-03-2015
Dr.H.S.Gupta	DG, BISA & Ex-Director, ICAR-IARI, New Delhi	18-03-2015
Dr.Panjab Singh	Ex-Secretary, DARE&DG, ICAR, New Delhi	25-03-2015
Dr.B.N.Singh	Registrar, RKDF University, Bhopal	25-03-2015
Delegates (10 members)	Amhara Regional Agricultural Research Institute (ARARI), Ethiopia	25-04-2015
Dr. S.K. Chaudhari	ADG(SWM), ICAR, New Delhi	06-05-2015

Dr. Alok K. Sikka, Hon'ble DDG (NRM) ICAR visits organic farming block of the institute

Dr. Evis Weullow and Dr. Andrew Sila, experts from World Agroforestry Centre (ICRAF), Nairobi, Kenya interacting with scientists of the institute

Dr. H.S. Gupta, Ex-Director, ICAR-Indian Agricultural Research Institute, New Delhi interacting with the scientists of the Institute

Dr. Panjab Singh, Ex-Secretary, DARE & DG, ICAR, New Delhi and Dr. B.N. Singh, Registrar, RKDF University, Bhopal, interacting with the scientists of the Institute

Programmes Held

Research Advisory Committee (RAC)

The XXI meeting of the Research Advisory Committee (RAC) of the Institute (The first meeting of the current RAC) was held under the chairmanship of Dr. C.L. Acharya on January 30-31, 2015. Dr. T.K. Adhya, Dr. N.S. Raghuwanshi and Dr S.K. Chaudhari, ADG (S&WM), ICAR attended the meeting. Dr. A.K. Patra, Director of the Institute welcomed the Chairman and Members of RAC and apprised them about the new initiatives taken after the previous meeting of the RAC held on 14th December, 2013. Dr. S.K. Chaudhari, ADG (SWM), at the outset congratulated the soil scientists who have helped in developing fertilizer prescription equations for the recommendations of the fertilizers in different parts of the country and the effect of long term use of fertilizers on soil health. Dr. C.L. Acharya, Chairman RAC, urged the scientists to focus on research of national importance for improving livelihood of resource poor farmers.

Republic Day

The staff recreation club celebrated the 66th 'Republic Day' with great zeal and enthusiasm. Various sports and cultural events were organized for the staff and their family members.

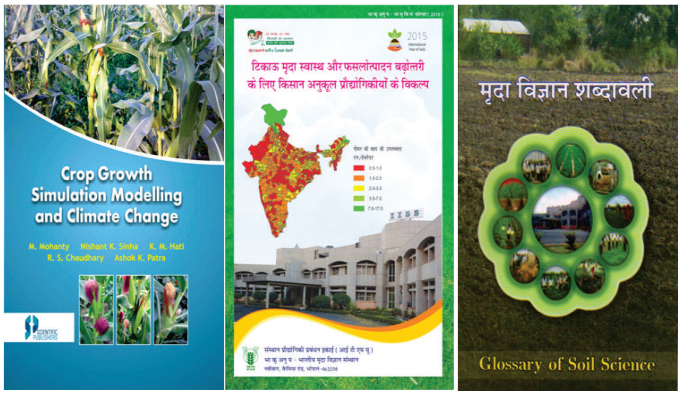
International Women's Day

International women's day was celebrated on 08 March with great fervor and gaiety. Various competitions viz., Rangoli, spot the city and Maan Ki Baat were organized for women staff and spouses of IISS staff. Dr. Mridulla Billore, Dean, College of Agriculture, Khandwa was the chief guest of function. The Guest of honor, Mrs. Reena Patra highlighted the importance of women's health and education.

28th Foundation Day

The 28th Foundation Day of ICAR-Indian Institute of Soil Science was celebrated on 16 April 2015 at the institute campus. Dr. Ashok K. Patra, Director, welcomed the dignitaries and participants and appraised them about the progress made by the institute. Dr. P. K. Verma, Director General, Madhya Pradesh Council of Science and Technology (MPCOST), Bhopal was the Chief Guest of the event. Dr. R. K. Gupta, Team Leader, Research Station Developments, Borlaug Institute for South Asia (BISA), CIMMYT, New Delhi was the Guest of Honour. Several progressive farmers were felicitated for their achievements in pursuing innovative agricultural practices. A new mini lab (Mridaparikshak) for soil testing for the generation of soil health card was also demonstrated.

Recent Publications



Staff News

Staff Promoted		Wef
Shri Vinodbabu Pal	Sr. Tech. Officer to Asstt. Chief Tech. Officer	10.02.2015
Shri Sahab Siddiqui	Sr. Tech. Officer to Asstt. Chief Tech. Officer	19.12.2014
Shri O.P. Shukla	Sr.Tech. Asst to Technical Officer	01.01.2014
New staff joined		**Date**
Dr. Abhay Omprakash Shirale, Scientist		10.04.2015
Dr. Sudeshna Bhattacharjya, Scientist		10.04.2015
Staff transferred / resigned from the institute		**Date**
Dr. S. Neenu, Scientist, Transferred to ICAR-CPCRI, Kasaragod		08.01.2015
Shri S. Mukherjee, JAO, Transferred to ICAR-ATARI, Kolkata		14.05.2015
Superannuated		**Date**
Shri V.K. Derashree, AO		30.04.2015

Scientists' Participation in Conferences/Seminars/Trainings/Workshops

Name	Programme	Venue	Date
Dr. D.L.N. Rao, Dr. Pradip Dey & Dr. Tapan Adhikari	102nd Indian science congress	University of Mumbai, Mumbai	January 3 -7, 2015
Dr. M. Mohanty	AIC Workshop on soil and water networking	IIT, Kharagpur	January 5-7, 2015
Dr. K. Ramesh	National conference on indigenous innovation and foreign technology transfer in fertilizer industry: needs, constraints and desired simplification	ICAR-CRIJAF, Barrackpore	January 17, 2015
Dr.A.K. Patra	National conference on innovation in fertilizer technologies vis-a-vis environment through PPP mode	ICAR-CRIJAF, Kolkata	January16-17, 2015
Dr. S. Kundu & Dr. M.C. Manna	XII Agricultural science congress	ICAR-NDRI, Karnal	February 3-6, 2015
Dr.A.K. Patra	International conference on natural resources management for food security and rural livelihoods	NASC, New Delhi	February 12, 2015
Dr. Pradip Dey	ING Brain storming workshop on reactive nitrogen assessment in India	ING-SCON, New Delhi	February 13, 2015
Dr. S.R. Mohanty	National seminar on science led development for environmental sustainability	Indian National Science Academy (INSA), New Delhi	February 20-22, 2015
Dr A.B. Singh	Nav dunia kisaan mahotsav on organic farming	Vidisha	February 24-25, 2015
Dr. Pradip Dey	Indo-French workshop on scientific cooperation for agricultural research	New Delhi	March 9-11, 2015
Dr. A.K. Patra, Dr. Muneshwar Singh, Dr. Pradip Dey, Dr. R.H. Wanjari & Dr. S. Srivastava	IFA-FAI National seminar on sustainable fertiliser management for soil health	FAI, New Delhi	March 16-17, 2015
Dr. Sangeeta Lenka	Workshop on climate change and its impact on agriculture	KVK, Raisen, Bhopal	March 18, 2015
Dr. M. Mohanty	National mission on sustainable agriculture (NMSA)	ICAR-CRIDA, Hyderabad	March 23, 2015
Dr. M. Mohanty	Technical programme workshop of national innovations on climate resilient agriculture (NICRA)	ICAR-CRIDA, Hyderabad	March 24-25, 2015
Dr. I. Rashmi & Dr. Asha Sahu	National seminar on recent trends in science & technology	MPCST, Bhopal	March 30-31, 2015
Dr. A.K. Vishwakarma	Economic and industrial assessment of silt as a result of Koshi disaster in Bihar	BAMETI, Patna	April 7, 2015
Dr. R. Elanchezhian & Dr. K. Ramesh	Workshop on climate smart technologies	RVSKVV, Gwalior	April 17-18, 2015
Dr. R. Elanchezhian	National training on right to information for public information officers	ISTM, New Delhi	April 27-28, 2015
Dr. A.K. Patra	Annual conference of vice chancellors (VCs) of agricultural universities and directors of ICAR institutes	New Delhi	May 13-15, 2015
Dr. Muneshwar Singh	Review workshop of AICRP on integrated farming systems	ICAR-PDFSR, Modipuram	May 18-19, 2015
Dr. A.B. Singh	Kisan sangosthi, organized by state department of agriculture, Madhya Pradesh	ICAR-CIAE,Bhopal	June 10-12, 2015
Dr. Sanjay Srivastava & Dr. P. Jha	National seminar on evaluation of available nutrient of soil from the view point of rhizosphere	JNKVV, Jabalpur	June 17, 2015

Editors : S. Ramana, Sanjay Srivastava, K. Ramesh, K.C. Shinogi

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