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

Name	Programme	Venue	Duration
Drs. A.K. Biswas, Pradip Dey and Ritesh Saha	100th Indian Science Congress	Calcutta University, Kolkata	Jan 3-7, 2013
Dr. M. L. Dotaniya, Mr. Hiranmoy Das and Mr. V. D. Meena	Training on 'Recent Advances in Designing and Analysis of Agricultural Experiments'	IASRI, New Delhi	Jan 8-28, 2013
Dr. Asit Mandal	DBT sponsored training on 'Microbial Diversity & Gene Prospecting Metagenomics'	K A U, Thrissur	Jan 16-Feb 5 2013
Dr. Sangeeta Lenka	National Symposium on 'Climate Change and Indian Agriculture- Slicing down the uncertainties'	CRIDA, Hyderabad	Jan. 22-23, 2013
Dr. R.H. Wanjari	The 'First International Conference on Bio-Resource and Stress Management'	Science City, Kolkata	Feb 6-9, 2013
Drs. Pradip Dey and P. Jha	Workshop on Simulating Nitrogen Dynamics in Major River Basins of India, organized by Indian Nitrogen Group (ING)	NASC Complex, New Delhi	Feb 22-23, 2013
Dr. A.K. Biswas	Institute Management Committee (IMC) meeting of NBSS & LUP, Nagpur	NBSS & LUP, Nagpur	Feb 25, 2013
Dr. D.L.N. Rao	Institute Management Committee (IMC) meeting of NBAIM, Mau RAC meeting of NBAIM, Mau	New Delhi NBAIM, Mau, U.P.	Feb 21, 2013 Feb 27, 2013
Dr. Pradip Dey	Southern Regional Workshop-cum-Training on Soil Testing	KAU, Thrissur	Mar 1-2, 2013
Dr. P. Jha	National Workshop on 'Foresight and future pathways of Agricultural research through Youth in India'	NASC Complex, New Delhi	Mar 1-2, 2013
Dr .R. Elanchezian	Association of Rice Research Workers Golden Jubilee International Symposium	CRRI, Cuttack	Mar 2-5, 2013
Dr. Pradip Dey	Eastern Regional Workshop-cum-Training on Soil Testing	BCKV, Kalyani	Mar 4-5, 2013
Dr. Asha Sahu	Training programme on 'Science and Technology for Rural Societies'	IIPA , New Delhi	Mar 11- 15, 2013
Drs. A. Subba Rao, Muneshwar Singh, D.L.N. Rao, S. Kundu, M.C. Manna, A.K. Biswas, A.K. Shukla, R.S. Chaudhary, P. Dey	Interactive meeting of National Resources Management Division under the Chairmanship of Secretary, DARE & DG, ICAR with Directors, Joint Directors, Project Coordinators, Head of Regional Stations, Head of the Division.	NASC Complex, New Delhi	Mar 12, 2013
Dr. Sanjay Srivastava	Meeting on Soil Health card project	Department of Agriculture, Govt. of M.P. Bhopal	Mar 14, 2013
Drs. R.S. Chaudhary, J. Somasundaram and Nishant K. Sinha	Regional Workshop on "Ground water management in MP challenges, opportunities and strategies"	Hotel Palash, Bhopal	Mar 14, 2013
Drs. (Mrs.) Asha Sahu and Sangeeta Lenka	3rd Madhya Pradesh Women Scientist Congress: National Conference on New Frontiers for Women in Science and Technology	Jiwaji University, Gwalior	Mar 20-21, 2013
Drs. Pradip Dey and Hiranmoy Das	Western Regional Workshop-cum-Training on Soil Testing	Department of Soil Science and Agricultural Chemistry, JNKVV, Jabalpur	Mar 20-21, 2013
Dr. Pradip Dey	Northern Regional Workshop-cum-Training on Soil Testing	GBPUA&T, Pantnagar	Mar 22-23, 2013
Dr. Pradip Dey	Workshop attended by Indian Nitrogen Group	NASC, Complex, New Delhi	Mar 25, 2013
All Scientists of the Institute	Workshop cum training program in Soil fertility mapping	IISS, Bhopal	Apr 11-12, 2013
Dr. K. Ramesh	United States India Educational Foundation (USIEF) workshop on Building partnerships	Ahmedabad	Apr 11-12, 2013
Dr. Pradip Dey	UNEP sponsored Stakeholder's Workshop on 'Capacity-building in national planning for food security - Punjab state, India',	Shivalik View Hotel, Chandigarh	Apr 22, 2013
Dr. T. Adhikari	Brainstorming Session on 'Nanotechnology in Agriculture'	NASC Complex, New Delhi	Apr 23, 2013
Mrs. I. Rashmi	International Symposium on 'Minerals and Mining in India-The way forward, inclusive of cooperative mineral -based industries in SAARC countries'	MPCOST, Bhopal	Apr 27-29, 2013
Dr. T. Adhikari	CIC, CAC, and CMU meeting NAIP-Nanotechnology project	CAZRI, Jodhpur	May 8, 2013
Drs. A.K. Biswas, J. Somasundaram	2nd brainstorming meeting on CRP on conservation agriculture.	NASC Complex, New Delhi	May10-11h, 2013
Drs. Muneshwar Singh and Pradip Dey	National Seminar on 'Soil Fertility, Degradation and Contamination'	Dr. Balasaheb Sawant Konkan Dapoli Krishi Vidyapeeth,	May 8-9, 2013
Mr. R.K. Mandloi	Competence Enhancement Programme for Technical Officers	NAARM, Hyderabad	May 13-22, 2013
Dr. T. Adhikari	National Seminar on 'Climate Change and Indian Horticulture'	Sabour, Bhagalpur, Bihar	May 25- 27, 2013
Drs. J.K. Saha and Sanjay Srivastava	The meeting was called by Director, CRIDA to discuss on fate of basic slag generated in huge amounts from iron and steel industry.	CRIDA, Hyderabad.	8 June, 2013

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Silver Jubilee Year of IISS (1988-2013)

IISS Newsletter

Volume 16, Number 1 January- June 2013

New Publications

In This Issue

Forthcoming Events

- NAIP Training on 'Climate Change, Carbon Sequestration & Carbon Trading in Agriculture' during August 23 - Sept 5, 2013.
- National Consultation Meeting on 'Soil Health Assessment, Management & Monitoring in Different Production Systems across Agro-ecological Regions' during last week of Sept., 2013.
- National Workshop of AICRP (MN) During Sept, 2013
- MTC on 'Improving Nutrient Use Efficiency by Agronomical Measures for Major Crops of India' during Oct. 12-19, 2013
- MTC on 'Assessment of Soil Health for Higher Productivity' during Dec. 3-10 , 2013.

Director's Desk

Down the Memory Lane: Shaping of IISS

The Indian Institute of Soil Science (IISS), Bhopal has just completed 25 years of its glorious existence and we are celebrating the Golden Jubilee. It is a proud moment for all of us, and I take this opportunities to apprise our readers the history of growth and development of IISS.

The Director General of ICAR appointed a Task Force for preparing the Blue Print of the Indian Institute of Soil Science at its very formative stage during 1985- 86 (Late Dr. S.K. Mukhejee and Late Dr. J.S.P. Yadav served as the Chairman and Member-Secretary, respectively and Late Dr. R.S. Murthy, Dr. K.V. Raman and Dr. N.N. Goswami were the other three members of this task force). The Indian Institute of Soil Science was established during the VII Plan Period and has been functioning from 16th April, 1988 with joining of the Founder Director, Dr. P.N. Takkar. The institute was initially located in a rental building in Bhopal city at Z -6, Zone -1, Maharana Pratap Nagar. The institute then acquired 124 acres land at village Nabibagh on the periphery of Bhopal city on Bhopal- Berasia Road, 8 km off the railway station and airport to establish the campus. Initially the institute research programmes were implemented through its seven laboratories/sections viz., (i) Soil Physics and Soil and Water Conservation (ii) Soil Chemistry (iii) Soil Microbiology (iv) Nitrogen (v) Phosphorus (vi) Potassium and (vii) Micro and secondary nutrients. The coordinating unit of the AICRP on "Micro and Secondary Nutrients and Pollutant Elements" was first shifted to this institute on 28.4.1988 with joining of Dr. M.V. Singh, Project Coordinator.

The mandate committee constituted by ICAR under the chairmanship of Dr. J.S. Kanwar, Dy. Director General (Emeritus), ICRISAT, Patancheru, Hyderabad formulated the mandate of the institute as "To Provide a Scientific Basis for Enhancing and Sustaining Productivity of Soil Resources with Minimal Environmental Degradation", with the following objectives:

- To carry out basic and strategic research on soils especially physical, chemical and biological processes related to management of nutrients, water and energy.
- To develop advanced technologies for sustainable systems of input management in soils that is most efficient and least environment polluting.
- To develop expertise and back-stop other organizations engaged in research on agriculture, forestry, fishery and various environmental concerns.
- To exchange information with scientists engaged in similar pursuits through group discussions, symposia, conferences and publications.
- To collaborate with State Agricultural Universities, National, International and other Research Organizations in the fulfillment of the above objectives.

The possession of 124 acres of land at village Nabibagh was taken on 19th July, 1991 from Govt. of Madhya Pradesh. The CPWD appointed M/s Span Consultants, New Delhi as the Architect of the institute. The master plan of the institute with respect to zoning of various buildings of the institute was approved. Plans were chalked out on excavation of two farm ponds and were completed in 1992. The construction of the farm produce shed was started in March, 1993, farm laboratory complex and farm workshop in November, 1993 and underground irrigation grid network covering

whole farm was also completed during 1993. The institute organized a National Seminar on "Nutrient management of soybean based cropping systems" during 22-23 September, 1994.

Farm plantation with 1000 saplings was done in 1994-95 on either side of farm peripheral road. First RAC was constituted with Dr. J.S. Kanwar, Dy. Director General (Emeritus), ICRISAT, Patancheru, Hyderabad as its Chairman during 1994-95. The research programmes finalized by the RAC included integrated plant nutrient management, soil fertility management and improvement, nutrient dynamics in soil-plant system, soil biota, environmental impact of soil fertility management, soil and plant health diagnostic techniques and transfer of technology.

During the year 1994-95 the construction of farm block building was completed and the institute was shifted from the rented building at M.P. Nagar to the Farm Block building of the institute in December, 1995. AICRP on Soil Test Crop Response (STCR) was shifted to IISS, Bhopal in April 1996 and Dr. A. Subba Rao, I/c Coordinator joined on 3.4.1996. Dr. Anand Swarup, Project Coordinator, Long Term Fertilizer Experiments (LTFE) joined on March 6, 1997, Dr. K.K. R. Bharadwaj, PC, Microbial Decomposition and Recycling of Farm and City Wastes (MDRW) joined on 26 Sept., 1997 and Dr. D.K. Painuli, PC, Tillage Requirements of Major Indian Soils (Tillage) joined on 15.9.1997.

The year 1996-97 has a special place in the history of the institute. During the year the institute has brought out the "Vision 2020 IISS Perspective Plan" document. Also the institute had the opportunity to present its achievements before the RAC and the Quinquennial Review Team (QRT) comprising eminent soil scientists under the chairmanship of Dr. J.S. Kanwar and Dr. G.S. Sekhon, respectively. During 1997-98 the erstwhile laboratories and sections were reoriented into four Divisions, namely, Soil Physics, Soil Chemistry and Fertility, Soil Biology and Environmental Soil Science and one section i.e., Statistics and Computer Application and were duly approved by the Council on April 13, 1998. Dr. A.K. Mishra became the first regular Head of Soil Physics Division followed by Dr. R.S. Chaudhari. In Soil Chemistry & Fertility, Dr. Muneshwar Singh followed by Dr. A.K. Biswas headed the Division. Dr. M.C. Manna and Dr. S. Kundu became the first regular Head of Division of Soil Biology and Division of Environmental Soil Science, respectively. All the Divisions under their stewardships contributed significantly and meaningfully to the growth and development of the Institute. By the end of the year 1997, the institute has grown up in stature in terms of scientific manpower and R & D infrastructure. Construction of 46 residential quarters was completed and the quarters were handed over by CPWD and occupied by the institute staff.

Dr. C.L. Acharya joined the institute as Director on 16.5.1998. Project Coordinator, Biological nitrogen fixation, Dr. D.L.N. Rao joined on 25.6.1998. Dr Mohan Singh PC (MD) joined on 17.11.1998. FAO-ICAR-IFFCO collaborative project on 'Eco regional integrated nutrient management' was initiated during January 1999. Also one ICAR-ICRISAT collaborative project on 'Sustaining production of soybean based cropping systems through soil-water-nutrient management (SWNM) in landscape watersheds' was initiated in 1999. One ICAR-ACIAR collaborative project entitled "Survey of potential of manure for meeting crop nutrition needs with integrated nutrient management in Madhya Pradesh" involving IISS, Bhopal was approved by the ACIAR, Australia. During the year 1999-2000 the institute functioned from new building. Several new infrastructure facilities were planned and acquired. Farm, library, green house and laboratory facilities were created to step up research activities. The Hon'ble Union Minister of Agriculture Shri. Nitish Kumar inaugurated the Main Building of the Institute and its ARIS cell on June 23, 2000. In a major research initiative, effort and involvement, institute scientists were involved in 9 National Agriculture Technology Projects (NATP) during 1999-2000 with focus on simulation modeling, organic carbon pools and dynamics, integrated nutrient management in pulse and oilseed based cropping systems, systems for carbon sequestration, potassium stocks and conservation agriculture. The Institute started its website www.iiss.nic.in on 04.01.2002. The 6th Agricultural Science Congress of the National Academy of Agricultural Sciences was organized by the institute in collaboration with JNKVV, Jabalpur and Govt. of Madhya Pradesh on the theme 'Multi-enterprise systems for viable agriculture ' during . Tata-ICRISAT-ICAR project launching workshop on 'Combating land degradation and increasing productivity in Madhya Pradesh and Eastern Rajasthan' on June 20, 2002, was inaugurated by Shri. Digvijay Singh, Honorable Chief Minister of M.P. The second QRT for the period 1997-2001 was constituted under the chairmanship of Dr. N.N. Goswami and the team made several visits to the institute and four coordinated project centers and finally met at IISS, Bhopal on June 17-20, 2003 and finalized the report for submission to the ICAR. The QRT added a new objective 'Developing data base repository of information on soils in relation to quality and productivity'. The QRT suggested for arranging the research in four programme theme areas, namely, Nutrient Management and Fertility Improvement, Management of Soil Physical and Biological Components, Soil Quality for Sustainable Productivity and Minimizing Environmental Pollution.

Online fertilizer recommendation system for targeted yield of crops (STCR) for different states was developed during 2004-05 and was further improved in subsequent years. Based on the RAC recommendations the institute framed research programmes under the following themes, soil fertility evaluation, improving input use efficiency, maintaining long-term productivity, managing soil physical environment, assessing soil chemical quality, improving biological conditions, microbial diversity and biofertilizers, recycling and rational use of different wastes in agriculture and on farm research and technology transfer.

During the intervening period after the departure of Dr C. L. Acharya and joining of Dr. A. Subba Rao as regular Director of the institute, Dr. D. L. N. Rao, PC (BNF) and Dr. A. K. Mishra, Head, Division of Soil Physics were the officiating Directors. I took over as Director on 4.2.2004.

In the RAC meeting held during the year 2004-05 on March 5-6 under the chairmanship of Dr. N.N. Goswami, we discussed the IISS Vision 2025 and finalized the major issues and programmes of the institute. The meeting also identified important areas of research in the national and global context which included carbon sequestration /accretion, organic farming, soil quality assessment, soil biodiversity, safe use of industrial effluents and environment protection and soil quality and animal health. National seminar on soil testing was held on January 23-24, 2005. The seminar highlighted the need for working out soil fertility maps using GIS and GPS on regional basis employing requisite number of samples. It suggested creation of model soil testing laboratories with all the latest facilities. Shri. Kanti Lal Bhuria, Honorable Minister of State for Agriculture, Govt. of India visited the institute and suggested for dissemination of institute technologies among farmers and improve quality of soil at village level. ACIAR, Australia funded research project on 'Integrated manure nutrient management in soybean-wheat cropping system on vertisols in Madhya Pradesh and Queensland' was started from July 1, 2004. Three other network projects were also running during the year 2004-05 i.e., 'Network Project on Organic Farming', 'Impact, Adaption and Vulnerability of Indian Agriculture to Climate Change' and 'Delineation and Mapping of Nitrate Contamination in Water in Heavily Fertilized and Intensively Cultivated Districts of India'. The 11th RAC meeting was held on 14-15 September, 2005 under the Chairmanship of Dr. N.N. Goswami which dwelt upon the need to develop 'soil information systems' creating a repository of information on soil resources and the need for strengthening the institute capabilities in the field of GIS. Dr. Mangala Rai, Honorable DG, ICAR, Secretary DARE along with Dr. J.S. Samra, DDG (NRM) during their visit on December 3-4, 2005 highlighted the issues of resource conservation technologies, conservation of water, organic farming and farmer friendly technology. Midterm review workshop of ACIAR project was held on 29th August – 1st Sept., 2006. The need for studying water quality in the villages, getting feedback of farmers on INM and BBF technology and conducting more 'baby trials' was highlighted . The IISS Vision 2025 was compiled and edited during the year 2006-07. The Institute museum was also established during the same period. Dr. Mangala Rai, Secretary DARE and DG, ICAR visited the institute on February 2, 2008 and advised the scientists to take up new line of research work especially on conservation agriculture. During the year 2008-09 a new project was initiated with funding from NAIP on 'Assessment of quality and resilience of soil under diverse agro-ecosystems'.

RAC under the chairmanship of Dr J.S.P.Yadav was constituted on Jan 25, 2008. In addition to input use efficiency, soil quality, biodiversity, characterization, recycling of organic wastes, he emphasized on *rhizosphere* studies to increase mobilization of nutrients in soil- plant system, isolation and characterization of tolerant microbial strains for abiotic stresses and soil management for physical conditions for sustainable higher productivity. Another NAIP project 'Understanding the mechanisms of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanisms of micronutrient enrichment in plant parts' was launched on 8th May 2009. Two other NAIP projects- one on 'Nano-technology for enhanced utilization of native P by plant and higher moisture retention in arid soils' in collaboration with CAZRI, Jodhpur and another on 'Soil organic carbon dynamics and climate change', with CRRI, Cuttack were initiated. Also an AMAAS funded research project on 'Improving yield and nutrient uptake of selected crops through microbial inoculants in vertisols of central India' was initiated during 2008 under the aegis of NBAIM, Mau, U. P. The work done in the ACIAR project was appreciated by the external members and recommended for conducting 100 more 'baby trials' in new villages for popularization of INM technology among farmers during 2009-10. From 2009-2010 onwards a lot of impetus was given to farmers' training at the institute on institute developed technologies and soil health improvement. A new initiative on Biochar was taken with a discussion meeting on October 19-20, 2009 under the chairmanship of Dr. S. S. Khanna, Ex-Vice Chancellor, NDUA&T, Faizabad and Former Advisor (Agriculture), Planning Commission. Annual Convention of the Indian Society of Soil Science was held at the institute on November 14-17, 2010. Dr. Ramakrishna Kusumaria, Hon'ble Minister of Farmers Welfare and Agril. Development, Govt. of Madhya Pradesh and Dr. A.K. Singh, President ISSS and DDG (NRM), ICAR graced the occasion. Farm income increased over the years with record crop yields and income during 2010. We prepared GIS based fertility maps of India at district level using soil test data of 21 states. A mega project entitled 'Preparation of GIS based fertility mapping of selected districts of the country' was approved with an outlay of 10 crores for 170 districts of the country during 2009-10. All the three AICRP's i.e., STCR, LTFE and Micronutrients under the leaderships of Dr. Y. Muralidharudu followed by Dr. P. Dey, Dr. Muneshwar Singh and Dr. M.V. Singh followed Dr. A.K. Shukla with their centers in different parts of the country are participating in the project.

Another important milestone in the history of the institute was the visit of Dr. S. Ayyappan, Hon'ble Secretary to Govt. of India and Director General, ICAR along with Dr. A. K. Singh DDG (NRM), ICAR on 15th June 2011. Hon'ble DG showed keen interest in the research work of the institute by enquiring the ongoing research work of the scientists, visiting the field experiments, laboratories and briefly addressing the staff. He impressed upon the scientists for taking up small number of comprehensive projects with a focus on frontline and thrust areas. He highlighted the need for good team work to achieve holistic results. He desired that

senior level scientists may act as mentors and guide the young scientists for quality output.

The work done by the institute over the years has been summarized in three publication (i) IISS-A Decade of Progress 1988-98; (ii) Two Decades of Soil Research: Indian Institute of Soil Science, Bhopal, and (iii) Frontier Areas of Soil Research- IISS Contribution (Silver Jubilee Publication). Indian Institute of Soil Science during its journey over last 25 years has made significant research achievements in the areas, namely, nutrient management and fertility improvement, management of soil physical and biological components, soil quality for sustainable productivity and minimizing environmental pollution. The Institute has developed and tested economically viable and environmentally benign site specific INM packages for soybean-wheat, rice-wheat, pulse and oilseed based cropping systems. The work done by the Institute on long-term tillage management vis-à-vis nutrient management, *in situ* moisture conservation and rainwater management has led better understanding of different physical and bio-physical constraints for soil productivity in Vertisols. Superiority of conservation tillage over other tillage practices, and broad-bed-and-furrows (BBF) over flat-on-grade (FOG) in enhancing soybean-wheat productivity in Vertisol has been reinforced by the studies made at the institute. Concerted efforts have also gone into compost enrichment and vermicompost technology and evaluation of different physico-chemical and biological parameters as indicators of maturity of the compost. The biofertilizer organisms isolated at the institute are under mass production for supply to farmers all over M.P. A good attempt has been made to understand the changes in organic C pools under long-term cropping and fertilizer use in different agro-ecoregions of the country in an effort to evaluate the capacity of different systems to sequester C in soils. Development of C and N turnover model based on the theory of C saturation and stabilization will go a long way to understand attainable C in different soil-crop-climate situations. Attempts have also been made to evaluate the environmental impact of use of distillery effluents and sewage in agriculture, and to determine the sink capacity of some soils for heavy pollutant elements. The work of the institute led to defining the BIS standards of compost quality for various indices and limits of heavy metals.

The work of the institute scientist has received wide peer recognition in the form of about 16 Fellowships (INSA, NAAS, ISSS, etc.) and several other Awards and Honours numbering around 64. The institute has grown from strength to strength and entered into 25th year of its existence with the celebration of 25th Foundation Day of the Institute on 16th April, 2012, which marked the beginning of its Silver Jubilee Year. Silver Jubilee of the Institute has been celebrated round the year with National Seminars, Agriculture Education Day, National Consultation Meeting on 'Future of Soil Research and Roadmap of Soil Research in India' followed by Western Region Agriculture Fair during Jan 28-31, 2013. Silver Jubilee Year was culminated into a grand celebration of Silver Jubilee of the Institute comprising of Silver Jubilee Seminar on 'Frontier areas of research in soil science' and Foundation Day.

The Silver Jubilee Year of the Institute coincided with the beginning of XII five year plan and Indian Institute of Soil Science foresees a holistic or systems-oriented approach, to address different issues associated with the complexity of food and other production systems in diverse ecologies, and locations of the country. In view of this, Institute has now strong research focus on four major flagship programmes (i) Soil Health Management and Input Use Efficiency for Food and Environmental Security (ii) Soil Microbial Diversity and Its Role in Nutrient Use Efficiency, Waste Recycling, Climate Mitigation and Bioremediation for Sustainable Agriculture and Ecosystem (iii) Conservation Agriculture and Carbon Sequestration, and (iv) Soil Pollution and Remediation. The Institute would also be establishing four state-of-art laboratories to conduct advanced scientific research in major focus areas viz. Soil Health and Produce Quality, Conservation Agriculture and Carbon Sequestration, Soil Biodiversity and Genomics, and Nanotechnology. These laboratories would act as national repositories and IISS, Bhopal would continue to provide a leadership role for the most advanced soil research and advisory in the country.

Dr. A. Subba Rao

Research Highlights

Nitrogen sorption isotherms and pore volume distribution of zeolite samples

Nitrogen adsorption isotherms of three fractions of zeolites (Fraction 1: <125 µ ; Fraction 2: 125-250 µ and fraction 3: >250 µ) show well-defined curvature and hysteresis loop characteristic of type IV isotherm of IUPAC with H_3 hysteresis. Fractions of Clinoptilolite collected from by St. Cloud Mining Co, New Mexico, USA showed nearly inverted-S-shaped curves. At the relative pressure lower than 0.1, the adsorption/desorption isotherms form the convex shaped curves for both fraction 2 and 3, while it is a steep rise for fraction1 suggesting the dominance of micropores in fraction 1. The pore volume distribution (f (v) = - (dV / d log D)) of the three fractions showed that although the curve became parallel to the "x" axis in the macro pore region, fraction 1 terminated with higher volume; while fraction 3 was trailing and the curves resembled "twisted cubic curve". In case of desorption, the behavior of the curves were similar with downward shifting. But in fraction 1 and 2, it was abrupt trailing in the macropore region.

Development of phosphorus saturation indices for selected soils of India

A study was undertaken to develop degree of phosphorus saturation (DPS) indices for some selected Indian soils representing Vertisol (Jabalpur), Inceptisol (Delhi), Alfisol (Bangalore) and Ultisol (Trivandrum). DPS calculated with Olsen, Ammonium oxalate, Mehlich-3 and AB-DTPA reagents ranged from 0.86 to 92.8, 0.3 to 68.5, 0.4 to 183.3 and 0.4 to 163.07 per cent, respectively, for Jabalpur soil and 1.2 to 95.31, 0.4 to 54.4, 1.4 to 264.71 and 0.7 to 107.88 per cent for Delhi soil at different level of P addition. Similarly, DPS calculated with Bray1, Mehlich3 and ammonium oxalate reagents ranged from 0.7 to 91.4, 0.9 to 166.5 and 0.61 to 63.0 per cent for Bangalore soil and from 0.58 to 91.56, 0.9 to 179.59 and 0.26 to 55.55 per cent for Trivandrum soil. The results indicated that Olsen and AB-DTPA extractants can be used in neutral to alkaline soils like Delhi and Jabalpur and Bray1 in acidic soils of Bangalore and Trivandrum. Mehlich 3 and ammonium oxalate can be used for all the four soils for estimating DPS.

Zn and S are essential for sustaining soybean-wheat productivity in Vertisol

Due to continuous use of DAP and inclusion of soybean in cropping system, hidden hunger of S and Zn appeared in the experiment after few years. To demonstrate the effect of S and Zn on productivity of soybean and wheat, demonstrations were conducted on farmers' fields of Akola and Buldhana districts of Vidarbha region (MS). Yield data clearly indicated that application of Zn and S resulted in increase in soybean yield on an average by 2 qha^{-1} for both Zn and S. Similarly, increase in wheat yield with the application of Zn and S (along with K) was 2.1 and 3.0 qha^{-1},respectively.

Soil fertility status of the tribal district Jhabua, Madhya Pradesh

The geo-referenced surface (0-15 cm) soil samples were collected from 540 farmers' fields of the Jhabua district. The collected soils were analyzed for their physico-chemical properties. Most of the soils in this region were sandy loam in texture with bulk density of 1.3- 1.6 Mg m^{-3} and low available moisture content of 7-12%. The pH of the soils was in the range between 5.5 and 8, and 61%, 32% and 7% of the soil samples were low, medium and high in soil organic carbon status, respectively. The percentage of soil sample low and medium in mineralizable-N was 84% and 16%. In case of available P, 49% of the soil samples were low, 42% were in medium and 9% were in high category. The 67%, 28% and 5% of soil samples were high, medium and low in available K. Available S status was low in 78% of soil samples. Among DTPA extractable micronutrients, soils were mostly deficient in Zn (26%) and sufficient in respect of Fe, Mn and Cu. The available B was low in 53% of the soil samples.

Soil compaction effects on chickpea root and shoot growth

A study was conducted to evaluate the effect of soil compaction (increase in bulk density) on root and shoot growth of seedlings of two chickpea cultivars (JG 11 and JG 130) in a black soil. With increase in bulk density level from 1.2 Mg m^{-3} to 1.6 Mg m^{-3}, there was 58% reduction in root length of the seedling of cultivar JG 11 and the reduction was 44% in case of cultivar JG 130. With increase in bulk density, there was significant reduction in plant height of both the cultivars. On an average there was 42% reduction in height of seedlings when the bulk density was increased from 1.2 to 1.6 Mg m$^{-3.}$ The critical bulk density values at which the root ceases to grow was found to be 1.76 Mg m^{-3} for these two cultivars.

Soil resilience effects of fly ash and organic manures in black soil

Black soils having expansive clays possess low strength and undergo excessive volume changes. It can be plastic, compressible and expand when wetted and shrink when dried. Laboratory study showed that the plasticity parameters such as liquid limit, plastic limit and shrinkage limit exhibit favourable changes in the values i.e. the liquid and plastic limits decrease (23-37%) while the shrinkage limit increases (19-28%) with the addition of fly ash. The compaction characteristics like the maximum dry density increases with the corresponding decrease in optimum moisture content. The behaviour of black soil is controlled by diffused double layer. The addition of fly ash results in increased flocculation due to increased availability of free lime content of fly ash. This increases the repulsive forces of soil particles, thereby increasing the resistance to compactive effort and hence the density of mix starts decreasing. Simultaneously, organic manures increase the microbial growth (84% increase as compared to control) and enzymatic activities (78% increase against control) so as to increase organic carbon

content (71-80% increase among various treatment combinations against 34% increase in sole fly ash treated soil) in the soil. Study suggested that fly ash along with organic amendments like FYM, poultry manure or biochar can be used for better resilience in black soils.

Microbial diversity in response to long term fertilizer application

Microbial community dynamics under long term fertilizer application (LTFE) was evaluated using terminal-restriction fragment length polymorphism (T-RFLP) technique. Microbial diversity varied significantly among the treatments. Control, NPK 100% and NPK 100% +FYM were represented with 16, 12, and 30 unique ribotypes (fragments). Microbial diversity indices comprising species richness (Shannon Weiner index H') estimated and found higher in FYM (3.27) followed by control (2.72) and NPK 100% (2.07) in Pantnagar soil. FYM treatments were dominated by Bacillus cellulyticus, Geobacillus, Rhizobium and clostridium. Treatment comprising NPK 100% was dominated by Methylobacter, Ralstonia, Chloroflexi, and Nitrospira sp. While the unamended control soil was predominated by Arthrospira, Paenibacillus, Clostridium, sp, and many uncultured soil bacteria. Result confirmed that long term application of fertilizers shifts microbial community, however interaction of functional diversity and fertilizers is required to predict microbial strategies to the changing agricultural scenario.

Popularization of biofertilizers in tribal areas of Madhya Pradesh

In seven tribal blocks of Chhindwara district (Tamia, Harrai, Junnardev, Chhindwara, Mohkhedh, Chourai, Pandhurna) biofertilizer packets (4250 no.) were distributed to tribal farmers to cover an area of 375 acres by the JNKVV, Jabalpur center of the AINP on Soil Biodiversity-Biofertilizers. For wheat, 2 packets of *Azotobacter* and 6 pkt of PSB per acre were applied. For chickpea 2 pkt of *Rhizobium*, 6 pkt of PSB and 2 pkt of *Trichoderma* were applied per acre. In 17 front-line demonstrations conducted in Mandla and Chhindwara districts, the yield in the recommended practice consisting of applying the full recommended dose of fertilizers along with biofertilizers over farmers practice increased by 19.0-30.9 % in soybean, 40.2-50.8 % in wheat, 35.1-50.0 % in chickpea, 42.1% in pea and 17.1% in lentil.

Panchagavya and biodynamic preparations on crop yield and soil nutrient status.

Under organic farming, application of organic manures (3 t/ha) along with panchgavya (3%) and biodynamic preparations (BD 500 (75g/ha) and BD 501 (2.5g/ha) performed better compared to other organic nutrient treatments in terms of yield (24.1 %) and yield attributing parameters of soybean crop. There was higher available N and K under soybean-wheat cropping system when the combined application of Panchagavya (3%) + Biodynamic preparations (BD 500 (75g/ha) and BD 501 (2.5g/ha) and organic manures was done, while under maize + cowpea-gram system, application of panchagavya preparation with organic manures (CDM-3.3 t+ PM 2.2 t + VC 1.6 t/ha) registered higher post-harvest soil N content. There was improvement in microbial biomass carbon and soil enzymes activity with the application of various organic manures compared to either chemical fertilizers or control.

Distribution of nano-particles in soil solution

Presence of nano-particles and distribution of different size particles in soil solution of two cultivated soils was examined and measured (table 1 and table 2). The mean size of nano-particles decreased from 2443 nm to 175.6 nm with the successive extractions in vertisol while the mean size decreased from 266.7 nm to 147.4 nm in alfisol. It is surprising to note that during the 1st extraction, the soil solution of vertisol was dominated by larger size particles as compared to alfisol. These nano-particles in soil solutions were largely comprised of amorphous silica, hydrous aluminosilicates (allophane), nano-clays (halloysite), oxides of mangnetite and hematite, and particulate humic substances generated through bio-geo-chemical processes.

Phosphorus use efficiency in different soybean and chickpea cultivars

Four high yielding nutrient efficient varieties of soybean (JS 335, JS 9560, JS 9305 and JS 9752) were screened to study their phosphorus use efficiency under two sowing conditions (optimum and late sowing) in the field. There were four phosphorus treatments *viz.* control, 50% P of RDF, 100% P of RDF and 150% P of RDF. It was found that the variety JS 9752 is having high phosphorus use efficiency under the above two sowing conditions. The variety JS 335 also showed high phosphorus use efficiency under optimum sowing condition but failed to respond to the applied P levels in the adverse condition. Under optimum sowing conditions the P use efficiency of these varieties fall in the order, JS 9752>JS 335> JS 9305 > JS 9560. But under late sowing conditions, the P use efficiency recorded in the order, JS 9752> JS 9560 > JS 335 >JS 9305.

Similarly four nutrient use efficient varieties of chickpea were screened from 12 high yielding cultivars of chickpea. These four varieties (JG 16, JG11, JG 315 and JG 218) were used to study their phosphorus use efficiency during the *rabi* season of 2011-12. Under optimum and adverse field conditions and four levels of phosphorus nutrition (control, 50% P of RDF, 100% P of RDF and 150% P of RDF). It was found that the variety JG 16 had the highest phosphorus use efficiency followed by JG 11 in the optimum sowing conditions. The order of P use efficiency under optimum sowing conditions falls in the order JG 16> JG 11> JG 315 ≥ JG 218. But under adverse condition (late season) the P use efficiency of these varieties followed in the order, JG 218 > JG 11> JG 16 ≥ JG 315.

Method of preparation on heavy metal load in municipal solid waste composts

A study compared the distribution and nature of heavy metals in composts from 12 cities of India, prepared from different types of processed urban solid wastes, namely, mixed wastes (MWC), partially segregated wastes (PSWC) and segregated bio-wastes (BWC). Compost samples were physically fractionated by wet sieving, followed by extraction of heavy metals by dilute HCl and NaOH. Cd, Ni, Pb and Zn were extracted to a greater extent by acid than by alkali; the difference being greater in MWC, which contained a higher amount of mineral matter. In contrast, Cu and Cr were extracted to a greater extent by dilute alkali, particularly, from BWC containing a higher amount of organic matter. Water-soluble heavy metals were generally related to the water-soluble C or total C content as well as to pH, rather than to their total contents. This study concludes that wet sieving with dilute acid can effectively reduce heavy metal load in MWC and PSWC.

Non-point sources of phosphorus loading to upper lake, Bhopal

Total P in the lake water collected at pre-and post monsoon samples varied from 0.23 to 0.59 mg/L with a mean value of 0.41mg/L, which is higher than the limit for eutrophication (0.2 mg/L). The mean total dissolved P (TDP), total reactive P (TRP), dissolved reactive P (DRP), dissolved organic P (DOP) and particulate P (PP) were 35.42%, 24.49%, 13.12%, 10.18% and 72.51% of TP, respectively. The total P in the sediment of post monsoon stage samples ranged from 0.02% to 0.08% with a mean value of 0.038%. The mean sediment inorganic phosphorus (SIP) and the sediment organic phosphorus (SOP) were 72.47 % and 27.53% of total phosphorus (TP), respectively. In general total P and other P fractions in post-monsoon water samples were found to be higher than pre-monsoon stage. The source of water from the city and at idol immersion location contained relatively higher TP and dissolved reactive phosphorus (DRP).

Greenhouse gas emission from different composts

A field study was carried out using different composts viz. conventional compost (FYM), vermicompost, poultry manure and phospho compost. Static box chamber was used to trap the GHG and were quantified by gas chromatograph equipped with FID, ECD detectors. CH_4 emission was the highest in FYM followed by vermicompost, phosphocompost and poultry manure and the values varied between 0.1 and 1.5 mg m^{-2} d^{-1} while N_2O emission was found to be high (10-12mg $m^{-2}d^{-1}$) in poultry manure followed by vermicompost , phosphocompost and FYM.

Major Events

Republic Day

The Staff Recreation Club (SRC) celebrated the 'Republic Day' on 26th January, 2013 in the Institute premises. The National Flag was hoisted by the Hon'ble Director. Mrs. Bhulaxmi Subba Rao also graced the occasion. All the staff of IISS and their children participated in various events with thrill and great enthusiasm. Activities included racing, poem recitation, songs, drawing competition for children and musical chair for the family members of the staff. Prizes were distributed to the children on this occasion.

IISS Celebrates its Silver Jubilee

Indian Institute of Soil Science, Bhopal celebrated its Silver Jubilee on April 15-16, 2013 with fervour and gaiety. On this occasion Silver Jubilee Seminar was organized and Foundation Day was observed. On 15th April, 2013 Silver Jubilee Seminar on the theme 'Frontier areas of research in soil science' was organized followed by a Panel Discussion on 'Future research in soil science'. Dr. S.S. Khanna, Former Advisor (Agriculture), Planning Commission, acted as Chairman and Dr. N.N. Goswami, Ex-Vice Chancellor, CSUA&T, Dr. P.N. Takkar and Dr. C.L. Acharya Former Directors, and Dr. N.S. Pasricha, Former Director, PRII, Gurgaon graced the occasion. In the seminar six lead articles were presented by eminent scientists on current areas of interest and the institute scientists were the major participants. This was planned to infuse new thinking in the minds of scientists in the areas where our institute scientists may be encouraged to work. This was followed by panel discussion on `future research in soil science' in which eminent scientists' panel and institute scientists participated and the new ideas emerged from discussion have been documented. On 16th April, 2013, 26th Foundation Day of the institute was celebrated and the Foundation Day Lecture was also organized to commemorate the completion of Silver Jubilee Year of the Institute Dr. Charan Das Mahant, Hon'ble Minister of State for Agriculture & Food Processing, Govt. of India was the Chief Guest of the function and Dr. N.N. Goswami, Ex-Vice Chancellor, CSUA&T, Kanpur presided over the function. Director of the Institute presented the achievement of the institute during last 25 years. Past Directors also presented their memoirs with regard to developmental stage of the Institute. The Chief Guest in his address applauded the good work of the institute especially with regard to soil fertility mapping, integrated nutrient management and composting. The Hon'ble Minister also inaugurated the Silver Jubilee Block (Biodiversity and Biotechnology Lab). Dr. N.N. Goswami delivered the Foundation Day Lecture entitled “Soil science at cross roads - way ahead” and the session was chaired by Dr. S.S. Khanna, Former Advisor (Agriculture), Planning Commission. Past developments/achievements in the soil science have been enumerated and also complemented the institute for its achievements. He has also put forward the research agenda for the next 25 years. On the Foundation Day, 18 innovative and progressive farmers were honoured by the Hon'ble Minister. Past Directors and retired institute employees were also honoured on the occasion.

Foundation Day Lecture

Soil Science at Cross Roads - Way Ahead

Dr. N.N. Goswami
Former Vice-Chancellor, CSAUA&T, Kanpur

Mr. Chairman, Dignitaries on the dais, Dear Colleagues!

At the outset I wish to congratulate the Director and his colleagues at the Institute for the extremely valuable services they have rendered to the Nation and the scientific community at large during its existence for the last 25 years. I am particularly happy to join all of you on this momentous and glorious occasion of the Silver Jubilee of the Indian Institute of Soil Science more so because I have had the unique opportunity of serving as a member of the DG, ICAR appointed Task Force for preparing the Blue Print of the Institute at its very formative stage (Late Dr. S.K. Mukherjee and Late Dr. J.S.P. Yadav served as the Chairman and Member-Secretary, respectively and Late Dr. R.S. Murthy, Dr. K.V. Raman and myself were the other three members of this task force). Next to IARI, where I have spent all my academic and professional life, the Indian Institute of Soil Science has been closest to my heart. You, the scientists of this Institute, have done a great job. I have been a witness to your excellent contribution to soil science on my visit to the Institute as Chairman/Member of the RAC and as Chairman of the QRT. I have had a glance at the IISS Vision 2050 document and I must say this is an outstanding one and if carried through to its logical end the agricultural scientists of the country should be proud of your contribution.

I am extremely glad to see the founder Director Dr. P.N. Takkar whose contribution to the establishment and growth of the Institute will be recorded and remembered for all time to come, to Dr. C.L. Acharya who succeeded Dr. Takkar, goes the credit of streamlining the research agenda and strategies and bring the Institute to new height in terms of infrastructure facilities. I fondly remember my interaction with him on numerous occasions. The presence of Dr. V.S. Tomar, Chairman, RAC of the IISS and at present Vice Chancellor, JNKVV, Jabalpur, and of a large number of distinguished scientists from different parts of the country, have added much significance to this Foundation Day function. I am extremely delighted to see Dr. S.S. Khanna, a former Vice-Chancellor of the Acharya Narendra Dev University of Agriculture & Technology, Faizabad and former Advisor, Planning Commission, with whom I have had a very close association for over four decades chairing this session.

In my lecture, I would try bring home to you the importance you held in the society, and to steer clear of your conscience as an elderly person, in making soil science a vibrant and dynamic one and a broad spectrum canvas to keep pace with the changing needs and challenges of the country to develop into a welfare state and vibrant economy through your contribution to science and agriculture.

Mr. Chairman and fellow scientists, ladies and gentlemen, I would like to share with you some thoughts which have been bothering me for more than a decade. The burning question that has been constantly harping me (and may be to many others): "Is the species of soil scientists and the discipline of soil science" still dominant, proactive and commanding or has it outlived its utility?"

In the 30's and 40's of the last century there were besides the IARI (then Imperial Agri. Res. Inst.) advanced centers of knowledge forming high class soil science research - whether it is the Calcutta School of late Prof J.N. Mukherjee which churned out such legendary soil scientists as S. P. Raychaudhuri, S.K. Mukherjee, N.P. Datta; or the Dacca University Dept. of Soil Science established in 1939 with Late Dr. J. C. Ghosh as the prime mover, where personalities like A.T. Sen, M.O. Ghani, PK De flourished, or the Punjab School of Chemistry with Dr. A.N. Puri, Late Dr. B.R. Puri who worked on Physical Chemistry, with much relevance to the understanding of Soil Science besides the research work on agricultural chemistry carried out in the State Departments of Agriculture.

The importance of soils in the international arena was all too evident in UK, Russia and other European countries and in USA. For general information, I may say that as early as 1938, the USDA Year Book of Agriculture was titled as "Soils and Men" with 1232 pages and 2, 58, 042 copies (unfortunately out of print). This was followed by USDA Year Book on Water in 1955, on Soil in 1957 and on land in 1958. The 1938 "Soils and Men" Year Book warned, "The social lesson of soil waste is that no man has the right to destroy soil even if he does own it in fee simple. The soil requires a duty of man which we have been slow to recognize".

Soil is a heritage and the natural custodian of it is the soil scientist, similar to that of the national heritage building and monuments by the archaeologists. Agriculture starts with soil and ends in soil and when this closed system operates, the outputs become inputs, the entropy is minimised and the energy is conserved. That is the essence of conservation agriculture and preservation of soil and its productivity.

What is soil science? In general terms, all different branches of science such as physics, chemistry, biology, geology, geography etc when applied to the study of soil is soil science. The question arises: Is soil science merely an application of different branches of sciences to the soil study or does the soil has its own peculiarity in the sense that it has its own distinctive properties even though the general scientific principles do apply. Soil science is viewed differently by a physicist, a chemist (physical, inorganic or organic again looks at it differently) a biologist or microbiologist, an engineer (civil, mechanical, electrical, conservation) hydrologist, pedologist, ecologist and so on. Some of them look only to the surface of the soil, some a little deep, while some others still deeper, and still some others look at the soil as a continuum over the land surface (with rivers, lakes and so on) as a component of the community. Soil can be looked and studied in isolation but it can be best studied as an entity in the community of other living objects in close proximity, in unison or in separation but interacting with and influencing one another in such a manner that one cannot be thought of without the other, eg. land, water, vegetation, man, animal, .. Thus, the broader perspective of soil would include the land, forest, habitat, the animal and human population, and water resources. Soil science must relate to these interrelationships especially the soil as a natural body supporting vegetation, animal and human population and getting support from them in turn to retain its distinctive identity.

The climate is a determinant factor in soil's capacity to perform and the soil-climate relationship is unique in the sense, each influencing the other both in positive and negative manner, of course most often in a positive manner. In the Vedas, they (soil or land and climate) have been referred to as 'Mata' and 'Pita' (matter and energy) relationship. Jenny's factors of soil formation: $S = f(cl, o, r, p, t)$ also states that these factors continuously influence the function and behavior of the soil; In terms of soil's major function for biological production, the crop yield is a function $Y = f(soil, crop, inputs, climate, management)$

Thus, we see soil's formation and function are both dependent upon other factors and therefore without scientific studies of these factors, soil science is not complete; and soil science must involve study of social sciences, and environmental sciences. When we look in this perspective then soil science becomes soil sciences. Having said that let us see how we have dealt with soil as 'soil scientists'

In the very early years of soil studies in India (pre-partition) when soil science was still regarded as something very close to agricultural chemistry and plant physiology, mainly related to pedology (soil survey & classification, mapping included), physical chemistry of soil (soil acidity, alkalinity, mineralogy), fertilizers, manures and agricultural chemicals, and biochemistry and microbiology; I don't recall if there was any scientist designated as a soil scientist or agronomist although there were a few microbiologists. Mostly the agricultural chemists of the States (Govt. Depts) (there was no Imperial soil scientist, rather Imperial Agril. Chemist) used to function both as soil scientists as well as agronomists (However, there were professors of agronomy in most agri. colleges). I have referred to earlier in this lecture that the first Department of Soil Science was located at Dacca University (now in Bangladesh) in 1939 by Dr. J.C. Ghosh (Prof. of Chemistry at Dacca University, later V.C., Calcutta University, and Member, Planning Commission).

In the 60's and 70's when the State Agril. Universities were set up and more particularly in the Green Revolution era Soil Science/SSAC Departments of the Agril. Universities were drawn upon to supplement the work of the breeders in developing nutrient and soil management strategy for maximizing or optimizing the production potential of the then miracle varieties. The soil scientist's job assumed the role of pseudo-agronomists and somewhat subservient to the breeders as the latter were mostly credited with the success of the green revolution at least in the common scientific and economic parlance. Although it was somewhat apparent that the soil science as a science suffered, but this period led to the re-discovery of micronutrient deficiencies (Zn, Mn, Fe) and also depletion of S. It was the ingenuity of Dr. J.S. Kanwar who as the first DDG (Soils, Agro, Engg.) in the reorganized ICAR (1966) initiated Coordinated Projects involving soil science (Long-term, STCR, Micronutrients & secondary nutrients, Soil structure and so on) in addition to the all pervading 'All India Coordinated Agronomic Project'

These projects served two purposes- (i) to provide ample scope for soil scientists to pursue their research interests in science, and (ii) to provide background for

future soil scientists to study soil in long term perspective for its productivity and functions. In addition these projects enabled the soil scientists to study soil in relation to sustained productivity and soil's production function ability.

There have been criticisms from different quarters. For example, Raina & Sangar (ISSS Bull 23, 2006, Trends in Soil Research) observed, "Soil science continues to use the conduit of production/productivity enhancement for legitimization". "It is more crucial to explore how soil science research can integrate itself into the national natural resources management innovation system so as to understand and enhance its capacity to address these complex ecological and social demands". In fact, one amongst us from the same fraternity had made a very critical observation. "Isn't it that soil scientists feature rarely in policy discourses concerning the food and livelihood security of the teeming millions? No wonder, soil scientist is more of a liability than asset for the country!" (Sudhirendar Sharma, ISSS News letter No.17: 2004).

Challenges for Soil Scientists: With the passage of time, the nature of challenges have changed and so also the priorities

1960's & 70's: Crop Productivity/Production era

Challenges for increased biological production (food crops) in particular, ignoring the pulses, oilseeds. In the process legumes took a back seat and so also the soil productivity (appearance of micronutrient deficiencies). Organic matter research had an accidental death in the hands of intensive agriculture. Nutrient mining was the consequence.

1980's & 90's : Production plateau reached, stagnating yield

Concerns for low response ratio (decreased factor productivity), stagnating yield, lowering of water table, concern for degradation of soil quality, environmental issue, climate change scenario, raised micronutrient and secondary nutrients constraints, fertilizer efficiency issues. Renewed interest in organic matter research, vigorous effort to relate it to soil quality.

2000 onwards: Sustainability & Environmental Concerns

Environmental Issues particularly climate change, soil quality and resilience issues, soil biodiversity, food and nutritional quality, fertilizer efficiency, precision agriculture, conservation agriculture, zero tillage, etc. Use of nanoscience and nanotechnology in soil study, organic matter and soil quality, and nutrient use efficiency.

It is thus observed that environment, soil quality and nutritional quality of food produced has taken the center stage as against the production controlled issues. However, for nearly half a century, the only major concern for soil scientists and rather all agril scientists alike remaining uppermost is the input use efficiency. Since a great majority of the soil scientists have their allegiance to soil fertility, over 60% of all research activities in the area of soil science has been in the domain of fertilizer efficiency studies, albeit with no major breakthrough (or innovations). Of late nanoscience has entered into this field of research with not much success as yet.

With passage of time, the magic of high yielding varieties their responses to high level of fertilizer, irrigation or pesticides (ingredients of intensive agriculture or as called now conventional agriculture as opposed to traditional or sustainable or alternate agriculture) started disappearing because of yield stagnation, water table lowering, reduction in input efficiency, severe deficiencies, nutrient mining, soil quality deterioration, soil related environmental issues, nutritional quality of food, and above all the ecological issues and the immediate consequence of all these is the lack of importance or priority in the soil science and its studies in the broad field of agriculture.

One of the positive outcomes of the attitudinal and priority changes in soil science made the latter a component of Natural Resource Management (similar to UK model of National Natural Resource Management). To some such changes raised concerns and doubts over annihilation of the 'science' part of soil science. In fact, a series of articles appeared in the ISSS Newsletter (Sept, 2003; March 2004, Sept. 2004) and JISSS (Dec. 2003 issue). Dr. G.Dev, one of the past Presidents of the ISSS expressed concern in his address to the Society, "There is worldwide tendency to de-emphasize the 'science' in soil science to shift emphasis to land use and social problems", and Dr. J. S. Samra, a Past President and DDG (NRM) ICAR, captioning his address of the society as 'Future of Soil Science' (JISSS, 54 (4): 385-88, 2006).

Dev (1996) further warned "We will have to maintain and continue to show our professional superiority. As soil scientists as soil workers, we must do our best to put soil agenda in the fore front. We must prepare ourselves to enter the 21st century" In fact my presidential address to the society (30 Nov.1994) had much earlier outlined a renewed road map for soil research, in the areas of Agricultural Production System, Sustainable Agriculture, Environment, Forestry, Agro-forestry, and Horticulture, Science & Technology. Continuing the same thought processes, Dr. A. Subba Rao, the worthy Director of IISS, Bhopal has in the IISS Newsletter (vol 15, no 2, 2012) talked about "The Future of Soil Science". He has added the word 'The' before 'Future of Soil Science' thus giving more weight of to the word 'Future'. Dr. Subba Rao has lamented, "The role and status of soil science as an independent discipline is currently a serious concern. Subjects that require knowledge of soils in various water/hydrology and environmental sciences and tasks are being addressed by experts other than soil scientists. A sign of negative spiral has emerged in Universities, a dwindling number of students with a decreasing number of soil science faculties".

Future of Soil Science - An Introspection

Let us have a self introspection. Out of the two words in Soil Science which one, have we been able to contribute and/or serve properly. Have we been able to develop a new concept, hypothesis or theory in the recent past for greater agricultural productivity and/or enriched the science in general? Alternatively, what kind of scientific developments or breakthroughs have we provided to maintain/improve the health or productivity of the soil as a source/supporter of all life forms for a sustainable agriculture? What has been our contribution in real terms in the area of increasing efficiency of fertilizers? Have we developed protocol or DSS (Decision support system) for precision agriculture or for forewarning against harmful or negative factors which adversely affect soil and crop productivity? We have remained mainly empirical, been trying to repeat, rediscover and recapitulate things of the earlier decades.

Let us not forget that the 1960's panacea in the use of radioisotopes in agriculture did not last long. Similarly, the biotechnology would fade away as has been the fate for intensive agriculture before it makes a real impact. The current craze for nanoscience & nanotechnology may also disappear in favour of other new developments but soil would remain as the permanent seat for living forms. We as soil scientists shall fail in our task if we cannot deliver in concrete terms technologies for improved fertilizer efficiency based on science which in turn would help protect the environment and protect the mother earth from degradation. We must invade/explore other domains relevant for a sustainable agriculture and environment and interact/collaborate with those. We have to seriously think and contribute to the health (quality and productivity) of the soil, the production base, and also of the human and animal health which draw their resources ultimately from the soil, and means and measures for improving the quality of the produce apart from productivity per se.

When we can deliver a matching platform for soil health on one side and animal and human health and total environment on the other, we, as soil scientist, would definitely succeed and prove our worth. To quote Samara (2006) research on "soil-water vegetation-livestock-human being - soil again" chain is the need of the day. This would require large network of soil scientists, physiologists & biochemists, animal and human nutritionists, and social scientists.

In a developing country like India we cannot think of the luxury of 'ivory tower' research and have a bigger challenge of doing production oriented and multifunctionality use aspects of soil (as a geomembrane of the earth, protective filter, buffer against degradation processes and a mediator of energy, water and bio-geo-economic processes). In the words of Samra (2006), "It is really a very conflicting and paradoxical situation and in that sense, 'soil science' is at the crossroads groping into darkness and directionlessness".

Soil Science and NRM

A soil scientist can survive and make his presence felt if and only if he unravels, understands and utilizes the basic soil processes in relation to its immediate environment (agro-ecosystem) for its effective management for a sustainable agriculture and the changing needs of the society in the face of drought and climatic aberrations, changing land use pattern and inputs. Higher throughflow, lower storage capacity and less recycling of nutrients mark the agroecosystem from natural ecosystems. Increasing the storage capacity and recycling can increase nutrient use efficiency and sustainability.

A soil scientist has to be at once a good scientist in whichever branch of soil science he researches upon and should have the ability to interact, interpolate and put to use his research findings for growth and development of the country.

Is it not true that the four major functions of soil: (i) biological activities and productivity (ii) buffering and

filtering (iii) partitioning and regulation water/solute flow through environment, and (iv) cycling nutrients, energy, water and other elements through the biosphere are interrelated and interconnected ? Then how can we separate these factors for a sustainable agriculture and soil productivity and in this scenario the apparent confusion between soil science and NRM disappears, the "Puritan" soil science provides the basic support and NRM overtakes sustainability and environment issues, and, in turn, the soil scientist finds his pivotal and respectable place in the society.

Epilogue

A former President of the ISSS and the ISCA (Indian Science Congress Association) and the first Indian Director of the Inperial (now Indian) Agril. Res. Institute, New Dehli, Rao Bahadur, Dr. B. Viswanath made the following two statements as early as 1937 (ISCA- Agri Science Hyderabad, 1937 before 'Soils & Men' was published by the USDA): "Manage soils to maintain them as well aerated, freely drained, stable structure under integrated plant nutrient management over a cropping cycle and maintain or increase soil organic matter" "Both the health of the animal and quality of the plant are dependent on the fertility of the soil and its management. Infertile soil and indifferent management dwarf both the health and the intellect of the nation". On the importance of soil organic matter he remarked, "If we neglect organic manures and fail to build up the humus content of the soil we shall be doing four things. Firstly we shall not be able to maintain the fertility of the soil. Secondly, we shall not be using artificial fertilizers to the best advantage. Thirdly, we shall be failing to keep up the inherent cropping power of our improved seed and run counter to the good work of the plant breeder and fourthly, we shall be producing food deficient in nutritive value".

The IISS Bhopal has very succinctly put forth in the Preface to Vision 2050 document of the Institute, the emerging challenges requiring the attention of the soil scientists. These are:

- Increasing food production
- Ensuring food and nutritional security from shrinking land resources
- Characterizing and conserving large soil biodiversity
- Maintaining soil quality and ecological balance
- Developing economical conservation agriculture technology for different agro-ecosystems
- Energy efficient agriculture
- Carbon sequestration

Soil science must play an active role in the national agenda of hunger and poverty alleviation, food and nutritional security and in meeting the challenges of socio economic needs. In my view the five words- Entropy, Energy, Ecology, Economics and Environment are intimately connected and they define the quality and sustainability of a system and conservation of resources - soil (also land), water, nutrients and energy. As scientists we must develop technologies which make the farmer and his resources sustainable and economical at the micro level and conservation of all natural sources, higher contribution to GDP from agriculture and improve the food and nutritional quality for man and animal. The IISS Vision 2050 document brings out these interrelations in the research agenda: I wish the soil scientists take up these challenges and then there would be no question mark or ambiguity and apprehension for 'Future of Soil Science'. The probability of success should be approaching almost certainty and the Future of Soil Science the brightest ever. I entirely agree with the following statements made by Dr. A. Subba Rao amongst some others. These are: (i) Soil science as a profession has not sufficient dynamism to adjust to changing needs. It was slow to embrace its role as an environmental science, (ii) the community of soil scientists needs to increase its visibility, and (iii) there is a need for change in mindset.

To me **"Agriculture is our Profession, the Soil our Salvation"** Long live soil science, soil scientists and the Indian Institute of Soil Science, Bhopal in the service of the nation and to the mankind!

Thank you, Jai Hind !!!

Extension Activities

Agriculture Education Day

Indian Institute of Soil Science, Bhopal successfully celebrated 'Agriculture Education Day' on 11 February 2013 as per the directives of the Council. The day was marked with the participation of more than 100 students along with their teachers from 9 educational institutions/schools is and around Bhopal. Chief Guest of the programme, Dr. Nawab Ali, Ex-DDG (Agril. Engg.), ICAR and Ex-Director, CIAE, Bhopal addressed the participants on the 'Importance of Agricultural Education for New Generations'. Several activities including inspirational talks, laboratory visit, debate and essay writing competition were organized. All the students enthusiastically participated in debate on 'Economic Development needs Agriculture; for or against' and in essay writing on 'Perception about Agriculture – my point of view'. Dr. A. Subba Rao, Director chaired the closing ceremony and distributed the prizes among the successful students.

Western Region Agriculture Fair-2013

"Western Region Agricultural Fair-2013" was organized on the focal theme of "Soil health for sustainable productivity" at IISS, Bhopal during Jan 28-31, 2013, sponsored by Government of India, Ministry of Agriculture and Cooperation New Delhi. More than 2000 farmers from Madhya Pradesh, Maharashtra, Gujarat and Rajasthan participated in the fair. 40 companies of different agricultural inputs/implements/machinery supply exhibited their products in the fair. The following four themes area were concentrated: 1. Strategies for sustainable soil health management, 2. Organic farming and soil health, 3. Agricultural waste management on soil heath & 4.Involvement of industries / NGOs / universities / KVKs / innovative farmers to promote soil health. Lecture session was conducted every day followed by question and answer session was arranged.

Training/Workshop organized

- Farmers' training on 'Organic Farming and Soil health' during Feb. 11-16 for ATMA Distt. Darbhanga, Bihar, 26 Feb to 2nd Mar, ATMA Distt. Shivpuri, Madhya Pradesh and Mar, 18-22, 2013 ATMA Distt.Morena, Madhya Pradesh at IISS, Bhopal.

- A Training-cum-Workshop on Soil Fertility Management for KVK personnel of M. P. Chhatishgarh and Odisha in collaboration with Zonal Project Directorate, Zone- VII, Jabalpur on May 3-4, 2013 at IISS, Bhopal.

Western region zonal workshop

- A Training Programme on "Soil testing for primary, secondary and micronutrients" for the soil testing laboratory personnel of Govt. of Madhya Pradesh in three batches (12-15, 18-21 and 26-29June, 2013) at IISS, Bhopal.

Personnel

New Appointment

Ms. Raksha Parsai joined the Institute as LDC on May 24, 2013.