ICAR

IISS Newsletter

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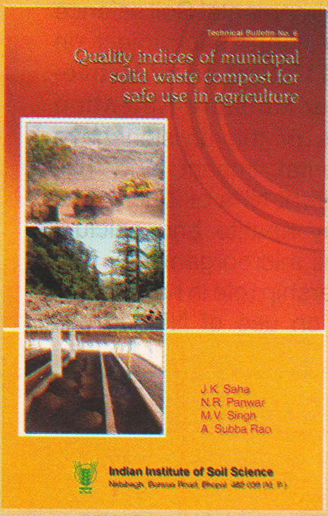
New Publication



In This Issue

Forth Coming Events

- Research Advisory Committee meeting on 21-22[nd] May, 2009
- Foundation day celebration on 16[th] April, 2009

From the Director's Desk

Nanotechnology in Soil Science and Plant Nutrition

The soil environment harbours a tremendous number of *nanoparticles (NP)* and understanding the behavior of nano-particles is very important to a wide variety of soil processes pertaining to plant nutrition and soil reclamation. The field of nanoscience is gradually emerging out as a frontier area of research; because many of the natural components of soil are nano-particulates. Moreover, increasing number of engineered NPs produced by nanotechnology industries find their way into soil environment, though the conceptual framework under which nanotechnology works still continuing to evolve. Nanotechnology is defined as the understanding and control of matter at dimensions of roughly 1-100 nm, where unique physical properties make novel applications possible (EPA, 2007). Banfield and Zhang (2001) suggested that nanoparticles might be defined based on the size at which fundamental properties differ from those of the corresponding bulk material. The soil colloids include three types of compounds namely inorganic colloids, humic substances and large biopolymers such as polysaccharides and are having a size of about 1 nm to 1000 nm. Therefore soil colloids should be viewed as an essential building block of the abiotic medium supporting life in general (Buffle, 2006). During the process of weathering of silicates, oxides and other minerals, a number of NPs such as amorphous silica, hydrous aluminosilicates such as allophane, clays such as halloysite, and oxides such as magnetite and hematite, are produced in soil but their precise function and effects are still poorly defined and understood. Microorganisms can also produce NPs through the generation of metabolic energy by pathways involving inorganic ions that participate in redox reactions. Oxidation of Fe (II) results in the formation of iron oxide NP. Similarly, variety of different manganese oxide NPs and ZnS NPs are formed by bacteria mediated oxidation-reduction processes in the soil.

One of the principle ways in which a nano-particle differs from a larger or bulk material is that a high proportion of the atoms that are associated with a NP occur at the surface. The NPs have extremely high specific surface areas for their volume and that a significant proportion of atoms on NP occur at surfaces.

There are numerous nano-enhanced products in different countries and nano-based tools and methods with immediate application to addressing the issues pertaining to low use efficiency of inputs like water, fertilizers, etc. These include nano-enhanced products such as nano-fertilizers with nano-based smart delivery systems (use of halloysite) to provide nutrients at desired site, time and rate to optimize productivity. The nano-fertilizers can be delivered timely to a rhizospheric target or by foliar spray for higher use efficiency. The emerging literature on nano-technology have started showing the importance of nano-particles in increasing bio-availability of nutrient elements and transport of pollutants in soils. Several synthesized NPs like amphiphilic polyurethane, Zerovalent iron (nZVI) and Nano-sized zeolites are widely used for reclamation of heavy metal and poly-aromatic hydrocarbons contaminated soils.

The NPs of metal oxides like ZnO and TiO_2 are being commercially produced by various industries and these NPs find their way into the soil. Several reports show that inorganic NPs like TiO_2, SiO_2 and ZnO had a toxic effect on bacteria and other organisms. Not much research information is available on interaction of NP with plants. The uptake of many types of NPs in the bacterial cell (prokaryotes) is very much limited as they do not have mechanisms for transport of NPs across the cell wall but in eukaryotes, cellular internalization of NPs occurs through the process of endocytosis and phagocytosis (Moore, 2006). Several workers (Hong et al, 2005, Zheng et al, 2005, Geo et al, 2006 and Yong et al 2006) have shown that nano-sized TiO_2 can have a positive effect on growth of spinach when administrated to the seeds or sprayed onto the leaves whereas nano TiO_2 was found to show toxic effect in green algae which have a cell wall similar to plants. The most possible interactions of NP with plant roots are adsorption onto the root surface, incorporation into the cell wall, and uptake into the cell. The NP could also diffuse into the intercellular space and be absorbed or incorporated into membranes. The interaction of NP with toxic organic compound can both amplify as well as alleviate the toxicity of the compounds. In contrast to harmful effects, NP can therefore also have an advantageous role in the soil environment. Some researchable issues in agriculture pertinent to nanotechnology are (i) development of nano-sensors to monitor soil quality, (ii) development of nano-magnets for soil contaminant retrieval, (iii) development of nano-membranes for water treatment/ purification, (i) fertilization and herbicide application through NPs, (v) synthesis of nano fertilizers for soil and plant application, (vi) solubility and degradability of engineered NPs in soils and waters, and (vii) establishment of baseline information on safety, toxicity and adaptation of NPs in soil and aquatic life. I am happy to inform that a modest beginning in research on NPs has started at Environmental Soil science Division of this institute under the NAIP sub-project on **"Nano-technology for Enhanced Utilization of Native-Phosphorus by Plants and Higher Moisture Retention in Arid Soils"** and the scientists of the division have initiated research on environmental impact and risk assessment studies on use of different NPs of Zinc oxide, Copper oxide, iron oxide, hydroxy apatite and calcium phosphate on plant growth and soil microorganisms. The institute is gearing up to take a leadership role in harnessing the opportunities and challenges on use of NPs in soil science and plant nutrition studies.

(A Subba Rao)

Research Highlights

Mercury Pollution in India (Survey Report)

India's population was unaware of mercury hazards for last few decades. Mercury distribution in the environment has been a focus of scientific attention because of the potential health risks posed by mercury exposure. Organic mercury, mostly methyl mercury, the most toxic species is bioaccumulating in the biota and subsequently biomagnified in the aquatic food chain, especially in fish. The chlor-alkali industries are the major source of mercury release in atmosphere and surface water. Other industries, which contribute to mercury pollution in India, are coal fired plants viz. thermal power plants, steel industries and cement plants. Plastic industry (mercury is used as a catalyst), pulp and paper industry, medical instruments and electrical appliances, certain pharmaceutical and agricultural products accounting for additional consumption of mercury (www.toxicslink.org/docs/06035_publications-1-33-3.pdf). India consumes 510 million tonnes of coal in 2007-08 in various thermal power plants, steel industries (www.mjunction.in/market_news/coal_1/indias_200809_coal_consumption.php). Coal contains mercury (0.25 ppm Hg) and its combustion as a source of energy is often sited as significant source of mercury emission (100-110 t Hg). Mercury levels are reported to be extremely high in the working environment of these industrial processes including thermometer factories. Mercury contamination in water in India is verging on alarming situation due to discharge of industrial effluents containing mercury ranging from (0.058-0.268 mg/l) against 0.001 mg/l as per WHO and Indian standards. Mercury levels in water near caustic chlorine industry has been reported as high as 0.176 ± 0.0003 mg/l in water and 596.67 ± 25.17 mg/kg dry wt soil against the prescribed limit of 0.001 mg/l in water and 0.05 mg/kg in soil (www.envisnioh.org/Mercury-Exposure%20and % 20effects.pdf and http://www.cseindia.org/dte-supplement / global-warming.htm).

The mercury consumption in Indian caustic chlorine companies is at least 50 times higher than the global best companies. They alone contribute to about 40 per cent of the total mercury pollution in the country. As much as 44 per cent of mercury consumed by mercury cell companies is released into environment through unknown sources. On an average, 47 gm mercury is lost in the production of 1 tonne of caustic soda in the Indian caustic- chlorine industry. This mercury loss is based on the total caustic soda production, irrespective of the production process. The average specific mercury loss from mercury cell plants in India is about 142 gm/MT NaOH produced. More than 1,000 tonnes of mercury remains in the inventory of industry and 8-10 per cent is the annual replenishment. For producing 0.5 million tonnes caustic soda, the total annual consumption of mercury in Indian caustic-chlorine industry is about 70 -100 tonnes (http://www.cseindia.org/dte-supplement/who-responsible.htm).

The chlor-alkali plants using mercury cell as the electrolytic cell are the main cause of mercury pollution. The mercury cell chlor-alkali plant is reported to discharge mercury in wastewater in the range of 0.08-2mg/l. Other industries discharging mercury-contaminated wastewaters include mining, smelting, tars and asphalt, coke ovens, textiles and those manufacturing cements, catalysts, paints, pesticides, pharmaceuticals, and batteries. The maximum limit of mercury in the industrial effluents, as per Indian Standards, is 0.001 mg/l. The pollution can be substantially reduced either by the use of some other metal electrodes (titanium substrate insoluble anodes) and electrolytic cell in the chlor-alkali plants or by the effective treatment of the effluents from these polluting industries by using micro-organism based technology (mercury resistant strains of Pseudomonas), use of low cost Resins (grafted coconut husk), precipitation of mercury by a more reactive metal, such as Al, Fe, Cu, Zn etc., and also as mercuric sulphide using sulphide reagents (www.toxicslink.org / docs / 06035_publications-1-33-3.pdf and www.envisnioh.org / Mercury-Exposure %20and % 20 effects.pdf). Therefore, India may become "Hot Spot for Mercury Poisoning" if corrective measures are not immediately imposed and implemented.

P recovery from diverse organic manures

Availability and recovery of P from diverse organic manures having varying C:P ratio, in contrasting soils viz. Vertisol (Bhopal), Oxisol (Dapoli) and Mollisol (Pantanagar) was assessed. The P availability was relatively high during initial period following addition and gradually declined with time in narrow C:P ratio materials. In contrast, the material with wide C:P ratio maintained low P availability initially and promoted it over the time. P recovery from manures, at one month after addition, was the highest for FYM (40.3-48.8%) and the lowest for wheat residue (10.2-13.0%). Generally, P recovery among soils followed the order Oxisol > Vertisol > Mollisol. Effectiveness of organic materials relative to inorganic P in promoting P availability was greater in a high P fixing soil than in a low P fixing soil.

Assessing Nutritional Constraints of Soybean-Wheat Production on Vertisols of Central India

Nutrient omission trials were conducted for the soybean and wheat crops on farmer's fields in Geelakhedi (Rajgarh district), Mugaliahat (Bhopal district) and Rangai (Vidisha district) villages. Results revealed that balanced fertilization through application of NPKSZn at recommended rates produced higher soybean seed yield by 30-35% over Farmers' Practice (FP) (12 kg N and 30 kg P_2O_5 ha^{-1}). Skipping of application of P (NKSZn treatment) and S (NPKZn treatment) had resulted in 15-19% reduction in soybean seed yield as compared to NPKSZn treatment. Application of NPKSZn at recommended rates produced significantly higher wheat grain yields as compared to Farmers' Practice (80 kg N and 50 kg P_2O_5 ha^{-1}) at all sites. Skipping of application of P (NKSZn treatment) had resulted in reduction in wheat grain yield as compared to NPKSZn treatment at all sites but the decline in yield was significant only at four sites out of six sites. Absence of S (NPKZn treatment) also resulted in decline in grain yield as compared to NPKSZn and the reduction was significant at four sites. Similarly the wheat grain yields were reduced significantly at 3 sites when Zn was not applied.

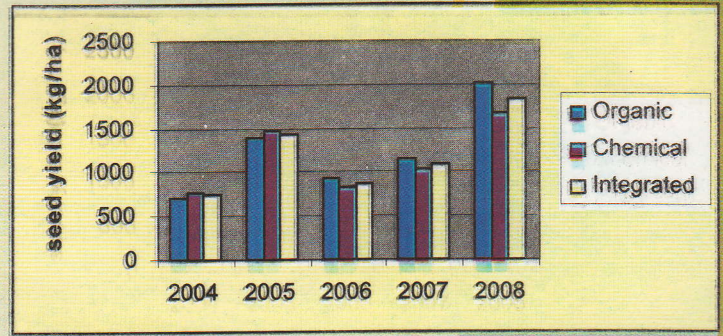
Long-term effect of INM intervention on carbon pools

Application of manures and fertilizers for five year in soybean-wheat system in a Vertisol has improved the carbon pools. Application of 8 t FYM to soybean and 16 t FYM to wheat without any inorganic fertilizers has resulted in the highest total organic C content in all the three layers, followed by 50% NPK annually along with 20 t FYM once in four years to soybean and 100% NPK to wheat. Most of the treatments involving organic sources of nutrients with or without inorganic sources significantly increased the total organic C content over the general recommended dose and Soil Test Crop Response dose of fertilizer application to soybean and wheat. Water-soluble C ranged between 43.6 to 67.9 mg kg^{-1} in top 7.5 cm soil layer with the highest in treatments receiving only organic source of nutrient to soybean-wheat system. The carbon management index (CMI) values ranged from1.00 to 1.59, 1.00 to 1.30 and 1.00 to 1.49 in 0-7.5, 7.5-15 and 15-30 cm layer with a mean CMI varying between 1.00 and 1.46 among different INM treatments.

Performance of soybean under organic farming

In a long-term field experiment, initiated in 2004 to study the effect of three management practices viz. organic, inorganic and INM practices on the production sustainability, soil health and produce quality of soybean, there was a reduction in seed yield of soybean in organic treatment in the first two years (7.8 and 5.3 % reduction in 2004 and 2005, respectively) compared to chemical fertilizers. Whereas from third year (2006) onwards, organic treatment recorded higher seed yield compared to either chemical or integrated nutrient management practice. In the fifth year (2008), organic treatment recorded 20.7 and 9.4 % higher soybean seed yield compared to chemical and integrated nutrient management practice, respectively (Figure).

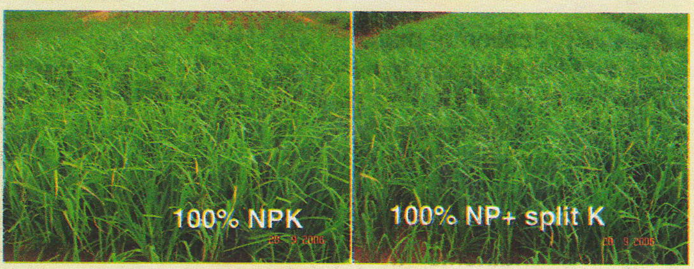
AICAR team visiting the field trials



Performance of soybean under different management practices

Potassium management to sustain finger millet productivity in Alfisols

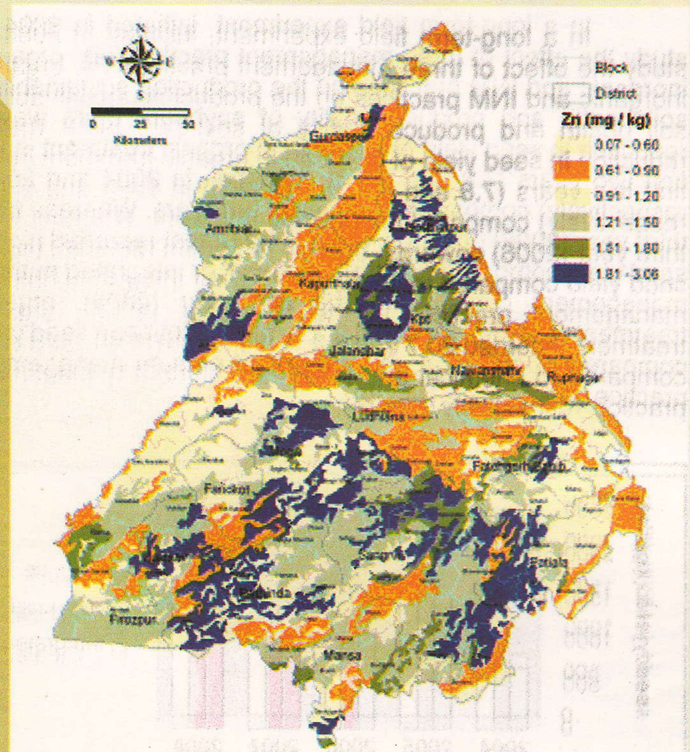
Alfisols are associated with potassium (K) inadequacy. Long-term fertilizer experiments demonstrated that proper management of K might increase the productivity to the tune of 3 t ha^{-1} in Alfisols. A satellite experiment was conducted at Bangalore for two years with finger millet cowpea cropping system to demonstrate the impact of K management in Alfisols. Application of K resulted increase in productivity from 1.9 t ha^{-1} to 3.9 t ha^{-1} while split application further enhanced the finger millet yield to 4.3 t ha^{-1}. Thus, results demonstrated that proper management of K would help in boosting the crop productivity in Alfisols.



Effect of split application of K on finger millet

Status of DTPA extractable Zn in soils of Punjab

Ludhiana centre of AICRP on Micro- and Secondary Nutrients and Pollutant Elements in Soils and Plants prepared Zn deficiency map of Punjab soisl pertaining to five agro-ecological subregions. DTPA extractable Zn in Punjab soils ranged from 0.07 to 3.06 mg kg^{-1} with a mean 1.10 mg kg^{-1}. Fifty per cent of the samples had DTPA-Zn more than 0.97 mg kg^{-1}. Considering 0.6 mg kg^{-1}as the critical limit, 24 per cent samples were found deficient in DTPA-Zn. The highest available Zn was observed in central alluvial plain eco-subregion and piedmont and alluvial plain eco-subregion. The content of DTPA-Zn in southwestern alluvial plain eco-subregion and Siwalik hills and undulating eco-subregion of Punjab was relatively lower. About 10 per cent (5036.20 km^2) of the total geographical area of Punjab was suffering from Zn deficiency (as shown in map).



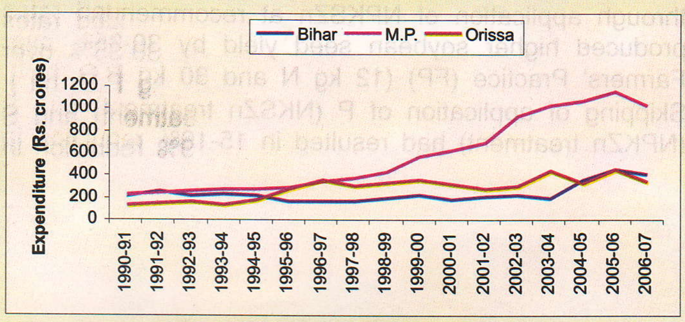
Map of DTPA extractable zinc status in Punjab Soils

Soil biological health under pomegranate

Application of 18 kg vermicompost or 21 kg compost or 29 kg cattle dung manure (CDM) per plant or a combination of 50% CDM+50% RDF improved the biological and biochemical properties of soil. Biological parameters such as microbial biomass C, N, P contents, dehydrogenase and cellulase enzyme activities were maximum in organic nutrient management system followed by integrated nutrient sources and inorganic fertilizers alone. Chemical fertilization did not have any adverse effect on bacteria and fungal proliferation.

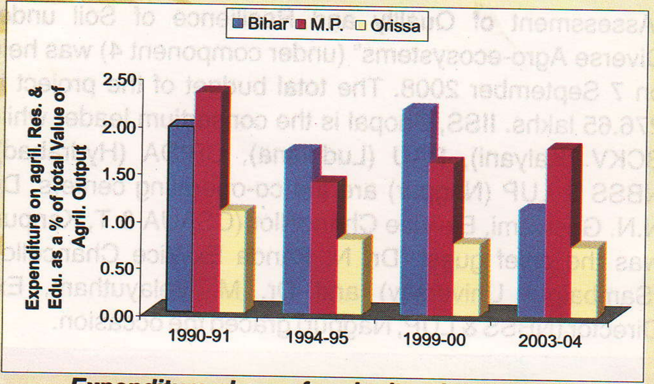
Ailing Agricultural Productivity in Economically Fragile Region of India: An Analysis of Public Investment and Farmers' Capacity (Survey Report)

Trend of public expenditure by the 3 state governments in agriculture (includes expenditure on crop husbandry, soil & water conservation, food storage & warehousing and agricultural research & education) shows that MP has the highest expenditure on agriculture and allied activities, while Bihar has the lowest. Over the years, growth in expenditure by the Government has declined in Bihar. Similarly, in the state of Orissa, investment in agriculture increased significantly after mid-1990s. Most of these expenditures were, however, incurred on revenue account, which means only 10-15 per cent of total expenditures were meant for creation of assets.



Public expenditure on agricultural development

Total expenditure on agricultural development as well as its share in total value of agricultural output is the lowest and declining in Bihar state as compared to other two states. Of late, its share has declined due to relatively better realization of value of agricultural output in Bihar. Still, the spending on research & education in Bihar is the highest (Rs. 58 crores) in 2006-07 followed by M.P. (Rs. 54 crores) and Orissa (Rs. 30 crores).



Expenditure share of agricultural research & education in value of agricultural output

Liquid Biofertilizer Formulations

Liquid biofertilizer formulations with long shelf life were developed by ANGRAU, Amaravathi center of AINP on Biofertilizers. Different concentrations of cell protectants like arabinose, trehalose, glycerol, polyvinyl pyrrolidone (PVP) were used in the media. They maintained a good titre of Rhizobium (log 8.43 CFU ml^{-1}), Azospirillum (log 8.64 CFU ml^{-1}) and P solubilising Bacillus megaterium (log 8.03 CFU ml^{-1}) even at the end of one year whereas in lignite carrier their population had come down to log 1.11, 2.99 and 2.16 CFU g^{-1} respectively. No contamination was observed until 360 days in any of the liquid inoculants.

Detergent pollution in sewage water of four cities of Madhya Pradesh

A survey was conducted in 4 cities, viz., Bhopal, Gwaliar, Jabalpur and Bhopal to have an estimate of detergent pollution in sewage water based on 120 samples collected from each city. The survey revealed that sewage waters of Indore and Bhopal contained more detergents (LAS and STPP) as compared to sewage water of Jabalpur and Gwalior.

Nitrate contamination in groundwater in intensively cultivated districts of the country

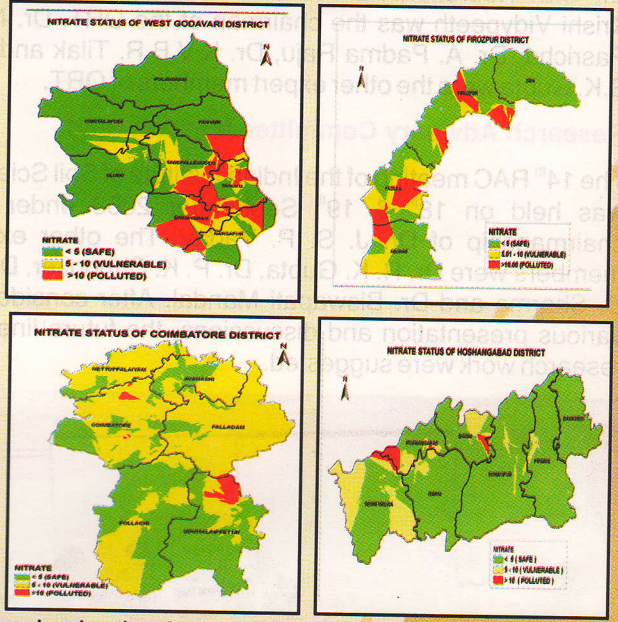
The extent of nitrate contamination in groundwater in six intensively cultivated districts of the country, namely, West Godavari (A.P.), Ferozepur (Punjab), Jalgaon (Maharashtra), Hooghly (W.B.), Coimbatore (T.N.) and Hoshangabad (M.P.) was evaluated through a stratified random sampling survey. From each target district, a total of 500 water samples were collected each time during pre-monsoon and post-monsoon periods of 2006 and 2007. Water samples were analyzed for nitrate-N with the help of an automated colorimetric method using Flow Injection Analyzer.

There were wide and significant variations in the levels and extent of nitrate in ground waters in the target districts. Evidently, West Godavari and Coimbatore were the most polluted, about 20% samples recording beyond 10 mg NO_3-N L^{-1}. The target district of Hooghly and Jalgaon did not show any nitrate pollution in groundwater. The other three districts, Ferozepur, Coimbatore and Hoshangabad, recorded moderate level of nitrate pollution in their groundwater resources. With the help of geo-referencing and kriging using ArcGIS, the digital maps with block boundaries of the target districts have been prepared, and nitrate contaminated areas in each district have been delineated based on the results of pre-monsoon 2007.

Mean nitrate content and extent of nitrate pollution in groundwater

Target District	Sample size	Mean NO_3-N Level, mg L^{-1}	Per cent polluted samples	
			Overall	Field areas
West Godavari	1440	9.11	20.1	12.4
Ferozepur	1500	3.57	9.2	9.2
Hooghly	2112	0.76	0	0
Jalgaon	1306	-	0	0
Coimbatore	1073	6.74	20.5	20.5
Hoshangabad	1519	4.55	7.7	5.5

Shallow and unconfined or semi-confined aquifers like dug-wells, open wells and hand pumps were more polluted than deep and confined aquifers in all the districts, and organic sources of nutrients including wash-off of agricultural residues, human and animal excreta especially near habitation areas rather than inorganic fertilizer sources seem to have played the major role in nitrate contamination of groundwater. The map clearly showed that nitrate contaminated areas in a district was very much localized and not well distributed, and hence the geo-hydrological conditions of the area apart from the sources of nitrate was mainly responsible and need to be explored. In all districts higher nitrate was recorded in ground water in areas under vegetables and orchards/plantation crops as compared to rice-based/soybean-based cropping systems and other field crops. The results thus clearly indicated that the source of the pollution was a combination of many factors and could not be pin-pointed to inorganic fertilizers usage alone.



Maps showing the nitrate contaminated areas in the target districts

Awards / Honour

- Dr. Sangeeta Lenka, Scientist, Soil Physics, received the Jawaharlal Nehru Award for Postgraduate Agricultural Research for the year-2007 for outstanding research in the field of Soil Science, NRM and Agronomy.
- Dr. K. Sammi Reddy, Senior Scientist, Dr. A. Subba Rao, Director, Dr. Muneshwar Singh, PC (LTFE) and Dr. Anand

Swarup, Former PC (LTFE), received the FAI Golden Jubilee Award for Excellence in the Field of Development of Fertilizer Best Management Practices.

Dr. K. Sammi Reddy receiving FAI award

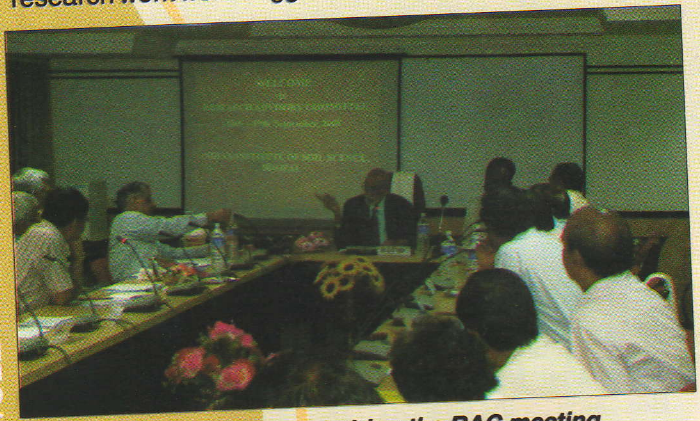
Major Events

Concluding meeting of Quinqineal Review Team

The concluding meeting of the QRT was held on 25-28 August 2008 to review the work done by the Indian Institute of Soil Science, Bhopal and All India Co-ordinated Research Projects on Soil Test Crop Response, Long Term Fertilizer Experiment and Micro & Secondary Nutrients & Pollutants in Soil and Plants for the period from 2002-06 and Network Project on Bio-fertilizers (2004-06). Dr. S.B. Kadrekar, Formar Vice Chancellor of Konkan Krishi Vidypeeth was the chairman of the QRT. Dr. N.S. Pasricha, Dr. A. Padma Raju, Dr. K.V.B.R. Tilak and Dr. S.K. Gupta were the other expert members of QRT.

Research Advisory Committee Meeting Held

The 14th RAC meeting of the Indian Institute of Soil Science was held on 18th & 19th September 2008 under the chairmanship of Dr. J. S. P. Yadav. The other expert members were Dr. R. K. Gupta, Dr. P. K. Chhonkar, Dr. P. D. Sharma and Dr. Biswapati Mandal. After considering various presentation and discussions, the future lines of research work were suggested.



Dr. J.S.P. Yadav chairing the RAC meeting

Lunching workshop

Launching workshop of NAIP sub-project entitled "Assessment of Quality and Resilience of Soil under Diverse Agro-ecosystems" (under component 4) was held on 7 September 2008. The total budget of the project is 276.65 lakhs. IISS, Bhopal is the consortium leader while BCKV (Kalyani), PAU (Ludhiana), CRIDA (Hydrabad), NBSS & LUP (Nagpur) are the co-operating centers. Dr. N.N. Goswami, Ex-Vice Chancellor (CSAUA & T, Kanpur) was the chief guest. Dr. N. Panda Ex-Vice Chancellor, (Sambalpur University) and Dr. M. Velayutham, Ex-Director (NBSS & LUP, Nagpur) graced the occasion.

Dignitaries attending the Launching workshop of NAIP sub-project

Initiation of Externally Funded Project

The Institute has been awarded a new NAIP sub-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'. The total outlay of the project is Rs. 453.1 lakhs. Dr. M.V. Singh, PC (AICRP on Micro- and secondary nutrients and pollutant elements) is the Consortium Principal Investigator and IISS, Bhopal is Consortium leader. Other Co-operating centers are PAU Ludhiana, GBPUAT Pantnagar, ANGRAU Hyderabad, AAU Anand, RAU Pusa and Bihar Veterinary College Patna and Lucknow University, Lucknow.

Model Training Course (MTC)

An eight days Model Training Course (MTC) on "Efficien use of on-farm and off-farm resources for sustainable crop production in organic farming" was organized at IISS Bhopal during 1-8th December, 2008 which was sponsore by Ministry of Agriculture, Department of Agriculture & Cooperation, New Delhi. Eighteen candidates fron different State Agriculture/Horticulture Departments, Stat Agricultural Universities and ICAR Institutes participated i this training program.

Group meeting of AINP on Biofertilizers

The group meeting of the All India Network Project o Biofertilizers was held during September 11-13, 2008 at th Y.S. Parmar University of Horticulture and Technolog Hon. Minister inaugurated it for Health and Family welfa of H.P. Govt., Dr. Rajeev Bindal who underlined t

Dr. G .S. Kaushal, Ex Director of Agriculture (M. P.) chairing the inaugural function of the MTC

importance of organic farming and bioinoculants for the hill state. The vice-chancellor of YSPUHT, Dr. K.R. Dhiman, Dr. P.D. Sharma ADG (Soils) and Dr. A. Subba Rao, Director, IISS graced the occasion. Dr. D.L.N.Rao, Network Coordinator presented the salient achievements and the XI plan programme. There were 4 technical sessions where the progress and future programmes of the 11 network centres was discussed.

Release of publications by Dr. Rajeev Bindal, Minister of Health and Family welfare (H.P.) during group meeting of AINP on Biofertilizer

Review Workshop of ACIAR Project

Final Review Workshop of the ACIAR project entitled "Integrated manure nutrient management in soybean/wheat cropping systems on Vertisols in Madhya Pradesh and Queensland" was organized during 15-17 September 2008 at IISS, Bhopal. The project Scientists from IISS, Bhopal and BAIF Research Foundation, Bhopal, India; University of Queensland & Queensland Department of Natural Resources, Brisbane, Australia, Dr. Christian Roth, Programme Manager, ACIAR, Canberra, Australia; Ms. Simrat Labana, Assistant Country Manager, ACIAR, New Delhi had participated in the workshop. During the workshop, Dr. Michael Webb, Soil Scientist, CSIRO, Brisbane, Australia has reviewed the work done under the project and appreciated the research outcomes. He has recommended for conducting another 100 baby trials (Demonstration trials) in new villages for popularization of the INM technology among the farmers during 2009-2010. Therefore, the ACIAR has extended the project period up to June 30, 2010 for conducting these trials with the unspent funds of the project.

Extension activities

- Dr. A. B. Singh had given training on phospho-sulpho-nitro compost production on farmers' fields on 06/12/2008, arranged by Swami Vivekanand Shiksha Samiti, Bhopal. One day training was also given to the farmers on vermicomposting arranged by Madhya Pradesh Vigyan Sabha Bhopal. Dr A. B. Singh coordinated the visits of the 30 farmers from Khandwa on 14/12/2008 and 40 farmers from Tonk Rajasthan on 18/12/2008 in the institute. During field visits, he explained about the technologies generated in the institute.
- A Farmers' Day was organized at Rangai village, Vidisha district under ACIAR project on 16 September 2008. About 100 farmers from Rangai and surrounding villages, project scientists from India and Australia (Dr. Christian Roth, ACIAR, Australia, Ms. Simrat Labana, ACIAR, New Delhi and Dr. Michael Webb, ACIAR Reviewer, Australia) participated in the Farmers' Day. Both the host and non-host farmers visited the demonstration trials of NADEP compost heaps.

Farmers' Day at Rangai village, Vidisha district

Distinguished Visitors

- Dr. Neal Menzies, Professor, and Dr. F. P. C. Blamey, University of Queensland, Brisbane, and Dr. Ram Dalal, Senior Principal Scientist, Queensland Department of Natural Resources & Water, Brisbane, Australia: Visited IISS, Bhopal during 11-17 September 2008 to participate in the Final Review Workshop of ACIAR Project.
- Dr. Christian Roth, Programme Manager, ACIAR, Canberra, Australia and Dr. Michael Webb, Soil Scientist, CSIRO, Brisbane, Australia: Visited IISS during 15-17 September 2008.

New Appointments

Dr. J. Somasundaram was appointed as Senior Scientist (Soil Physics). He joined the Institute on 22 December 2008. Earlier he was at CSWCRTI RS, Kota.

Promotions

Dr. A.K. Biswas, Senior Scientist promoted to Principal Scientist w.e.f. 23rd Aug. 2007.

Dr. J.K. Saha, Senior Scientist promoted to Principal Scientist w.e.f. 31st Aug. 2007.

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

Name	Programme	Venue	Period
A. Subba Rao, Director	National Seminar on 'Soil, Water Conservation and Crop Management Technologies under Rainfed Agriculture'	Zonal Agricultural Research Station, MPKV, Solapur	29-30 Aug., 2008
	Group Meeting of 'Network Project on Biofertilizers'	YSPUHT, Solan	10-12 Sept., 2008
	National Symposium on 'Agroforestry Knowledge for sustainability, climate moderation and challenges ahead'	NRCAF, Jhansi	15-17 Dec., 2008
Drs. R. S. Chaudhary, Blaise Desouza & D. Damodar Reddy	ICAR training-cum-workshop on 'IP and Technology Management'	CIAE, Bhopal	27-29 Nov., 2008
Dr. Blaise Desouza	National Seminar on 'Second Green Revolution – Necessity or Compulsion'	ANRAU - ARS, Adilabad	19-21 Oct., 2008
Dr. Blaise Desouza	International Training programme on 'Cotton Production and value addition'	CICR, Nagpur	18 Nov., 2008
Dr. Blaise Desouza	Guest lecture on 'Winter School on Research and development needs in a Transgenic Farming Era'	UAS-Dharwad	17 Dec. 2008
Dr. D. Damodar Reddy	Guest lecture on 'Technological Advancements in Rainfed Agriculture'	CRIDA, Hyderabad	12 Dec., 2008
Dr. K. Sammi Reddy	International Seminar on 'Strategies for Improving Livelihood Security of Rural Poor'	ICAR Reaearch Complex, Ela, Old Goa	24-27 Sept., 2008
Drs. S. Kundu, A. Biswas & Tapan Adhikari	Lunching workshop of NAIP sub-project 'Nano technology for Enhanced Utilization of Native Phosphorus by Plant and Higher Moisture Retention in Arid Soils'	CAZRI, Jodhpur	23-24 Dec., 2008
Drs. A. Subba Rao & K. Sammi Reddy	FAI Annual Seminar	FAI, The Ashok Hotel, New Delhi	4-6 Dec., 2008
Drs. K. Sammi Reddy, Brijlal Lakaria, K. Ramesh	International Conference on 'Nanotechnology In India's Future'	2nd Bangalore Nano, Grand Ashoka, Banglore	11-13 Dec., 2008
Drs. S. K. Behera & K. Ramesh	Model training course on 'Efficient use of on-farm and off-farm resources for sustainable crop production in organic farming'	IISS, Bhopal	1-8 Dec., 2008
Dr. Ranjit Kumar	Management Development Programme on 'Performance Assessment of Agricultural Research Organizations'	NAARM, Hyderabad	16-20 Sep., 2008
Dr. A. B. Singh	'International Soybean Processing and Utilization', Conference-V (ISPUC-V 2008)	CIAE, Bhopal	10-14 Dec., 2008
Drs. M.V. Singh, M. C. Manna & A. B. Singh	73rd Annual convention of Indian Society of Soil Science	UAS, Bangalore.	27-30 Nov., 2008
Dr. M. C. Manna	CIC and Lunching workshop of NAIP project entitled 'Soil organic carbon dynamics vis-à-vis anticipatory climatic changes and crops adaptation strategies'	CRRI, Cuttack.	23-28 Dec., 2008
Dr. M. C. Manna	Annual meeting of Bureau of Indian Standards	Manak Bhavan, New Delhi	11 Dec., 2008

Training Imparted to Post Graduate Students

Name of the Student	Affiliated Institution
1. Devendra Kumar Mahagaya	Chitransh Amulya Dutta P. G. Mahavidhyidyalaya, B. U. Bhopal
2. Sajad Ahemad Seikh	Jawahar Lal Nehru P. G. College, B. U. Bhopal
3. Mr. Shadab Aga	
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