



# IISS Newsletter

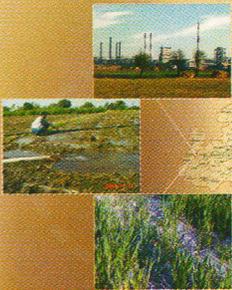
Volume 9, Number 2

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## New Publication

Agriculture Bulletin - IISS-4

Impact of the use of polluted irrigation water on soil quality and crop productivity near Ratlam and Nagda Industrial area



Indian Institute of Soil Science  
Nabibagh, Berasia Road, Bhopal - 462038

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

## What a Soil Scientist can do?



A Soil Scientist is a person who is well qualified to analyze soil and interpret soil-related data for the purpose of understating soil resources as they contribute to not only agricultural production, but also environmental quality and human health. Soil scientist has a thorough understanding of the soil environment, including soil morphology and soil forming factors, soil chemistry, soil physics, and soil biology, and the dynamic interaction of these.

Soil Scientists play a role in maximizing food production, planning efficient urban development, safely disposing of wastes, conserving prime farm land, reducing the impact of soil erosion, conserving the world's energy resources and many other activities.

Soil Scientists worldwide are engaged in a variety of interdisciplinary activities that involve direct application of Soil Science knowledge. The areas of activity include:

- Lessons learnt from Long Term Fertilizer Experiments and measures to sustain productivity in Alfisols
- Research Highlights
- Awards and Honours
- Visit Abroad
- Foreign Fellowship
- Events
- Sports
- Staff News
- Scientists' Participation in Conference / Seminar / Training / Group Discussion
- Research of soil systems and soil management by central, state and private research institutions for the enhancement of soils knowledge.
- Investigation of soils as they relate to natural resource management, including agricultural soils, forest soils, wetlands, environmental, ecological and archeological sites.
- Management of soils for land enhancement such as land use planning, landscape design, mine reclamation and site restoration.
- Assessment and investigation of soils for application of wastes in a variety of forms, including non-hazardous process wastes and residential waste.
- Water quality assessment and protection.
- Suitability studies for a variety of land development uses, including soil stability, moisture retention or drainage and environmental impact.
- Assessment and investigation of environmental hazards, including hazardous waste sites that involve soil investigation techniques, evaluation of chemical fate and transport phenomena, and suitable remediation alternatives.
- Regulation of soils for agricultural purposes, forest products and erosion control. Management includes regulation of nutrient and water availability to plants.

## Editors

Muneshwar Singh  
R.H. Wanjari

## Why is there a need for recognition?

In the professional practice, Soil Scientists are recognized only to a limited extent. Management of soils for protection of human affairs and the environment is often conducted by professionals like geologists, environmental scientists and engineers

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who sometimes lack sufficient knowledge of soils. The opportunity for advancement of Soil Science in practice is often inhibited by those unable to recognize the application of Soil Science. Thus, the practice of Soil Science is often undertaken by individuals with poor understanding of soils or soil processes. Soil Scientists must be recognized as responsible professionals amidst other practitioners of science and engineering for the proper management and use of our soil resources.

Well-trained soil scientists are in high demand world wide for an array of professional positions with public agencies or private firms such as: Water quality Specialists, Environmental Specialists, Soil Conservationist, Hydrologist, Soil Consultants, Natural Resources Scientists, Environmental Specialists (Wetlands), Professional Soil Scientist

and Environmental Consulting Firm. Soil Scientists have a strong role to play in the future development of ecological research. Soil Scientists also undertake management of urban and sports Turf Soils.

Soil Scientists must address critical problems facing society, namely: population pressure and the need for increasing agricultural productivity; competing uses for land and water resources; dependence on non-renewable resources and environmental quality. The current issues of research include precision agriculture, assessment of environmental quality, conservation management, sustainable land resource management, carbon sequestration and global climate change and others.

A. Subba Rao

### Lessons Learnt from Long Term Fertilizer Experiments and Measures to Sustain Productivity in Alfisols

Alfisols are highly leached soils with poor buffering capacity occurring under high rainfall area. Out of 17 sites of LTFE, four sites belong to Alfisols viz. Palampur, Ranchi, Bangalore and Pattambi and last one has been functioning from 1996-97. In the last three decades, enormous information was generated from LTFE.

#### Productivity of Crops

Crops yield data of the three Alfisols sites revealed that continuous application of N alone has adverse effect on yield. The treatment (100% N) even could not keep pace with the absolute control where nothing was applied. For instance at Palampur, the productivity of maize and wheat in the N alone plot is adversely affected and in the recent years there is no crop in this particular plot (Fig. 1).

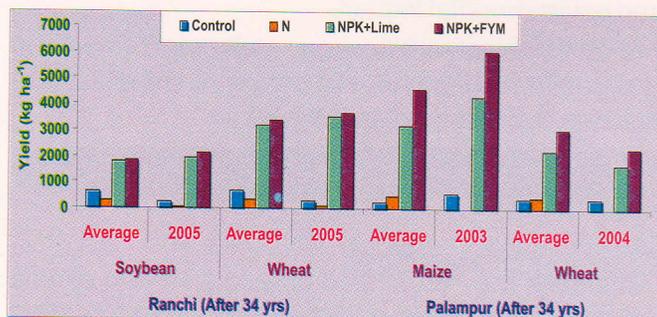


Fig. 1. Long-term crop productivity in acidic red soils

Contrary to upland situation, the effect of lime on crop yield in submerged rice-rice system was not observed. However, incorporation of FYM and in-situ green manuring resulted appreciable increase in yield of both kharif and rabi rice. Attainment of soil pH near neutrality under submergence could be the reason for non effectiveness of lime.

Similarly at Ranchi, the productivity of soybean in N alone treatment during 2005 was only 64 kg ha<sup>-1</sup> and wheat was 109 kg ha<sup>-1</sup> whereas their average yield (34 yr) were 296 and 344 kg ha<sup>-1</sup>, respectively. The low yields level during current year suggests yield decline further due to application of N alone.

Continuous absence of K from nutrient schedule resulted in decline in yield of finger millet and maize at Bangalore (Fig. 1), maize and wheat at Palampur and soybean and wheat at Ranchi. For example, in the absence of K application since last 17 years at Bangalore resulted in decline in yield by 33.8 q ha<sup>-1</sup> in finger millet and 14.7 q ha<sup>-1</sup> in maize. At Palampur also, in the absence of K maize yield declined to the extent of 12.2 q ha<sup>-1</sup> and wheat yield by 6.4 q ha<sup>-1</sup>.

Application of NPK + FYM/lime sustained the productivity at the highest level in all the soils. Thus, the results clearly brought out that the balanced application of nutrients is the only solution for sustaining the crop productivity in Alfisols.

Data depicted in Fig. 2 on soil organic carbon (SOC) status revealed that continuous balanced nutrients application maintained SOC whereas incorporation of FYM resulted in build-up in SOC in Alfisols of Bangalore and Palampur. At Ranchi, only NPK+FYM could maintain SOC whereas in all other treatments decline in SOC is recorded. Thus, results indicate that in Alfisols of high rainfall areas incorporation of FYM/lime is essential to sustain soil productivity.

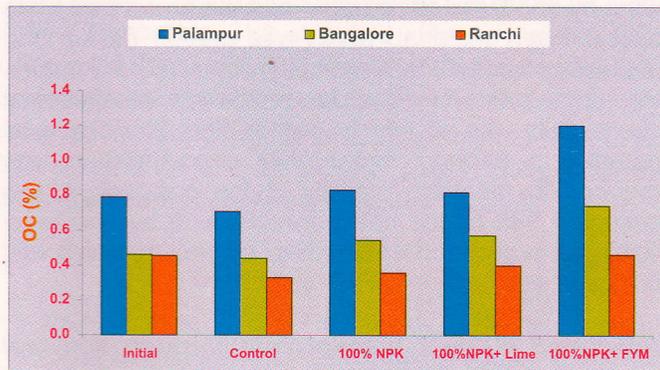


Fig. 2. Organic C status in different treatments under long-term fertilizer experiments in Alfisols

Sulphur is another growth limiting nutrient which adversely affected the crop productivity. At Bangalore absence of S from fertilizer schedule resulted in yield decline by nearly 2 q ha<sup>-1</sup> in finger millet and 3.5 q ha<sup>-1</sup> in maize (Fig. 2). At Palampur, 6.2 q ha<sup>-1</sup> decline in wheat yield was recorded in the absence of S.



Plate 1. Potassium and Sulphur: Growth limiting nutrients which adversely affected the productivity in Alfisols at Bangalore

#### The salient findings are:

- The use of nitrogenous fertilizer without ensuring supply of other nutrients in right proportion had detrimental effect on crop productivity and soil health.
- Application of P enhanced the crops productivity by 2.2-21.0 q ha<sup>-1</sup> and K 3.6 to 33.0 q ha<sup>-1</sup>. For sustaining the yield one has to keep an eye on P and K availability. Sulphur increased the crop productivity to the extent of 1.7 to 6.2 q ha<sup>-1</sup>.
- Alfisols are incapable to supply the K to crop in adequate amount. Therefore, to sustain the productivity N and K should be applied in equal amount i.e. 1:1 instead of 9:1
- The results clearly brought out that balanced application of nutrients coupled with soil amendments ensured increase in productivity by 2 t ha<sup>-1</sup> annually which would culminate into additional production of 50 m tons grain annually costing Rs 3200/- crores. Therefore, to harness the maximum utilization of nutrients by crop, soil amendments like FYM and lime are essential in Alfisols.

Muneshwar Singh (Project Coordinator, LTFE)

#### Research Highlights

##### Tillage and residue management

The performance of different tillage systems and nitrogen rates on soil quality and crop productivity in Vertisols has been assessed through a long-term tillage experiment. Results indicated that in terms of grain and biomass yield of soybean and wheat, conservation tillage treatments namely, no tillage and reduced tillage, were as effective as conventional tillage treatments with concomitant saving of energy and time. Adoption of conservation tillage practices significantly improved physical environment of the surface soil.

##### Studies on soil organic carbon stock and aggregation status of coastal agro-ecosystems of Orissa and Alluvial soils of lower Gangetic plains

Estimates of SOC stock and aggregation status of soils from the coastal agro-ecosystems of Orissa and alluvial soils of lower Gangetic plains clearly showed that the organic carbon stock of pristine soils were higher than cultivated soils. In general, cultivation caused a net loss of 0.3 to 0.5 g C/kg soil compared to the pristine state.

Aggregation status was mainly influenced by the clay and organic carbon present in the soil. The cropping system effect on aggregation was not clear. Both the macro and micro aggregates present in pristine soils contained higher OC than that in cultivated soils. Alluvial soils of lower Gangetic plains of West Bengal contained more SOC than the coastal agro-ecosystem soils of Orissa owing to finer texture, higher rainfall and more biomass addition.

#### ***Nitrogen mineralization characteristics of green manures, crop residues and organic manures in relation to their quality***

The mineralization of N was investigated in a Vertisol amended with green manures (gliricidia and subabul), crop residues (gram, soybean and wheat straws), and organic manures (poultry manure and farmyard manure). The total N mineralized in amended soils varied considerably depending on the type of organic materials incorporated. Expressed as a percentage of N added to soils, the S mineralized was higher in green manure and poultry manure treated soils as compared to other crop residues, FYM, crop residues + urea, and FYM + urea treated soils. There was a significant negative relationship between N mineralized and quality parameters of organic materials such as C: N ratio, lignin/polyphenol ratio, polyphenol / N ratio, and lignin + polyphenol /N ratio at different periods of incubation. Potentially mineralizable N pool and first-order rate constant values were lower in unamended soils and higher for green manures as compared to mixtures of urea and crop residues (gram and soybean straws) and FYM.

#### ***Improving soil biological health and produce quality in Horticultural crops***

To improve the produce quality of crop grown and also to maintain long term sustainable productivity in the existing farming system, it is important to minimize the use of chemical fertilizers. The equivalent amount of nutrients may be substituted through various organic nutrient sources to meet the nutrient requirement of the crop. It was observed that there was improvement in the biological and biochemical properties of soil due to application of various organic nutrient sources. Microbial biomass C, N, P and soil respiration were recorded maximum in cattle dung manure treatment whereas these parameters were at par in phosphocompost and vermicompost treatments. Maximum fruit yield per plant, sugar and ascorbic acid content in fruit juice were recorded with integrated nutrient management (INM) followed by organic or inorganics which were at par.

#### ***Quality assessment of MSW compost***

Solid waste management is an obligatory function of urban local bodies in India. About 90% of the municipal wastes are still being used for landfill in India. In India major cities such as Mumbai, Delhi and Kolkata have the distinction of generating solid wastes ranging from 4000 to 6000 tonnes per day. A survey of the quality of mechanical solid waste composts from six corporations of municipalities (Bhopal, Bangalore, Delhi, Kolkata, Mumbai and Nagpur) of India was carried out to compare with recently developed threshold standards of compost quality. It has been observed that the physical parameters were by and large comparable with the prescribed limits except insert material, which was greater (36%) than prescribed limits (25%). Among the chemical parameters, total organic carbon was on lower side whereas electrical conductivity was slightly on higher side. The biological parameters showed that further decomposition was required for attaining stability of the compost. It was observed that all the heavy metals were by and large within the prescribed limits except chromium, which was on higher side.

#### ***Integrated nutrient management through soil test crop response correlation***

Samastipur (Bihar), Hisar (Haryana), Jabalpur (Madhya Pradesh), Coimbatore (Tamil Nadu) and Bangalore (Karnataka) centres of AICRP on Soil Test Crop



STCR  
FOLLOW-UP TRIAL ON PADDY AT SUTTUR



Plate 2. Front line demonstration of STCR based IPNS technology in rice on farmers' fields

Response Correlation (STCR) have developed the technology for integrated nutrient management in rice crop. IPNS technology in rice crop has been demonstrated in front line demonstration on farmers' fields. Application of 3-5 t FYM ha<sup>-1</sup> along with the STCR based fertilizer dose resulted in increased crop productivity by 13-20 q ha<sup>-1</sup> and higher response ratio 2 to 10. This IPNS technology has also led to a saving of 30:20:10 kg N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O ha<sup>-1</sup>.

### Computerization of library

The Institute library has installed the Open Source Software for library management. The software KOHA is being used for library operations and is MARC21 and Z3950 compatible. The standard followed for the data entry is MARC 21 and 50 per cent of the library data has been entered in the worksheets. It gives online search, reservation facility for the library users. The URL addresses of the journals are also given in the software to access the current content pages of the journals.

### Awards and Honours

- Dr. K.M. Hati, Sr. Scientist received Golden Jubilee Commemoration Young Scientist Award 2006 of Indian Society of Soil Science, New Delhi.



- Dr. K. Sammi Reddy, Dr. Anand Swarup, Dr. Muneshwar Singh and Dr. A. Subba Rao received the prestigious 'TSI-FAI Award 2006' for their outstanding research work on the Plant Nutrient Sulphur.



- Dr M. C. Manna received 12<sup>th</sup> International Congress Commemoration Award-2006 of Indian Society of Soil Science at OUAT, Bhubaneswar, November 10-13, 2006.



- Dr. Muneshwar Singh, Project Coordinator (LTFE) has been nominated as one of the Editors for Journal of Indian Society of Soil Science (JISSS), New Delhi.
- Dr. K.G. Mandal, Scientist (SS), has been nominated as one of the Editors for a Scientific journal (World Journal of Agricultural Sciences), IDOSI Publication, Pakistan.

### Visit Abroad

- Dr. K. Sammi Reddy, Sr. Scientist, visited the IRRI, Manila, Philippines to participate in the training workshop on "Participatory Approaches for Agricultural Research and Extension" during August 7-18, 2006.



Dr. K. Sammi Reddy with Philippine farmers during the Farmers' Meet Programme at Banca Banca village near Manila

### Foreign Fellowship

- Dr. K.G. Mandal, Scientist (SS), successfully completed his Post-Doctoral Research in Agronomy in China Agricultural University, Beijing, under the

Chinese Government Scholarship- 2005-06 instituted by the Ministry of Human Resources Development, Government of India.

- Mr. M. Mohanty, Scientist (SS) received John Allwright Fellowship from Australian Council for International Agricultural Research (ACIAR), Canberra, Australia for three years for post Graduate Research (Ph. D.) at the University of Queensland, St. Lucia, Brisbane, Australia.

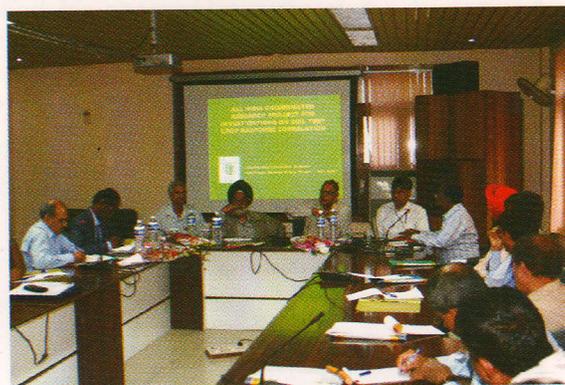
## Events

**Workshop of AICRP Micronutrients:** His Excellency Governor of Bihar Shri R.S. Gavai inaugurated the 24<sup>th</sup> Workshop meetings of All India Coordinated Research Project (AICRP) on Micro and Secondary Nutrients and Pollutant Elements in Soils and Plants (MNS) at Rajendra Agriculture University (RAU), Pusa, during September 16-20, 2006. The Governor highlighted the importance of micronutrients in living beings and asked to monitor emerging micro and secondary nutrients deficiencies and their impact on soils, plants and human health. The Governor hoped that the Micronutrient Workshop would come out with recommendations which would be helpful to the farmers to achieve better yields and also to maintain growth of gross domestic product (GDP) of the country. They also reiterated the statement made by honourable President APJ Abdul Kalam that Bihar can become the top food producing state in the country if its agricultural resources are tapped properly. He emphasized the need for proper management of soil resources and ensuring balanced nutrition of crops including micro and secondary nutrients through cost effective local input resources. His Excellency Shri Gavai also released Souvenir and various publications on Micronutrient management and also inaugurated a science exhibition comprising research highlights of University and AICRP Micronutrients.



Vice Chancellor of RAU Dr. H.P. Singh, welcomed the Governor and elaborated about five missions of University's future research. Dr. M.V. Singh, Project Coordinator (Micronutrients) mentioned that decline in factor productivity and sustainability is becoming an important issue in sustaining high productivity and sustainability of the Indian agriculture. So AICRP Micronutrient in XI plan will be prioritizing research to forecast emerging deficiencies in soil-water-plant-animal/human continuum and GPS based delineation to ensure desired interventions for micro nutritional security.

**Group Meeting of AICRP on STCR:** Group meeting of Soil testing and crop response research workers was held on November 2-3, 2006 under the chairmanship of Dr. J.S. Samra, Honourable DDG (NRM) and with the guidance of Dr. N. N. Goswami, Former VC CSAUA&T, Kanpur Special Guest at IASRI, New Delhi.



**Farmers Visit:** 39 farmers from Dungarpur, 37 farmers from Pali and 40 farmers from Malpura (Tonk) district of Rajasthan visited the Institute during the last fortnight of December, 2006 and were explained about the technologies developed at our Institute.

**Plantation Day:** A plantation day was observed on August 12, 2006 in the drive of 'Hariyali Mahotsav' in Madhya Pradesh. Different species of horticultural plants were planted in the Institute's Campus. The Institute staff actively participated in Plantation Campaign.



**Vigilance Awareness Week:** A Vigilance Awareness Week was observed in the Institute during November 6-10, 2006. Honourable Shri Anant Kumar Singh, SP, Bhopal graced the function. The Institute's Scientist team also visited Kotri village to have interaction with farmers and assess their needs.



### Sports

ICAR holds its Inter Zonal Sports Meet 2005-2006 at CIFRI, Barrackpore from October 27<sup>th</sup> to November 2<sup>nd</sup> 2006. Mrs. Vidya Shree Bharti got 3<sup>rd</sup> position in 200 m race (Women).



### Staff News

Staff Name and Designation	Promoted to	Date
Dr. Tapan Adhikari, Scientist (Sr. Scale)	Senior Scientist	22.03. 2005
Dr. K.M. Hati, Scientist (Sr. Scale)	Senior Scientist	27.12. 2005
Dr. S. Ramana, Scientist (Sr. Scale)	Senior Scientist	06.02.2006
Dr. M. Mohanty, Scientist	Scientist (SS)	10.11. 2005
Shri. T. Ayodhya Ramaiah, PA (ACP)	-	20.01.2005
Shri Jai Singh, T-3	T-4	22.05.2005
Smt. Kavita Bai, SS Gr.-III	SS Gr.-IV	28.08. 2006
Shri Laxminarayana Chouksey, SS Gr.-III	SS Gr.-IV	28.08. 2006
Shri Subhash Khare, Sanjay Katinga, Darashram, Harish Kumar Barmiya, SS Gr.-II	SS Gr.-III	28.08. 2006
Shri Lalaram Sahu, Jagannath Gour, Pramod Kumar Rout, Bhoilal Ukey, SS Gr.-I	SS Gr.-II	28.08. 2006

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

Name	Programme	Venue	Period
Drs AK Misra, AK Biswas and KM Hati	Impact, adaptation and vulnerability change of Indian agriculture to Climate	NDRI, Karnal	August 10-11, 2006
Dr Ajay	WTO and its implication on Indian Agriculture	MANAGE Hyderabad	September 18-22, 2006
Dr K Sammi Reddy	TSI-FAI-IFA Symposium-cum-Workshop on "Sulphur in Balanced Fertilization"	FAI, New Delhi	October 4-5, 2006
Dr AB Singh	Agricultural Technology Transfer Week Shivar Pheri and Mega Agricultural Exhibition	MAU, Prabhani	October 9-13, 2006
Dr KG Mandal	International Conference on Science and Technology for Desertification Control (STDC)	CAU, Beijing, P.R.China	October 14-16, 2006
Dr P Ramesh	National Symposium on Conservation Agriculture and Environment	BHU Varanasi	October 26-28, 2006
Drs Y Muralidharudu, Sanjay Srivastava and Abhishek Rathore	Group Meeting of AICRP on Soil Testing and Crop Response	IASRI, New Delhi	November 2-3, 2006
Drs Muneshwar Singh, K Sammi Reddy, MC Manna, AK Biswas, JK Saha, DD Reddy, AB Singh, KM Hati and NR Panwar	71 <sup>st</sup> Annual Convention of Indian Society of Soil Science	OUAT Bhubaneswar	November 10-13, 2006
Drs A Subba Rao, Y Muralidharudu and RH Wanjari	International Symposium on 'Balanced Fertilization for Sustaining Productivity'	PAU, Ludhiana	November 22-25, 2006
Dr AB Singh	International Conference on Post Harvest Technology and Value Addition in Cereals, Pulses and Oilseeds & Tenth Convention of the Indian Society of Agricultural Biochemists	CSAUA&T, Kanpur	November 27-30, 2006
Dr K Sammi Reddy	FAI Annual Seminar	FAI, New Delhi	November 28-29, 2006
Dr Ajay	National Seminar on Plant Physiology	KAU, Thrissur, Kerala	November 28-30, 2006
Dr K Sammi Reddy	Trainers Development Programme on "Right to Information"	ISTM, New Delhi	December 4-12, 2006
Drs P Ramesh and NR Panwar	Annual Group Meeting of Network Project on Organic Farming	PDCSR Modipuram	December 27-28, 2006

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Dr. A. Subba Rao, Director

**Indian Institute of Soil Science**

Nabi Bagh, Berasia Road, Bhopal-462038 (MP)

Telephone: (0755) 2730946, 2747375, 2730970, 2734221; Fax (0755) 2733310

E-mail: [iiss@iiss.ernet.in](mailto:iiss@iiss.ernet.in)

Visit us at: [www.iiss.nic.in](http://www.iiss.nic.in)