IISS Newslette

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New Publications

In This Issue

Forth Coming Events

- National Training on "Assessment of Quality and Resilience of Soils" during 9th - 13th January, 2012.
- Model Training Course on "Soil organic matter management for Climate Resilient Agriculture" during 14th - 21st February, 2012.
- Parliamentary Committee on Agriculture visit during 28th February - 1st March, 2012.
- QRT meeting during 20th - 21st April, 2012.

Director's Desk

Soil Quality Evaluation: An increasingly felt issue in agriculture

Although soil has evolved through millions of years of weathering and is sustaining various forms of terrestrial life, its management has become an essential component of strategy for sustenance of ever increasing population. Assessment of soil quality is pre-requisite for devising any intervention(s) in the existing management practices so as to achieve the desired goal. It focuses on the dynamic or management-affected, properties of soil, which are assessed in the context of its inherent capability. Soil quality cannot be measured directly because it is a broad and purpose-oriented concept. Instead, we analyze a variety of proxy measurements (called indicators) that together provide clues about how the soil is functioning as viewed from soil-use perspectives, which are subsequently integrated to arrive at certain numerical value that is indicative of overall quality of soil. Although importance of soil quality evaluation has not been realized in the era of high input dependent agriculture, rising cost of fertilizers/manures, decreasing availability of irrigation water and increasing impact of industrial activity on land are compelling us to devise policies based on soil quality.

Since the origin of this concept in early '90, several workers both in India and abroad have made efforts for identifying indicators for assessing the quality of soil within certain boundary conditions using several techniques, which can be grouped into two broad categories. In the first category, statistical techniques are employed for identification of indicators influencing goal variable (e.g. crop yield, produce quality etc.). As selection of indicators is based on the goal variables, experiments are required to be conducted under controlled condition for eliminating/minimizing influence of other factors not related to soil (like microclimate, disease/pest infestation & control, seed quality, irrigation water amount and quality etc.). Under this background, identification of indicators of soil quality on the basis of crop yield data generated from farmers' fields may not give a true picture. Information generated under an on-going NAIP project has also revealed that many of the important soil parameters known to have strong influence on crop growth did not figure-in as identified indicators and as a result, quite a lower degree (28%) of the variability in yield could be explained by the indicators of soil quality. The result also showed that soil quality index (SQI) values derived from the identified indicators for any agro-ecological sub-region (AESR) were not comparable with SQI values of other AESRs of the country.

Other group of workers/organizations has proposed indicators of soil quality based on the knowledge pool generated through detailed investigations on soil properties and its

functions. Soil quality index computation based on this approach appears to be very simple and can be easily adopted by soil testing laboratories. Although this approach appears more appropriate, difficulty arises while deciding upon (1) contribution of each of the indicators towards goal variable, (2) whether a similar set of indicators is applicable to all soil types, cropping types (like annual, perennial or horticultural) and management conditions or otherwise. Detailed investigations as well as thorough discussions are required among peer groups on these issues.

A. Subba Rao

Soil Science Sector

CAC and CIC meetings of NAIP sub-projects

The fifth CIC meetings of the NAIP projects entitled "Understanding the mechanism of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts" and "Assessment of quality and Resilience of Soils under Diverse Agro-ecosystems" were held at IISS, Bhopal on 13th September and 26th July 2011, respectively. The Director of IISS, Bhopal and Consortium leader, CPI and CCPIs of the projects participated in those meetings.

The fifth CAC meeting of the NAIP project entitled "Understanding the mechanism of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts" (C4/C30022) was held at IISS, Bhopal from 04th-05th October 2011. Dr. A. Subba Rao, Consortium leader, Dr. P. N. Takkar, Chairman CAC and Dr. A. Dabadghao and Dr. C. Chatterjee, Members CAC, CPI, CCPIs and associated scientists of the project participated in the meeting.

CAC meeting of NAIP project on micronutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts

Model Training course

Model training course on "Greenhouse gas mitigation strategies in agriculture: microbes in aid of global climate change" was organized during 12-19th December 2012. Participants from the departments of agriculture from Himachal Pradesh, Jammu and Kashmir, Haryana, Maharashtra, Andhra Pradesh, Orissa and Madhya Pradesh etc participated in this training programme. Participants were made aware about soil microbes, their role on global climate change and the microbial techniques during the training period. An 8-day model training course (MTC) on "Best Soil and Water management Practices for Resource Use Efficiency" was also organized during 17-24th October 2011.

Training programme on Greenhouse gas mitigation strategies in agriculture: microbes in aid of global climate change

Training programme on Best Soil and Water management Practices for Resource Use Efficiency

Institute's / Divisional News

- RAC meeting was held during 12-13 July 2011.
- IRC meeting was held during 12-15 December 2011.
- One day Hindi workshop on Climate Change was organized on 29th September 2011.
- Annual review meeting of the Network Project Entitled "Evaluation of Efficiency of Patent kali – PMS Fertilizer for Potash, Magnesium and Sulphur Nutrition and Yield of Different Crops in India" was held at IISS, Bhopal on 14th September 2011.

Research Highlights

Long term chemical fertilization and manuring on soil carbon stability

Carbon (C) stabilization in soil is a critical process influencing global C cycle. Long term fertilizer experiments (>37years) conducted at several locations in India provide an opportunity for assessing the influence of chemical fertilizer and manure on soil carbon stability and nitrogen dynamics. Long term fertilization had a variable effect on soil carbon stability. In Alfisol, application of chemical fertilizer (NPK) alone did not influence the carbon content of a resistant pool of SOM (soil organic matter) whereas it was significantly increased (161%) in Vertisol. However, long term application of chemical fertilizer significantly increased (82-111%) the carbon content of the slow pool of SOM in Alfisol. Long term application of either NPK+ farm yard manure (FYM) or FYM alone increased the carbon content of the resistant pool (bio-chemically stabilized carbon) of SOM with the concomitant increase in total carbon content of soil in both Vertisol and Alfisol. Carbon stability also affected the N dynamics in soil. Availability of N in soil was well correlated with the amount of carbon in the acid-hydrolyzable pool (r^2=0. 642**,) rather than total soil organic carbon content. A universal relationship was developed between WBC and TOC, thereby eliminating the use of TOC/CHNS analyser for soil TOC determination. A user friendly visual basic model was developed for predicting soil carbon and nitrogen pools with simple measurable parameters (WBC, SICL & MAR). The model was calibrated and validated by samples collected from different agro-ecological regions of the country. This will help in minimizing the use of chemicals and instruments for determining carbon pools, total and available N contents of soil.

Predicting the impact of climate change on Soybean yield of central India

The increase in surface air temperature during soybean growing season from +2 to +5 °C from the base value (current temperature) decreased soybean (cv JS 335) yield in the range of 19% to 27% as predicted by the APSIM model. The simulation of increase in CO_2 concentration from current 390 ppm to 650 ppm increased soybean yield. The increase in temperature in combination with enhanced CO_2 concentration decreased the soybean yield. However, the decrease in yield was less when the effect of temperature on yield was considered alone.

Crop cover impact on soil and nutrient losses through run off in Vertisol

On the land surface having around 1% slope, maximum runoff and soil loss was recorded under cultivated fallow (335 mm and 4468 kg/ha) over sole as well as intercrops. Amongst the sole crops, the highest runoff and soil loss was recorded under pigeon pea (296 mm and 3403 kg/ha) and the lowest under soybean crop (212 mm and 2256 kg/ha). In case of intercrops, the highest runoff and soil loss was in maize and pigeon pea (1:1) and the lowest in soybean + pigeon pea (2:1). The soil loss and runoff in various cropping followed the order: soybean as sole crop < soybean + pigeon pea (2:1) < soybean + maize (1:1) < maize + pigeon pea (1:1) < sole maize < sole pigeon pea crop.

Water loss through bypass flow and carbon sequestration in soybean-wheat cropping system: comparison of tillage practices in Vertisol

Loss of water beyond 60 cm soil depth as recorded were 37% and 56% in reduced tillage (RT) and no-tillage (NT), respectively. The depth and width of cracks in no tillage was also significantly more than reduced tillage. Lower crack width and intensity could have resulted in less loss of water through bypass flow in reduced tillage. After three years of soybean-wheat cropping system soil carbon sequestration was found to be significantly higher in no tillage compared to reduced tillage in surface 0-5 cm. However total carbon sequestration in 45 cm soil depth was significantly higher in reduced tillage (2125 kg/ha/yr) than no tillage (1656 kg/ha/yr) probably because residue is incorporated in RT and residue is on the surface in NT.

CO_2 mineralization of soft and hard wood charcoal in a Vertisol

Biochar has been used as a soil amendment to improve soil quality, crop yield and for carbon (C) sequestration. Therefore, a laboratory incubation experiment was carried out to study the mineralization rate of two different types of

charcoal in soil in the presence of farm yard manure. The result showed that application of FYM along with hard wood charcoal (WC) at 5% and 10% of the applied FYM resulted in reduction of loss of C from FYM to the tune of 44.46% and 59.87%, respectively. Even when the soil was treated with WC (without FYM) the loss of C from soil reduced marginally but not statistically significant. Significant mineralization of pigeon pea charcoal (PPC) was observed in soil, as a result of which 20.69% and 14.19% of total C of PPC was lost after 36 days of incubation. The results, thus, provide some evidence to indicate that hard wood charcoal has some refractory property to inhibit the mineralization of both native soil organic C as well as applied organic matter, and thereby can be used as an amendment to stabilize the native and applied organic materials in soil.

Pine Oleoresin coated urea- a substitute of Neem coated urea

Numerous investigation on neem oil coated urea clearly indicated higher use efficiency of nitrogen by 5 to 10%. But neem oil is a scarce resource and its low availability is a major hindrance towards large scale use of neem oil coated urea. A method was developed to coat urea with pine oleoresin (gum like substances extracted from pine trees) along with nano particles of CuO, ZnO, Fe_2O_3 and SiO_2 for enhancing its use efficiency (Fig.3). A preliminary test was conducted to study the release of urea from oleoresin coated urea in comparison with the normal urea (uncoated). It was found that pine oleoresin coated urea dissolved at slower rate as compared to uncoated urea.

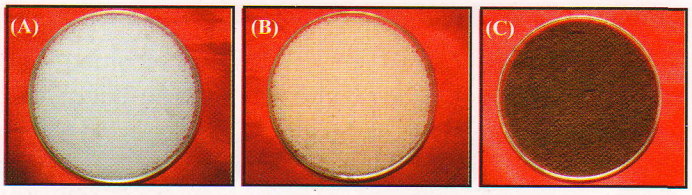


Fig. 3. Urea granules (A), Oleoresin coated urea (B) and Oleoresin coated urea fortified with nano particles (C)

Screening levels of heavy metals for assessment of toxicity in a susceptible soil amended with municipal solid waste compost

Regular use of municipal solid waste composts is associated with the entry of heavy metals into the soil which poses considerable risks to the environment. A study was conducted to determine screening levels of Cd, Cr, Cu, Ni, Pb, and Zn for a susceptible soil amended with municipal solid waste compost following a widely recommended soil test procedure involving the extraction of these heavy metals with a dilute calcium chloride solution. Separate sets of pot-culture experiments were carried out for each of these heavy metals in graded dose levels added to an acidic, light-textured, alluvial soil. Soil test screening levels were determined through three different approaches, namely, 'phytotoxicity', 'food contamination,' and 'soil microbial activity diminution'. The order of screening levels of soil test values was Zn > Cu = Ni > Cr > Cd based on phytotoxicity, Zn > Cu > Ni > Cd > Cr > Pb based on adverse effects on soil microbial activity, and Cu > Cr > Zn > Ni > Pb > Cd based on food contamination. Screening levels of the heavy metals determined through 'food contamination' and 'soil microbial activity diminution' were much lower than those determined through 'phytotoxicity'. Thus, adverse effects on microbial activity and contamination of the food chain by heavy metals occurred much earlier than their adverse effects on plant growth. The lowest values of these soil test screening levels of the heavy metals determined by three different approaches were considered to be protective for all target organisms and were found to be: 0.003 mg kg^{-1} Cd, 0.052 mg kg^{-1} Cr, 0.637 mg kg^{-1} Cu, 0.022 mg kg^{-1} Ni, and 0.008 mg kg^{-1} Pb. Zinc is also considered to be important for human nutrition and its deficiency is a critical health problem affecting about one-third of the world's population. Hence, contamination of edible parts of plants with Zn can even be considered desirable; and hence, food chain contamination approach was avoided for determining the screening limit for this element. Instead, soil microbial activity diminution approach was adopted to determine the screening level and the value was found to be 3.8 mg Zn kg^{-1}.

Phosphorus fractions in sediment and water samples of Upper Lake, Bhopal

A research investigation was carried out to study the non point sources of phosphorus loading to the Upper Lake, Bhopal. Geo-referenced Sediment and Water samples from 11 sampling points at pre-monsoon stage were collected from Upper Lake, Bhopal. The total P in the sediment of pre-monsoon stage samples ranges from 0.03% to 0.07% with a mean value of 0.04%. The mean sediment inorganic phosphorus (SIP) and the sediment organic phosphorus (SOP) is 68.01 % and 31.98% of total phosphorus (TP), respectively. Among the inorganic P fractions in the sediment, Ca bound P was maximum and found to be in the range of 86.32 to 96.97% of total sediment inorganic P followed by Fe bound P (2.10 to 11.51%) and loosely sorbed P (LSP) (0.39 to 5.66%). The total P value in the water samples ranges from 0.28 to 0.47 mg/L with a mean value of 0.39 mg/L. The total dissolved P, total reactive P and dissolved reactive P ranges from 0.08 to 0.17 mg/L, 0.05 to 0.09 mg/L and 0.008 to 0.04 mg/L with a mean value of 0.13, 0.08 and 0.03 mg/L, respectively. The mean total dissolved P, total reactive P, dissolved reactive P, dissolved organic P and particulate P was 31.05%, 20.31%, 10.39%, 18.73% and 68.94% of TP, respectively.

Microbial resilience of degraded acid soil under copper stress

A laboratory incubation study was conducted to understand the microbial resilience capacity of degraded acid soil

amended with various amendments (Biochar, FYM and Lime). The result from the incubation studies revealed that Cu stress (toxicity) showed significant reduction in all the enzymatic activities and microbial biomass carbon over the control (without Cu stress). Application of FYM + Charcoal showed greater resistance to Cu stress followed by Charcoal, FYM and Lime with respect to dehydrogenase and microbial biomass carbon, respectively. Among the various treatments, soil without amendment showed the lowest resistance followed by lime, FYM, Charcoal and FYM + Charcoal with respect to microbial growth as well as activity of soil enzymes namely acid phosphatase, alkaline phosphatase and dehydrogenase activity. The highest recovery of acid phosphatase enzyme activity was observed when soil amended with FYM. Whereas, the highest recovery of soil alkaline phosphatase activity, dehydrogenase activity and microbial growth was observed in FYM + Charcoal treatment.

Nano rock phosphate particles enhanced growth and enzyme activity of rice (*Oryza sativa L.*) and soybean (*Glycine max L.*) plant

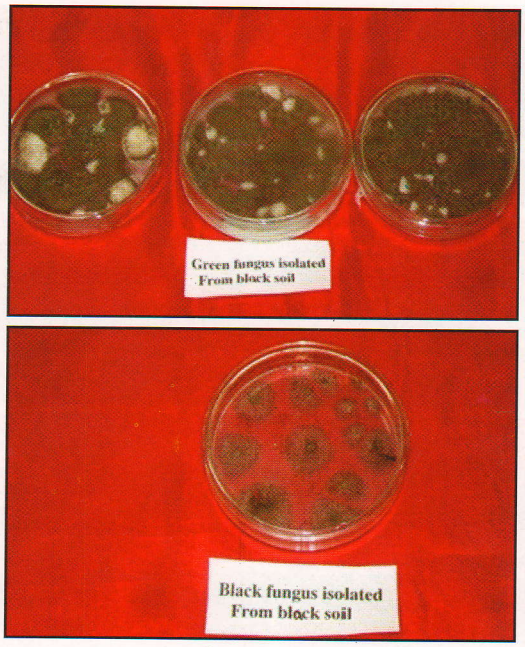
Hoagland solution culture experiment was conducted to know the effect of nano rock particles on growth of rice (*Oryza sativa* L.) and soybean (*Glycine max* L.) plants. Phosphorus was applied through nano rock phosphate particles SRP II (110 nm) and also through KH_2PO_4.Results showed that nano rock phosphate particles of SRP II (110 nm) recorded the highest dry matter yield of both the plants. The other plant parameters like, plant height, root length, root volume, root dry matter weight were all improved due to application of rock phosphate nano particles. Application of nano rock phosphate particles also enhanced the enzyme activity like Nitrate reductase, phosphatase of both the plants.

Seed treatment of gram (*Cicer arietinum L.*) with nano zinc oxide

In a laboratory experiment nano zinc oxide (<100nm) solution (0 to 1000 ppm Zn) was applied to gram seed to investigate the effect of seed coating with Zn nano particles on plant growth. Results showed that Zn can be loaded up to 1000 ppm in seed through Zn_M (<50nm) and 1330 ppm through ZnO (<100nm) with no toxic effect on plant growth. This technique can be adopted for the application of zinc in soil for crop cultivation.

Nano rock phosphate solubilizing fungi

Two rock phosphate solubilizing fungi (Black and Green) have been isolated from the IISS, Bhopal farm soil and were identified (MTCC, Chandigargh) as *Aspergillus niger*.



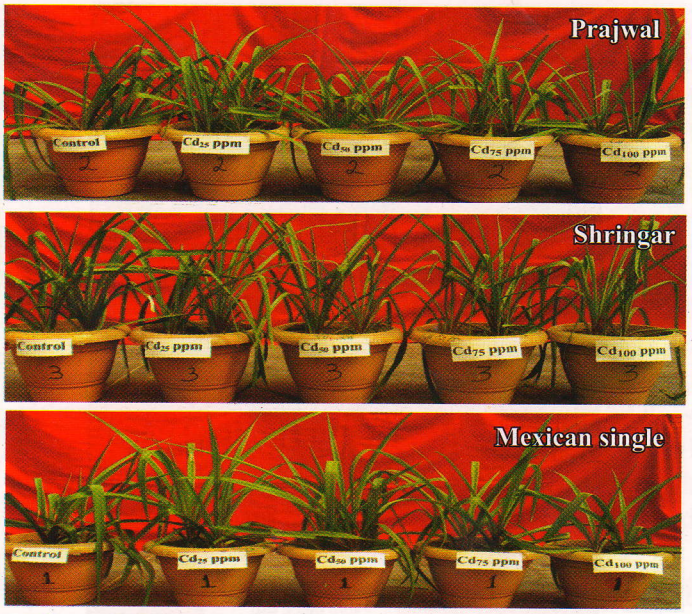
Nano rock phosphate solubilizing fungi

Effect of nano particles on growth of fungi

The release of heavy metal-containing nano particles (NP) into the environment may be harmful to the efficacy of beneficial microbes that function in element cycling, pollutant degradation and plant growth. In the present investigation effect of nickel and chromium (III) nano particles on microbial growth like black, yellow and green fungi was studied. Both the nano particles used in the experiments, could not show any detrimental effect on microbial growth. On the contrary, free metal ion Cr (VI) and Ni (II) badly affected the microbial growth at higher doses.

Phytoremediation of cadmium contaminated soils by different varieties of tuberose

The potential of three varieties of tuberose (Prajwal, shringar and mexican single) for phytoremediation of soil contaminated with cadmium has been evaluated by subjecting the plants to five levels of Cd (0,25,50,75 and 100 mg kg^{-1}soil). Applied Cd did not produce any toxic symptoms in all the three varieties of Tuberose though there was a significant reduction in the photosynthesis rate and total dry weight beyond 50 mg kg^{-1}soil. The study showed that tuberose possessed the typical ability of Cd hyper accumulation characterized by (1) accumulation of Cd in the shoots of the plant exceeding the critical judging standard i.e., 100 µg g^{-1} DW of a Cd hyper accumulation and (2) by ratios of Cd in the shoots to roots > 1. It was concluded that tuberose may be an effective accumulator plant for phytoremediation of cadmium polluted soils.



Effect of different levels of Cr on some floriculture plants

Methanogenesis in vertisols under different fertilizer management systems

Methanogensis comprising both CH_4 production and oxidation was investigated in vertisols under different established fertilizer management systems. Soils from experimental fields amended with inorganic, organic and integrated fertilizer sources were collected for this study. Under defined laboratory conditions, CH_4 production potential was low irrespective of the fertilizer amendments. Similarly, CH_4 oxidation at two moisture regimes i.e. 60% and 100% MHC varied from each other in different fertilizer managed soils. Methanotrophs possessing soluble methane monooxygenase as well as ammonium oxidizers were influenced by the fertilizer sources. Inorganic and integrated approach exhibited inhibitory activity of low affinity methanotrophs comparative to the organic fertilization practices.

Impact of climate change on microbial process and greenhouse gas emission under Vertisol

Elucidating possible climate change impacts on soil microbiota is of paramount importance, because microorganisms in the terrestrial environment are critical for ecosystem sustainability. Experiments undertaken to addresses impacts of synergistic factors; elevated CO_2, temperature and soil aggregate size on microbial processes regulating CH_4 oxidation in a tropical vertisol. Results revealed that the methane oxidation potential in vertisols varied at different CO_2 concentrations and temperature. Higher temperature stimulated CH_4 oxidation activity in the vertisols irrespective of other soil and ambient parameters. Elevated CO_2 concentration impacts CH_4 oxidation activity by stimulating oxidation potential, but only restricted to lower concentration i.e. at 1000ppm. Higher CO_2 concentration i.e > 1000 ppm inhibits CH_4 oxidation potential of soils.

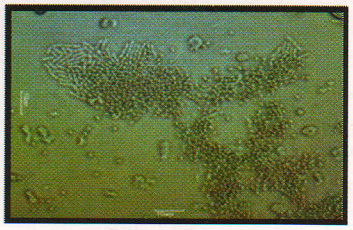
Effect of Long term Fertilizer application on Methanogenesis

An investigation was undertaken to study the CH_4 production under different nutrient management practices at two centres where fertilizers were applied for a period of 40 yrs consistently to the experimental fields. Results revealed that methane (CH_4) production potential in the flooded soil of Pantnagar and Ranchi was not significantly different. Soils with unamended control, 100% NP and 100% NPK exhibited low CH_4 production compared to soils amended with 100% N alone, 150% NPK and 100% NPK with FYM. Data sets suggest increase in the level of NPK and amendment of FYM stimulated CH_4 production. The study revealed that to minimize the CH_4 productions under anaerobic condition we should not apply N in large quantity at a time particularly in the soil amended with fresh FYM or green manure.

Plant growth promoting actinomycetes from arid and semi-arid soils

Actinomycetes were isolated (100 isolates) from rhizosphere soils of sorghum, pearl millet, pigeonpea, finger millet and groundnut in Karnataka; Anantpur in Andhra Pradesh and Jaisalmer, Rajasthan. Forty one isolates of actinomycetes were further characterized. Majority were *Streptomyces* (61%) and *Nocardia* (29%); the rest 10 % were *Micromonospora* and *Saccharopolyspora*. In screen house experiments on maize, 27 strains were effective in promoting growth while 14 strains were ineffective. Screening against chickpea is in progress.

Streptomyces sp.



Nocardia sp.

Awards and Honours

- Dr. Pramod Jha received the ISSS Golden Jubilee Commemoration Young Scientist award 2011.
- Drs. S.Ramana, A.K.Biswas, A.B.Singh, Ajay and N.K. Ahirwar received Best Poster Presentation Award-2011 at the National Seminar of Plant Physiology held at Ram Narain Ruia College, Matunga, Mumbai during 24-26th November 2011.
- Dr. S. Ramana received Bharat Jyothi Award of India International Friendship Society
- Drs. S. Kundu, M. Vassanda Coumar, J.K. Saha, A.K. Biswas and K.S. Reddy received Best Poster

Presentation Award-2011 at the 76th Annual convention of the Indian Society of Soil Science held at UAS, Dharwad during 16-19 th November 2011.

- Dr. Y. Muralidharudu, Project Coordinator (AICRP-STCR), received Chaudhary Devi Lal Outstanding All India Coordinated Research Project Award (AICRP) – 2010 of Indian Council of Agricultural Research (ICAR), New Delhi for site-specific nutrient management.
- Dr. A. Subba Rao, Director and Dr. K. Sammi Reddy, Principal Scientist received Hari Om Ashram Trust Award for the biennium 2008-09 of Indian Council of Agricultural Research (ICAR), New Delhi for their outstanding contribution in the field of Natural Resource Management.

Extension activities

- Dr. A. B. Singh organized five training programs for 6 days during month of September- December, 2011 for the farmers of districts Purvi Champaran, Gaya, Dharbhanga, and Paschim Champaran sponsored by ATMA.
- Dr A. B. Singh attended Krishi Vigyan Mela held during 3-5th November 2011 at Bharatpur, Rajasthan, Organised by Lupin Human Welfare & Research Foundation on Farm Technologies for Enhanced Productivity and Income.
- Dr. A. K. Tripathi organized a five days training programme during 27-30th December 2011 for 25 farmers from Diara Development Project, Bihar, Patna.
- Dr. A. K. Tripathi served as training coordinator for six ARS trainees from NAARM, Hyderabad in July 2011.

Major Events

Independence Day

- The Staff Recreation Club (SRC) celebrated the Independence Day on 15th August 2011.

International Cooperation Activities/Foreign Training Attended

Dr N K Lenka successfully completed USDA sponsored Norman E Borlaug International Agricultural Science and Technology Fellowship program at Ohio State University, Columbus during 09th October 2011 to 08th January 2012. Dr. K. Ramesh received USDA Norman E Borlaug Fellowship for the year 2011 and visited Ohio State University (USA) for advanced training on the theme "Organo-zeolitic mixtures for enhancing nutrient use efficiency" during 14th July to 9th September 2011.

Dr. N. K. Lenka with Dr. M.S. Swaminathan at Iowa.

Dr. K. Ramesh at Ohio State University (USA).

Staff News

New Appointments

- Shri Sunny Kumar appointed as Stenographer Gr.III on 21/12/2011.

Joining

- Dr. R. S. Chaudhary, Pr. Scientist (Soil Physics) joined as Head of the Division (Soil Physics) on 24/08/2011.
- Ms. K.C. Shinogi joined as Scientist on 05/09/2011.
- Shri Bharat Prakash Meena (Agronomy) joined as Scientist in the Division of Soil Chemistry & Fertility on 22/12/2011.
- Shri Hiranmoy Das (Agrl. Statistics) joined as Scientist in AICRP (STCR) on 23/12/2011.
- Shri Vasudev Meena (Agronomy) joined as Scientist in the Division of Environmental Soil Science on 23/12/2011.

Promotions

- Dr. Ritesh Saha promoted as Sr. Scientist under CAS w.e.f. 26/11/2008.
- Shri Jineshwar Prasad promoted from LDC to UDC on 18/11/2011.
- Shri O.P. Yadav promoted from LDC to UDC on 18/11/2011.

Transfers

- Dr. Blaise Desouza. Pr. Scientist on selection transferred as Head to CICR, Nagpur on 24/08/2011.

Retired

- Dr. Y. Muralidharudu, Pr. Scientist & PC (STCR) retired from ICAR service on 31/08/2011.

Scientists' Participation in Conference/Seminar/Training/Workshop/Group Discussion

Name	Programme	Venue	Period (July-December 2011)
Dr A. K. Shukla	Leadership Training	NAARM, Hyderabad	1-6 July
Ms. Neenu, S.	Training programme on "Climate change Mitigation Strategies- Planning for implementing the Mitigation Practices in India".	ESCI Campus, Gachi Bowli, Hyderabad	12-14 July
Drs. M. C. Manna, J.K. Thakur and M. L. Dotaniya	Mid-term review workshop of the project "GPS and GIS based model soil fertility maps for selected districts of the country".	IISS, Bhopal	28-31 July
Dr. M. Vassanda Coumar	Training on "Techno scientific management programme for scientists".	ASCI, Hyderabad	1-12 Aug.
Ms. Neenu, S.	Training programme on "Forecast Modelling in Crops".	IASRI, New Delhi	3-12 Aug.
Drs. J.K. Saha and M.C. Manna	2nd International Conference on "Recycling and Reuse of Materials (ICRM 2011)".	IMSE, Kottayam, Kerala	5-7 Aug.
Drs. A.K. Biswas and Tapan Adhikari	5th CAC, CIC, and CMU meeting of the NAIP-Nanotechnology Project	CAZRI, Jodhpur	24-29 Aug.
Drs. A. Subba Rao and A.K. Biswas	Planning Commission meeting on "Nutrient use efficiency and fertilizer use in agriculture".	Yojana Bhawan, New Delhi	8 Sept.
Drs. M. Mohanty and Sangeeta Lenka	National stake-holders consultation on Climate Change platform.	CRIDA, Hyderabad	19-20 Sept.
Ms. Neenu, S	Capacity building workshop on "Using Climate Scenarios and Analogues for Designing Adaptation Strategies in Agricultures".	Kathmandu, Nepal	19-23 Sept.
Drs. A. Subba Rao and J.K. Saha	NAAS Brainstorming Session on "Sustaining Agricultural Productivity through Integrated Soil Management".	NASC Complex, New Delhi	10 Oct.
Drs A. K. Shukla and S. K. Behera	3rd International Zinc Symposium - "Improving Crop Production and Human Health".	Hyderabad	10-14 Oct.
Mr. Rajendiran, S.	National training on "Nanocellulose and its composites in Agriculture".	CIRCOT, Mumbai	10-24 Oct.
Dr N K Lenka	USDA Seminar "Challenges of Natural Resource Management for Small-holder Farmer's on Marginal Lands".	Des Moines, Iowa, USA	12 Oct.
Dr. N. K. Lenka	World Food Prize symposium events and Laureate Award Ceremony	Des Moines, Iowa, USA	12-14 Oct.
Drs. A. Subba Rao and J.K. Saha	Stakeholders meeting for the project on "National Initiative on Utilization of Solid Organic (Agro- and Municipal) Wastes in Agriculture" under ICAR knowledge platform on Waste (Agro- and municipal).	NASC Complex, New Delhi	13 Oct.
Drs. J. Somasundaram and Nishant K. Sinha	National Consultation/Brainstorming on Water: Research Prioritization under ICAR Water Platform.	NBFGR, Lucknow	18 Oct.
Dr. A.K. Biswas	Workshop - cum - exhibition, "India R&D 2011 - Industry-Academia Linkages".	India Habitat Centre, New Delhi	2-3 Nov.
Dr A. B. Singh	International Conference on Innovative Approaches for Agricultural Knowledge management: Global Extension Experiences.	NASC Complex, New Delhi	9-12 Nov.
Dr. Sanjay Srivastava	Training programme on "Enhancing the Input Application Efficiency by using Precision Farm Machines, Remote & Ground Sensor".	PAU, Ludhiana	14-23 Nov.
Dr. Nishant K. Sinha	National Training on "Recent trends of Geoinformatics in Land resource Database management for sustainable Agriculture".	NBSSLUP, Nagpur	15-28 Nov.
Drs. Muneshwar Singh, Tapan Adhikari, Brij Lal Lakaria, Pramod Jha & M. Vassanda Coumar	76th Annual Convention of Indian Society of Soil Science.	UAS, Dharwad	16-19 Nov.
Dr. Sangeeta Lenka	National training programme on "Climate change, Carbon sequestration and Carbon trading".	CSWRI, Avikanagar, Rajasthan	24-25 Nov.
Dr. S. Ramana	National Seminar of Plant Physiology	Ram Narain Ruia College, Matunga, Mumbai	24-26 Nov.
Dr. Muneshwar Singh	Annual Convention of ISAC and National Symposium on "Balanced Fertilizer to Sustainable Soil Health, Crop Production and Food Security".	GBPUAT, Pantnagar	25-26 Nov.
Drs. Tapan Adhikari, S. Ramana and Sangeeta Lenka	Interaction meet with Scientists Trained Abroad in Frontier Areas of Agricultural Sciences.	NASC complex, New Delhi	28-30 Nov.
Dr M. L. Dotaniya	National Training on "Bioremediation of heavy metal and hazardous wastes contaminated soil and water ecosystem".	TNAU, Coimbatore	1-14 Dec.
Dr. Tapan Adhikari	4th Bangalore Nano symposium	Lalit Ashok Hotel, Bangalore	8-9 Dec.
Dr. M. Mohanty	National Workshop on "Climate Observation and Regional Modelling for Multidisciplinary Applications (CORMA)".	CSIR CMMACS, Bangalore	9-10 Dec.
Dr A. B. Singh	National Symposium on "Resource Utilization Through Integrated Farming System and Biodiversity Conservation in Drylands"	Bhuj, Gujarat	20-22 Dec.
Dr. Sangeeta Lenka	Chaired the botany and agriculture session in M. P. Women Science Congress.	Madahav Science College, Ujjain	22 Dec.

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