Silver Jubilee year of IISS (1988-2013)

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Agrisearch with a human touch

IISS NEWSLETTER

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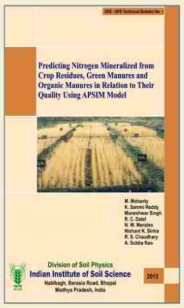
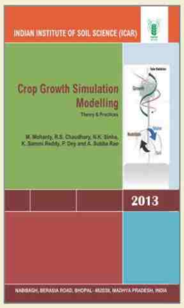
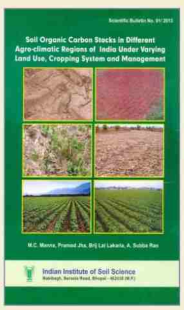
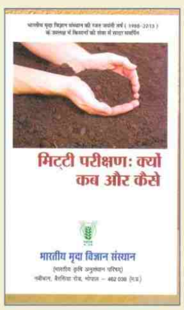
New Publication









In This Issue

Forth Coming Events

- National Level Consultation meeting on "Soil Health Assessment" on 26 February, 2014 at IISS, Bhopal
- Visit of Prof. Rattan Lal, Director, Carbon Management & Sequestration Centre, Ohio State University, Columbus during 10-12 March, 2014

Message from Director's Desk

Ecosystem Services, Soil Health and Best Management Practices: Linkages for Food Security and Biodiversity Conservation

With world population projected to reach 9.5 billion by 2050, it has been suggested that a 70-100% increase in food supply will be needed in order to meet the food demands. In many parts of the world, increase in food production through intensive farming methods have been possible at the expense of other ecosystem services to land, freshwater, biodiversity and climate. Soil health is the condition of the soil in relation to its inherent or potential capability, to sustain biological productivity, maintain environmental quality and promote plant and animal health. Soil resilience is the inherent capacity of the soil to recover after stress or disturbance. In view of large scale soil degradation, it is vital to maintain soil resilience and thus the ecosystem services, a quality soil provides. Ecosystem services can be described as the attributes of ecological systems that contribute to benefits for human beings. In other words, it may be defined as the conditions and processes through which natural ecosystems and the species that make them up, sustain and fulfil human life. The concept of "Ecosystem services" is relatively recent, with first appearance in the scientific literature in the late 1960s. The essence of the concept is that the multitude of interactions among living and non-living organisms in ecological systems, produce outcomes that not only have great value to humans but can potentially be more efficient and less costly. The type of benefits that come from ecosystem broadly include: support for production of food, fuel, fodder and other products of crops; provision of chemicals and genetic materials that can have value in human health and/or industrial processes; clean air and water; natural pest control; disposal of wastes; and a range of cultural, intellectual, spiritual and other intangible benefits. Ecosystem services are classified under four broad categories: (1) *Provisioning services*- refer to products obtained from the ecosystems, (2) *Supporting services* – the services essential for production of other ecosystem services such as, soil formation, photosynthesis, nutrient cycling, water cycling, primary production etc. (3) *Regulatory services* – are the benefits obtained from regulation of purification, erosion control etc., (4) *Cultural services* – those providing non-material benefits to the people such as recreation, maintaining aesthetic value etc.

A large proportion of the ecosystem services provided by soils are actually provided by the soil biota, though the biotic activity is mostly concentrated in the rhizosphere. Soil biodiversity is critical to ecosystem functioning and sustainable land management. The importance of soil in ecosystem services comes from the fact that soil is the medium for all terrestrial ecosystems. Thus, a degraded soil may have reduced soil fertility, declining organic matter content, loss of water retention capacity, disturbance in water and nutrient cycling and loss of biodiversity. So the degraded soils in the ecosystem may not provide all the services optimally, and thus resilience of soil is important. The ecosystem services provided by soil are linked to key soil functions. The key soil functions include, production of biomass, storage, infiltration and cycling of nutrients, substances and water, carbon storage and cycling, detoxification of wastes, provision of habitat, species and genetic diversity and

protection of archaeological heritage. In major agricultural production zones of the globe, the total and partial factor productivity is on the decline. This is because of the setting in of a degradation trend and reduction in soil quality, primarily due to depletion of soil organic matter, absence of organic inputs in the management schedule, which result in breaking of the physical integrity of the soil and a decrease in the natural nutrient cycling and nutrient provision services provided by soil biota. Human interventions have dramatically increased food provisioning services through the spread of agricultural technologies. Sustainable intensification of agricultural production, especially in developing countries, can improve food security through higher levels of production in agro-ecosystems. This requires innovation in land use and agricultural production along with natural resource management that deliver improved crop and livestock productivity while contributing to:

- Biodiversity conservation by reducing encroachment of agriculture into natural ecosystems and safeguarding agro-biodiversity
- Improved quality and sustained soil and water availability in production systems
- Climate change mitigation by reducing deforestation and emission of greenhouse gases in production systems
- Climate change adaptation by increasing sustainability and resilience of agro-ecosystem services

Soils underpin, basically all the processes leading to ecosystem services and subsequent benefits. Hence, any changes in soil condition potentially affect a range of processes, services and benefits to humans. Improving soil health/condition might address the question of ecosystem services either through maintenance of soil quality/ resilience or through best management practices (BMPs) for crop production along with natural resource management. BMPs approach to manage soil carbon (C), acidity and soil erosion are most important for improving soil conditions. The C content of soil is one of the key indicators of its health, and is a vital variable that controls numerous processes. It is the C contents of soils that largely governs their capacity to absorb, retain and supply moisture within the soil and to sustain active plant growth. Thus, the basic approaches might be:

- Approaches such as integrated soil fertility management, integrated soil-water-nutrient management, integrated crop-livestock management and farmers' friendly natural regeneration/ resilience processes.
- Strategies to increase soil carbon pools through practices like minimum tillage or no-tillage maintaining ground cover either through residue management or through cover crops for managing stock and machinery on soil disturbance and compaction.
- Management strategies for soil quality maintenance, soil resilience/resistance either through incorporation of organic matter amendments to the soil or through less disturbance to the soil
- Development of rejuvenation/rehabilitation programme for soil degradation problems by intervention of agroforestry i.e. inclusion of tree component by improving ground water quality through their deep rooted system, providing wildlife habitat, improving air quality by removing atmospheric CO_2 and providing O_2, limited wind erosion etc.

Studies are being conducted on soil resilience in this institute with regard to various soil parameters. Research highlights showed that soil organic amendments have favourable effect on soil resilience as well as the other index properties of soil such as, liquid limit, plastic limit and shrinkage limit.

In economic terms, what is the value of the ecosystem service? It may not be an easy proposition to value the ecosystem services, other than the provisioning services. However, researchers have attempted to value the ecosystem services through indirect computations such as avoided cost, replacement cost etc. For instance, the 'Nutrient cycling service by soil food web' is valued through replacement cost of substitution with chemical fertilizers and pesticides. Though substitutes are available for some ecosystem services, the cost of the technology substitution can be high. Further, the substitution may not replace all the services lost and also for all services, substitution may not be available.

Thus, a number of key research gaps are to be addressed for a sustainable maintenance of ecosystem productivity of soil. The important among them are: (a) quantification of the ecosystem services provided by soil, (b) understanding the relationship among the various ecosystem services of soil, and (c) assessing the relationship between soil processes and soil biota in maintaining a balanced service function.

Now-a-days with advancement in modern technology, the policy should have system approaches for maintaining and restoring ecosystem services of soil or for any other natural resources. One of the aims of the system approach is to be efficient in achieving multiple objectives. Integrated soil management is a method for restoration of any ecosystem, for example, large-scale grassland restoration through livestock. Multisectoral approach is essential to fully evaluate the ecosystem services and their impacts on people. The multisectoral approach should examine the supply and condition of each ecosystem service as well as the interactions among them.

(A. Subba Rao)

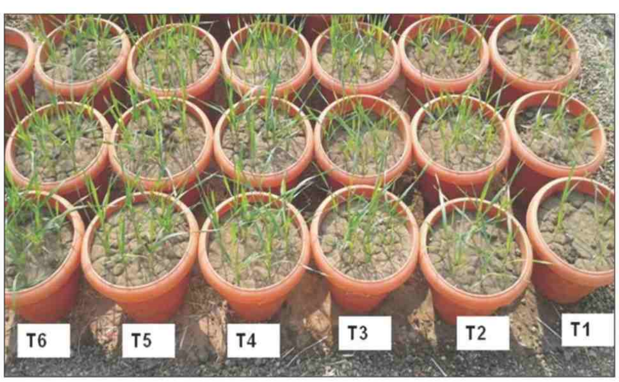
Research Highlights

Degree of phosphorus saturation affecting P movement in soil

A column experiment was conducted with four soils (Typic Chromustert, Typic Ustochrept, Kandic Paleustalf, and Typic Plinustult) saturated to different degrees with P (0, 25, 50, 100, 150, 200, 400 and 800 % Smax) levels. The P incubated soils were subjected to 11 batches of leaching events. Reactive P (RP) concentration in leachate was first observed at 400% and 800% Psmax treatments in inceptisol at 5^{th} batch of leaching event, followed by alfisol in 7^{th} batch of leaching and vertisol in 8^{th} batch of leaching and ultisol in 7^{th} leaching event. In vertisol, inceptisol , alfisol and ultisol the RP concentration in leachate ranged from 0 to 9.76 µg ml^{-1}, 0 to 12.31 µg ml^{-1}, 0 to 10.59 µg ml^{-1} and 0 to 8 µg ml^{-1} in 0 to 800% Smax treatments respectively. The movement of P in column section was revealed with increase in total P content in lower layers of treated soils and in upper layer of untreated soil with higher P loading rates.

Biochar effects on wheat grain yield

A Pot culture experiment was conducted to assess the effect of biochar application on wheat crop performance. Biochar was tested with and without FYM and inorganic fertilizers. Application of inorganic fertilizers alone increased the yield by 32.5% over control. Application of biochar and FYM alongwith NPK resulted in about 27.9% higher grain yield, over NPK only.



Microbial biomass carbon and nitrogen turnover and nutrient availability in long term fertilizer experiments

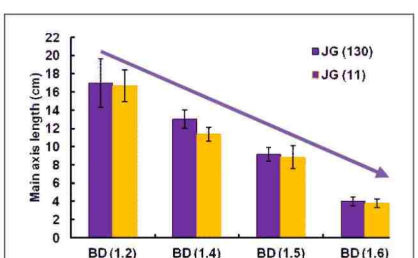
Microbial activity in soil is one of the important soil indicators for assessing soil health. More is microbial biomass carbon (SMBC), higher will be nutrient turnover in soil. A study was conducted in different soils and cropping systems in long-term fertilizer experiments to find the effect of fertilizer nutrient on soil microbial biomass carbon and nitrogen. Balanced use of chemical fertilizers resulted increase in SMBC and SMBN irrespective of soil type. However imbalanced nutrient application led to decline in SMBC and SMBN in acid soils (Alfisols) only. Integrated nutrient use (NPK+FYM) further enhanced biomass carbon and nitrogen. Increase in SMBC and SMBN is due to availability of fresh biomass which is a substrate for the growth of microorganisms, added each year in larger amounts through leaves, roots and stubbles in integrated nutrient supply treatment as compared to control and 100% N. Results indicated that application of chemical fertilizer along with manure resulted increase in growth of soil microorganisms of soil, which in turn enhance availability of nutrients in soil.

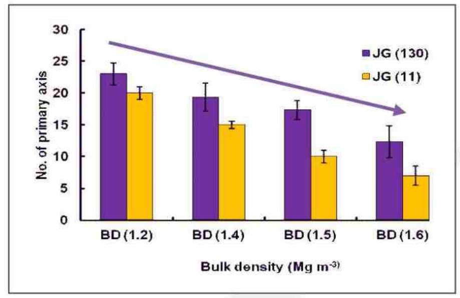
Fly ash and organic amendments interaction effects on resilience of Vertisol

An incubation study was conducted with various soil amendments i.e. FYM, biochar and, poultry manure @ 25 t ha^{-1} and fly ash @ 1% weight of soil with and without Cu stress to characterize soil resilience as affected by soil amendments in vertisol. Application of Cu stress significantly reduced the soil microbial biomass carbon (SMBC) and dehydrogenase enzyeme activity (DHA) from 0 to 6 week in un-amended soil and from 0 to 4 week in soil amended with various amendments. Soil without amendment showed the lower resistance, hence higher reduction in SMBC and DHA (40.20 and 46.13%, respectively) followed by other treatments (range 7.92–20.97 and 3.44–26.76 %) at the end of 4-6 weeks after incubation. The resistance capacity of the soil studied under Cu stress is found better in either biochar or biochar + fly ash treatment. The maximum soil resilience index was found under FYM + fly ash (0.74) followed by biochar + fly ash (0.71), poultry manure + fly ash (0.70), FYM (0.68), poultry manure (0.61), biochar (0.58), fly ash (0.57) and control (0.32). Similarly, the physical indicators of resilience *viz.* Californian Bearing Ratio (CBR) and resilient modulous values were the highest in the treatments with FYM + fly ash (2.79% and 28.88 MPa, respectively) followed by poultry manure + fly ash (2.25% and 23.28 MPa, respectively) depicting their higher strength due to addition of fly ash. Vertisol treated with organic amendments and fly ash showed better performance in terms of soil resilience.

Root architecture in chickpea crop as influenced by soil compaction levels

The root systems of chickpea cvs JG 11 and JG 130 showed a great response to soil compaction levels. There was significant difference in the root architecture of both cultivars with increase in bulk density (BD) from 1.2 Mg m^{-3} to 1.6 Mg m^{-3}. Between the two cultivars of chickpea, the main axis length was greater in JG 130 than JG 11 in all compaction levels. Increase in BD decreased the number of primary axis significantly in both the cultivars. On an average, there was 48% and 65% reduction in number of primary axis roots in JG 130 and JG 11 with increase in BD from 1.2 Mg m^{-3} to 1.6 Mg m^{-3}, respectively. The number of nodes in chickpea has also been decreased with increase in compaction levels. Both the cultivars under study showed negative response towards higher bulk density. There was 37% and 53% reduction in no. of nodes in JG 130 and JG 11 with increase in BD from 1.2 Mg m^{-3} to 1.6 Mg m^{-3}, respectively. Thus, the cultivar JG 130 proved superior in performance over JG 11 under increasing soil compaction.





Effect of soil compaction levels on main axis and number of primary axis of chickpea

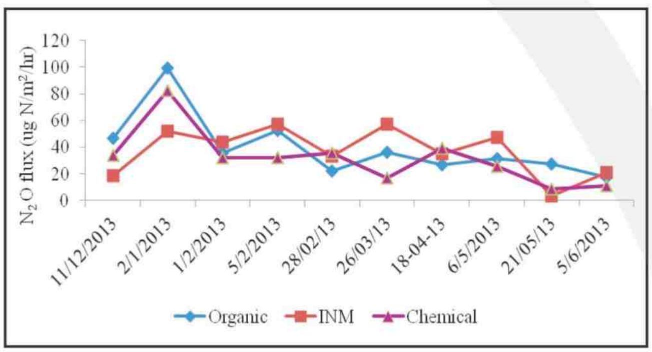
Soil organic carbon pools under conservation agricultural practices

Organic carbon pools namely very labile, labile and non-labile pools after three crop cycles from conventional tillage (CT) and reduced tillage (RT) were significantly higher in the surface than that in the subsurface layer. However, less labile carbon pools showed no significant difference between the surface and sub-surface layers. Among the tillage practices compared, the very labile and non-labile carbon pools at 0-15cm soil depth under reduced tillage (0.28% and 0.60%, respectively) were significantly higher than that under conventional tillage (0.23% and 0.53%, respectively). This was ascribed to the reduction in tillage operations and addition of crop residues in reduced tillage. Among the four fractions, carbon content under non-labile fraction was the highest followed by very labile, labile and less labile fractions at 0-15 cm depth. Thus, there may be a likely shift of carbon from one pool to another pool with residue addition and reduction in tillage operations in the long run.

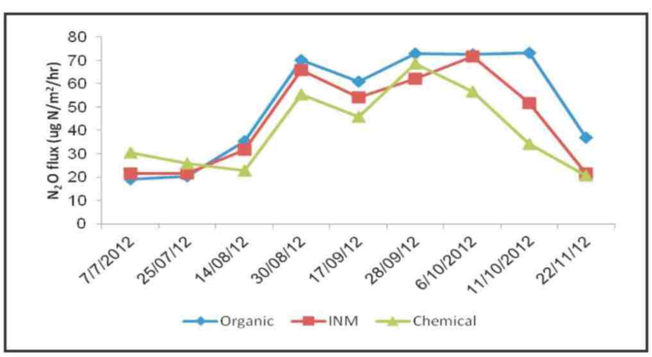
Influence of nutrient management on greenhouse gas emission in soybean and wheat

Influence of nutrient management on emission of greenhouse gases (GHGs) from soil was studied in a long-term experimental field in soybean-wheat cropping system of vertisols of central India. Collection of gas samples for CH_4 and N_2O was carried out by the closed-chamber technique placed between the rows of the plants. Total CO_2, CH_4 and N_2O

emissions of different treatments ranged between 2.7 to 25.4 mg C m^{-2} h^{-1}, -35.27 to 1.21 µg C m^{-2} h^{-1} and 20.50 to 81.8 µg N m^{-2} h^{-1} during the soybean and wheat growing season. Application of organic manure significantly increased emissions of all the three GHGs compared to inorganic fertilization. Substitution of 100% inorganic N by organic sources lead to a 30% and 77% increase in N_2O and CO_2 emission respectively. Though the use of organic manures along with inorganic fertilizer increases the GHG emission of soybean-wheat system but improves the soil carbon sequestration, soil fertility status, health and yield of soybean and wheat crop. Thus the trade-off between improved soil carbon sequestration, yield and soil health versus GHG emissions should be taken into account while promoting the practice of farming with organic residues substitution for mineral fertilizers.



Effect of nutrient management on N_2O fluxes during wheat growing season 2012-13



Effect of nutrient management on N_2O fluxes during soybean growing season 2012-13

Methanotrophs from compost (FYM) for greenhouse gas mitigation

A study was carried out to investigate the impact of several parameters on CH_4 oxidation of the farm yard manure (FYM). CH_4 oxidation was studied with different moisture regimes (30-80%) and temperatures (30-65°C). Compost moisture at 50-60% stimulated CH_4 consumption than at 30% and 80% WHC. Similarly incubation experiment with different temperatures revealed that FYM exhibited maximum CH_4 oxidation at 35°C. Methane oxidizing bacteria (methanotrophs) from FYM were isolated and enriched under laboratory condition to develop an environmental friendly microbial technology for reducing CH_4 emission from compost. These isolated cultures were tested for their efficiency in enhancing CH_4 oxidation potential of the composts. Methanotrophic bacterial population was added in the range of 10^7-10^{10} cells (CFU) per gram of compost (FYM). Methanotrophic bacteria applied at 10^8 cells showed maximum oxidation (22 µg g^{-1} d^{-1}) while with higher bacterial population did not show any significant increase in CH_4 oxidation rate.

Methanotrophs isolated from compost (FYM)

Biochar as an additive to compost for reducing Greenhouse gases (GHG)

A laboratory experiment was carried out to underpin the complex interaction of biochar, composts and soil microbial process involved in GHG production and consumption. Soil was amended with composts and biochar at 80 kg N ha^{-1} and 10% w/w respectively. Three types of composts including vermicompost (VC), poutry manure (PM), and farm yard manure (FYM) and two sizes of biochar (<0.25 mm, and 0.25-2.00 mm) were applied as single or in combination to soil. Production of GHG followed the trend of CO_2>CH_4>N_2O. N_2O production from soil was in the range of 30 µg g^{-1} soil while biochar amendment reduced N_2O production over control. Apparent rate constant of CH_4 oxidation k (µg CH_4 consumed g^{-1} soil d^{-1}) varied from 0.051 to 0.242. Amendment of biochar enhanced k value in all treatments but their response was maximum in small size (<0.25 mm) fraction than large size (0.25–2.00 mm). CH_4 consumption significantly correlated with methanotrophic microbial population ($p < 0.0001$) indicating the significant role of biochar in mitigating GHG emission from compost.

Diversity of nitrifying bacteria and archaea (crenarchaea) in vertisol

Experiment was carried out to know the structure and function of bacteria and nitrifying Crenarchaeota, their interaction in the development of biogeochemical cycles in relation to the plant growth and ecosystem function. Nitrification process in the vertisol was measured in soybean under different crop growth stages and fertilizer amendments. Nitrification rate (µg NO_3 produced g^{-1} soil d^{-1}) was high in the vegetative period and followed the trend of inorganic (0.48) > integrated (0.41) > organic (0.38) > control (0.24). Relative fluorescence of nitrifying bacteria (TRF 48, Nitrosomonas) remained high (18% relative flourescence) while Archaea did not vary significantly (TRF 56, TRF 147, with 10-15% relative fluorescence) in contrast to their initial abundance. To test the role of Crenarchaea in soil, nitrification process was explored under sequential reduction electron acceptors or terminal electron accepting process (TEAPs). Nitrification rate increased at NO_3^{1-} and Fe^{3+} reduction while decreased under SO_4^{2-} and CO_2 reduction (methanogenesis). Relative fluorescence of nitrifiers TRFs remained unchanged during sequential reduction. However relative fluorescence of Archaea (Crenarcheota clade 1.1a, and Crenarcheota clade 1.1b) increased (17-20% relative flourescence) with soil reduction. Based on data, a conceptual model for Crenarchaea mediated nitrification process was hypothesized. Results highlighted significance of Crenarchaea diversity and their interaction with bacteria in different soil biogeochemical process is that are relevant to the plant nutrient transformation.

Improving crop productivity and soil health under organic farming

Seed yield of soybean was the highest under organic followed by integrated nutrient management and the lowest soybean yield was recorded under inorganic fertilizer management system. Among the cropping systems, soybean-wheat/chickpea performed better than soybean-mustard/linseed cropping system under organic farming. Soil enzymes activity such as dehydrogenase, acid and alkaline phosphatase and FDA activity improved with the application of 100 % organic followed by integrated compared to the chemical fertilizers and control.

Consequences of transgenic cotton on soil microbial diversity

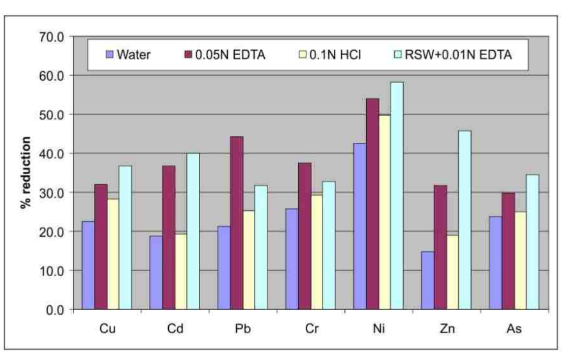
The impact of Bt-cotton on soil beneficial microorganisms such as soil heterotrophs, nitrogen fixers, P solubilizers, cellulose decomposers and biological properties were assessed. Under Bt-cotton system soil microbial biomass carbon (212-275 mg kg^{-1}), soil respiration (139-178 mg kg^{-1}10 d^{-1}) was higher compared to non Bt-cotton system (SMBC: 136-248 mg kg^{-1} and soil respiration: 114-152 mg kg^{-1}10 d^{-1}). Soil enzymes activity such as dehydrogenase, fluorescin di-acetate, and alkaline phosphatase was found 15%, 23% and 6% higher respectively in Bt rhizosphere soil as compared to non-Bt cotton rhizosphere soil. The glomalin protein content was also found higher (39-110 mg kg^{-1}) in Bt-cotton based cropping systems as compared to non-Bt-cotton (38-57 mg kg^{-1}). Soil microbial counts such as total heterotrophs, aerobic nitrogen fixers, P solubilizers and cellulose decomposer was found to be higher in Bt rhizosphere soil than non-Bt rhizosphere soil. The greater microbial activities in Bt-cotton cropping system was due to substantial improvement of soluble phase of carbon through rhizo-deposition, root biomass and leaf-fall which acted as source of bio-energy for soil microbes.

Developing technique for acceleration of decomposition process using thermophilic organisms

The purified 16S rDNA sequences derived have been deposited in GenBank, USA. Accession number has been obtained for the identified species. Based on the laboratory study, the consortium of thermo-lignocellulolytic organisms has been made. It has been observed that the treatments with inoculums showed 50% reduction in the C:N ratio where as the lignin:cellulose ratio got doubled in 120 days. A bioreactor for accelerated decomposition is designed and a rotating drum type reactor fabricated with a capacity of 100 kg.

Extraction-cum-sieving: a potential technology for removal of heavy metals from MSW composts

An experiment was conducted to investigate removal of heavy metals from municipal solid waste composts through extraction-wet sieving procedure. Fourteen compost samples from different cities, prepared from mixed wastes (unsegregated/ partially segregated) were selected for the study. Extractants compared were water, EDTA (0.05N), HCl (0.1N) and raw distillery spent-wash (RSW) containing 0.01N EDTA. Results showed that removal of finer particles with water only reduced, on average, Cu by 22%, Cd by 19%, Pb by 21%, Cr by 26%, Ni by 42%, Zn by 15% and As by 24%. Among the extractants, 0.05N EDTA was usually most efficient in removing Pb and Cr; whereas, RSW+0.01N EDTA was most efficient in removing Cu, Cd, Ni, Zn and As. Extraction-wet sieving using most efficient extractants reduced different heavy metals on an average by about 34-58%, indicating that this method has considerable potential in diminishing the magnitude of soil contamination potential from the regular use of MSW composts in agriculture.



Reduction in heavy metals contents in MSW composts using extraction-wet sieving methods

Soil fertility status of Alirajpur District, Madhya Pradesh

Geo-referenced surface soil samples (top 15 cm) were collected from the farmers' fields of tribal district Alirajpur (MP). About 90 villages were selected randomly and based on the socio-economic status, 6 farmers were selected in each village (2 farmers each in marginal and small, medium and large categories), and thus total number of collected samples was 540. Most of the soils in the district were found to have neutral to alkaline pH, medium to low organic carbon, low to medium available P and medium to high available K. The distribution of soils with alkaline pH was observed in Jobat, Alirajpur and part of Sondwa and Udaigad blocks and other parts of the district had neutral pH. Soils of Alirajpur and Babhra blocks were found to be low in SOC status. The low available P status was found in soils of Sondwa, Kattiwada and Udaigad blocks. In case of available K status, soils of Sondwa, Jobat and Babhra blocks had high and other parts had medium available K content.

Nano-rock phosphate coated urea

A protocol has been developed to coat nano-rock phosphate (NRP) (~48.8 nm, 34% P_2O_5) with pine oleo resin (POR) coated urea using 20% POR in commercial petrol. The requisite amount of urea (1 kg) was mixed with above solution (250 ml) in the ratio of 4:1 in a wide mouth glass bottle and shaken for 5 minutes. Immediately after mixing, the whole content was transferred to a plastic tray fitted snugly on a horizontal shaker. After the start of the shaking operation, requisite amount of nano-rock phosphate was spread through a 53 micron sieve over the POR coated urea and shaking operation was continued with maximum speed for an hour with intermittent scrubbing with a hard brush. After the complete evaporation of solvent (petrol), the product nano-rock phosphate coated urea became loose and friable and thereafter kept in oven (50- 60°C) for an hour for hardening. NRP coated urea acts as a slow release N fertilizer because of physical barrier, antifungal/ antibacterial properties as well as highly acidic nature of POR. This protocol will help in safe application and utilization of NRP for crop production.

Effect of Chromium on Carbon mineralization

An experiment was conducted to evaluate the chromium (Cr) effect on carbon mineralization and microbial activity. Graded doses of Cr (0, 5, 10, 15, 20, 40, 80 and 100 ppm) were applied, and CO_2 evaluation was measured up to 45 days. Increasing the concentration of Cr (0 to 100 ppm) reduced the cumulative CO_2 evolution from 354.2 to 122.47 mg CO_2/ 100 g soil incubated upto 45 days. High concentration of Cr significantly reduced microbial activity and carbon mineralization rate in soil. The chromium (Cr) toxicity effect on germination, root elongation and coleoptile growth of wheat was observed. The wheat seeds were exposed to five different concentrations of Cr (0, 20, 40, 80, and 100 ppm). The germination percent of the test crop decreased with increasing Cr levels. It decreased by 6, 14, 30, and 37 % under the Cr concentration of 20, 40, 80, and 100 ppm, respectively. The root elongation was more sensitive than the coleoptile growth.

Demonstrations of IISS Technologies in the Farmers' Fields

Three technologies developed by the Institute viz., Integrated Plant Nutrient Supply System (IPNS), Soil Test based Fertilizer Recommendation for Targeted crop Yields (STCR), and use of Phospho-Sulpho-Nitro-Compost were demonstrated in the *kharif* Soybean crop, in thirteen farmers' fields of Mengra Kalan Village, Berasia, Bhopal. The technologies showed a yield increase of 14.3% with IPNS, 25.9% with Phospho-Sulpho-Nitro Compost, and 15.2% in STCR based fertilizer recommendations over farmers' practices in the selected Agro-ecosystem. Two farmer–scientist interface meetings were also arranged in the village one before *kharif* sowing on 10 February, 2013 and another during harvesting of soybean on 22 October, 2013.

Farmers - Scientists Interface Meeting

Field visits by scientists

Awards and Honours

Dr. A.K. Biswas has been elected Councilor of the Indian Society of Soil Science for the biennium 2014-15.

Dr. A.K. Biswas has been selected as President, Bhopal Chapter of ISSS for the biennium 2014-15.

Dr. N.K. Lenka received the Golden Jubilee Commemoration Young Scientist award -2013 of the Indian Society of Soil Science at the 78th Annual Convention of the Indian Society of Soil Science held at CAZRI, Jodhpur on 24 October, 2013.

Dr. Ritesh Saha has been selected for NAAS associate fellowship for the year 2014 onwards for his scientific research contribution in natural resource management (NRM).

Dr. (Mrs.) I. Rashmi got a Best oral presentation award "Phosphorus adsorption capacity in soybean growing soils of Madhya Pradesh". In "Agro - Summit- 2013" on "Changing Scenario of Agriculture in Madhya Pradesh: Prospects and Challenges" 01-02 September, Search and Research Development Society, Bhopal.

Major Events

Training program organized

Training programme on *Soil Test and Yield Target based Balanced Fertilisation for crops* under Tribal Sub Plan of AICRP-STCR was organised at Sadivayalpathi village, Thondamuthur block, Coimbatore on 21 July, 2013.

NAIP sponsored National Training on "Climate Change, Carbon Sequestration and Carbon Trading in Agriculture" during 23 August to 05 September, 2013 *(Course Directors: Drs. Sangeeta Lenka, N. K. Lenka and M. Mohanty)*

Field Day cum Capacity Building programme under Tribal Sub Plan of AICRP-STCR was organised at CRIJAF, Barrackpore on 18-20 November, 2013. 26 tribal farmers belonging to Adhghara and Haringhata participated in the training programme.

MTC on "Improving Nutrient Use Efficiency through Agronomic Measures for Major Crops of India" at IISS, Bhopal during 12-19 November, 2013 *(Course Directors – Drs. K. Ramesh, B.L. Lakaria and A.K. Biswas)*.

MTC on "Assessment of Soil health for Higher Productivity" was organized during 03-10 December, 2013 at IISS, Bhopal. *(Course Directors: Drs. S. Kundu and M. Vassanda Coumar)*

NAIP Training Programme on "Data Analysis Using SAS" in collaboration with IASRI, New Delhi at IISS, Bhopal during 09-13 December, 2013). 30 Scientists/Technical Officers from IISS, Bhopal, CIAE, Bhopal, HSADL, Bhopal, DWSR, Jabalpur and others attended the training programme. *(Course Directors: Drs. Sanjay Srivastava and J. Somasundaram)*

Training Programme on "Soil Health Management – Training on Leaf Analysis and Soil Analysis" to Officers of Soil testing Labs under the Department of Agriculture, Kerala at IISS, Bhopal during 16-20 December, 2013 *(Course Directors – Drs. A.K. Biswas, B.L. Lakaria, and I. Rashmi).*

Extension Activities

Dr. A. B. Singh organized training programme on vermicompost production and organic farming to the extension officers/extension workers during, 5-7 August, 2013, arranged by State Institute of Agriculture Extension & Training, Bhopal. 30 members participated in the training.

Dr. A. B. Singh organized training programme on Source and production of organic inputs for organic farming to extension officers/extension workers during 07-09 October, 2013, arranged by State Institute of Agriculture Extension & Training, Bhopal. 35 members participated in the training.

Dr. A. B. Singh organized training programme on Management of different organic and inorganic sources of nutrients for higher productivity to extension officers/extension workers during 28-30 October, 2013, arranged by State Institute of Agriculture Extension & Training, Bhopal. 25 participants were in the training.

Dr A. B. Singh had given talk on Organic farming for sustainable productivity Doordharshan Kendra, Bhopal on 08 November, 2013.

Dr. R.H. Wanjari and Shri Vinod Chaudhary Participated and displayed exhibits in the Agriculture Fair-cum- '*Bharat Nirman Jan Suchna Abhiyan*' sponsored by the Press Information Bureau (PIB), Government of India at Krishi Upaj Mandi, Betul (MP) during 25-27 August, 2013. The Institute received fourth position for the stall depicting scientific information on agricultural technologies and transmitting them to the farmers.

International Cooperation

Activities/Foreign Training Attended

Dr. Asit Mandal had undergone a foreign training on Bioremediation at Centre for Environment Risk Assessment and Remediation, Australia (University of South Australia, Adelaide) during September to November, 2013.

Dr. Sanjay Srivastava attended an international meeting and presented a project "Establishment of Soil Water Tissue Testing Laboratory in Burkina Faso (Africa) in Krishi Bhavan, New Delhi on 18 November, 2013.

Dr. Sanjay Srivastava, as a member of official delegation, led by Additional Secretary, DARE and Secretary, ICAR, visited Burkina Faso and Togo in Africa during 01-07 December, 2013 in connection to setting up of different projects under Indo African Forum Summit (IAFS-II).

Dr. Pramod Jha is currently on a training soil carbon sequestration/carbon credit/climate change under Prof. R Lal, Director, SENR, Ohio State University, Columbus, Ohio during 19 December, 2013 to 19 March, 2014.

Staff News

New Appointment/Joining

Dr. Anand Kumar Vishwakarma (Agronomy) joined as Senior Scientist (PB-IV) on 01.08.2013.

Probation Clearance

Dr. Shinogi K. C., Shri Hiranmoy Das and Dr. Bharat Prakash Meena, Scientists cleared their probation period on 12.12.2013.

Promotions

Dr. Santosh Ranjan Mohanty, Sr. Scientist promoted from RGP 8000 to 9000 under CAS w.e.f. 18.06.2012.

Dr. Pramod Jha, Sr. Scientist promoted from RGP 8000 to 9000 under CAS w.e.f. 17.07.2012.

Dr. Kollah Bharati, Sr. Scientist promoted from RGP 8000 to 9000 under CAS w.e.f. 29.10.2012.

Retirement

Shri G. D. Dubey, F & AO, retired from ICAR service on 30.09.2013

Shri V. B. Andurkar, Farm Supdt. retired from ICAR service on 31.10.2013.

Scientists' participation in Conferences/Seminar/Training/Workshop/group Discussion

Name	Program	Venue	Period (Jul-Dec 13)
Dr. S. Srivastava	Meeting on 'Customized fertilizer formulations suitability'	Krishi Bhavan, New Delhi	05 July, 2013
Dr. R. Elanchezhian	National workshop on "Climate controlled green houses for agricultural research"	CDAC, Chandigarh	11 July, 2013
Dr. S. Srivastava	Presented a project on establishing soil water tissue testing lab in various African countries under IAFS-II.	NASC Complex, New Delhi	19 July, 2013
Dr. Muneshwar Singh	Round Table Discussion on 'Balanced Fertilization' organized by FAI	New Delhi	21-22 July, 2013
Dr. Muneshwar Singh	Project Coordinators Meeting called by Honourable Director General, ICAR in to discuss XII Plan proposal	NASC Complex, New Delhi	28-31 August, 2013
Drs. A. Subba Rao and A.K.Biswas	EFC meeting of CRP on Conservation Agriculture	NASC Complex, New Delhi	29-30 Aug, 2013
Dr. Nishant K Sinha	Machinery for Natural Resource Management and Technologies	PAU, Ludhiana	29 Aug -18 Sept, 2013
Dr. Asit Mandal	NAIP foreign training on Bioremediation	Centre for Environment Risk Assessment and Remediation Australia (University of South Australia, Adelaide	Sept., to Nov, 2013
Dr. Asit Mandal	Biennial CleanUp 2013 conference (5th International Contaminated Site Remediation Conference	Victoria, Melbourne, Australia	15-18 Sept, 2013
Drs. A.K. Biswas and K. M. Hati	National Travelling Seminar-cum-Workshop on Conservation Agriculture	CIMMYT, New Delhi/ BISA, Ludhiana	16 - 25 Sept, 2013
Dr. S. Srivastava	"Installation cum training workshop" under NAIP project "Strengthening statistical computing at NARS" for nodal officers.	IASRI, New Delhi	17-18 Sept, 2013
Dr. Pradip Dey	Agriculture Leadership Summit conducted by Agriculture Today Group	New Delhi	19 Sept., 2013
Dr. S. Srivastava	Training on "Online Application Development using PHP & MySQL".	IIFM, Bhopal.	23 – 27 Sept, 2013
Drs. J. Somasundaram and M. Mohanty	International Training programme on "Advance Course On Conservation Agriculture (CA) Gateway for Productive & Sustainable Cropping Systems"	The Borlaug Institute for South Asia in Ludhiana (BISA), PAU, Ludhiana	17 - 31 Oct, 2013
Dr. S. Srivastava	Meeting on "Innovative Partnership" on the occasion of foundation day of Agrinnovate India Ltd.	NASC complex, New Delhi	19 Oct., 2013.

Scientists' participation in Conferences/Seminar/Training/Workshop/group Discussion

Name	Program	Venue	Period (Jul-Dec 13)
Drs. A. Subba Rao, M.C. Manna, J.K. Saha, A.B. Singh, Brij Lal Lakaria, R. Elanchezhian, N.K. Lenka, R.H. Wanjari, Ritesh Saha, Sangeeta Lenka, M. Vassanda Coumar, M.L. Dotaniya, Asha Sahu, J.K. Thakur	National seminar on "Developments in Soil science" at the 78th convention of ISSS	CAZRI, Jodhpur	23-26 Oct 2013
Dr. B.P. Meena	21 days training programme on "Advances in Experimental Designs for Development of Technologies in Agriculture"	IASRI, New Delhi	23 Oct-12 Nov 2013
Dr. S. Srivastava	Technical committee meeting to examine the method of sampling of imported fertilizer.	Krishi Bhavan, New Delhi	29 Oct 2013
Drs. A. Subba Rao, Muneshwar Singh, Pradip Dey, A.K. Biswas, J.K. Saha, S. Srivastava, R. Elanchezhian and M. Vassanda Coumar	NAAS Brainstorming meeting on "Efficient use of Phosphorus"	NASC Complex, New Delhi	07-08 Nov 2013
Dr. B.P. Meena	MTC on "Improving nutrient use efficiency through Agronomical measures for major crops of India"	IISS, Bhopal	12-19 Nov 2013
Dr. Pradip Dey	International Conference on "Climate Change and Implication for Food Security and Nutrition"	Hotel Pride, Bengaluru	15 Nov 2013
Dr. N. K. Lenka	International Conference on "Climate Change and Implication for Food Security and Nutrition"	Hotel Pride, Bengaluru	15-16 Nov 2013
Drs. Brij Lal Lakaria and J. Somasundaram	Mid-term RFD achievements	NAAS New Delhi	18 Nov 2013
Dr. Pradip Dey	FAI Golden Jubilee Seminar on "Sustaining Soil Health in Ensuring Food Security"	NIRJAFT, Kolkata	21 Nov 2013
Drs. A.K. Biswas and R. S. Chaudhary	Management Development Programme on Leadership Development (pre-RMP cadre)	NAARM, Hyderabad	26 Nov - 7 Dec 2013
Dr. Ajay	Conference of Indian Society of Plant Physiology	NRCG, Junagadh	13-14 Dec 2013
Drs. J. K. Thakur and Nishant K. Sinha	Science fiesta	Regional Science Centre, Bhopal	10-12 Nov 2013
Dr. Ritesh Saha	National Training on "Project Formulation, Risk Assessment, Scientific Report Writing and Presentation"	IARI, New Delhi	09-13 Dec 2013
Drs. K. M. Hati, N.K. Lenka, R.H. Wanjari, A. Vishwakarma, Sangeeta Lenka, I. Rashmi, Nishant K Sinha, Asha Sahu, K. Bharti, M.L. Dotaniya, Jyoti K. Thakur, Sh. V.D. Meena and Sh. R. K. Mandloi	Training on "Data analysis using SAS" under the aegis of NAIP consortium "Strengthening Statistical Computing for NARS"	IISS, Bhopal	09-13 Dec 2013
Dr. R. Elanchezhian	National Conference of Plant Physiology on "Current trends in plant biology research"	DGR Junagadh	13-16 Dec 2013
Dr. A. B. Singh	14th National Agriculture Vigyan Sangosthi	CIFE, Mumbai	14-16 Dec 2013
G. Dubey, SRF	6th International Congress of environmental research	Aurangabad	19-21 Dec 2013

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