



IISS

Newsletter

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National Land Resources Conservation Week

National Land Resources Conservation Week (Nov. 21-27) was organized with the theme 'Our Land-Our Future'. Dr. G. Singh, Director, CIAE, Bhopal was the chief guest and Dr. C. L. Acharya, Director, IISS, presided over the function on Nov. 24. All the staff of the Institute participated in the function. The various speakers on the occasion laid emphasis on adopting land conservation measures to avoid loss of soil & nutrients, biodiversity and water resources.

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From the Director's Desk

Long-term soil health monitoring- Indispensable in sustainable agriculture

While research relating to the optimum combinations of fertilizers for different soils, agro-climatic conditions, crops and crop rotations under irrigated and unirrigated conditions has provided meaningful recommendations, the environmental consequences of agricultural technologies received little/no attention. Given the need to increase agricultural productivity for feeding the growing population, an understanding of the environmental consequences of biochemical technologies is important for better policy formulation.

Negative effects of fertilizers and pesticides viz., eutrophication in water bodies, nitrate pollution of ground water, adverse changes in soil micro-organisms' population & composition, increased emission of greenhouse gases and metal toxicities are matters of concern in intensive agriculture zones where they are widely used and poorly regulated. Another problem regarding the use of fertilizer is the imbalance of primary plant nutrients and increased incidence of secondary (S, Ca) and micronutrient deficiencies, viz., Zn, Fe, Mn, B, Cu which are existing and emerging as yield limiting and sustainability disturbing factors. Observations reveal that 49% soils are deficient in Zn, 25% in S, 12% in Fe, 55% in Mn and 3% in Cu. These imbalances have not only adversely affected the growth of agricultural production but also permanently damaged the chemical and physical environment of soils. The incorporation of legumes in crop rotations in Integrated Nutrient Management and the addition of higher dose of FYM (10-15 t/ha) help correct these problems. However, the farmers' practice is to apply FYM once in 3-4 years on rotation basis rather than on yearly basis to prevent decline in productivity. We must make use of traditional knowledge and farmers' perception and weave technology around it to face the challenge of sustainability of productivity. The frequency and quantity of FYM application need scientific examining on long term basis keeping in mind its availability, quality, convenience of application, soil health and environmental consequences.

The negative consequences of agro-chemicals on soil and environment can be overcome if their long-term changes and implications on soil health and agricultural production are well monitored. Attempts so far made for such monitoring have been piecemeal and need to be made as a coherent whole. Regular monitoring of soil nutrient status and local options for Integrated Plant Nutrient Supply System is necessary in order to avoid damages either through excessive or under fertilization in different agro-ecological zones. Extensive soil test facilities existing in the country need to be upgraded, strengthened and networked effectively with the research institutions for strategic monitoring. Estimation procedures need to be standardised or developed. The research priorities need to be reoriented to base on a broader set of criteria for generating technical solutions to maintain the soil health in varied agro-ecological conditions. Well coordinated interdisciplinary research for tillage+nutrient, water and crop management based on watershed concept, IPNS concept and farmers' perceptions need to be initiated in this direction. It will help in classifying the existing agricultural technologies according to potential externality problems in different agro-eco systems to fill existing gap in knowledge. Continuous monitoring of nutrient use pattern and vital soil health indicators will also help in quantifying the relationship between agricultural production, environmental degradation and human health risk.

- C.L.Acharya

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Balanced and integrated fertilizer use is indispensable for sustained crop productivity: lessons from long-term fertility experiments

Several factors influence the complex chemical, physical and biological processes undergoing in soil that govern soil fertility and productivity. Changes in fertility caused by imbalanced fertilizer use, acidification, alkalinity, salinity and declining soil organic matter (SOM) may take several years to appear. All these changes can be monitored only through long-term studies.

The post green revolution era made it imperative to examine the impact of fertilizer on soil quality and the sustainability of modern intensive cropping systems based on high external inputs of fertilizers, agro-chemicals and high yielding cultivars under irrigated conditions. In view of these emerging compulsions the ICAR launched AICRP on Long-term Fertilizer Experiments (LTFE) for important cropping systems and soil types at 17 fixed sites in different agro-ecological regions in India with the thrust on productivity, sustainability and environment safety.

LTFEs are valuable repositories of information and provide the best possible means of studying changes in soil properties and processes, identifying emerging trends in nutrient imbalances and deficiencies. Indian soils are mostly deficient in N and dramatic increases in yield are seen on first application of N alone. Such practices have led to disastrous results in intensive cropping systems. In Jabalpur and Coimbatore regions, the benefits of N and K application were not realized due to severe P deficiency. The application of 150% NPK though initially gave higher yield than the 100% NPK dose, higher quantities of nutrients does not seem to be sustainable in long run at the present level of crop production potential.

In acid soils of Ranchi and Palampur, the application of N alone has aggravated the problem of acidity. Potential liming accompanied with optimal dose of NPK has helped in correcting acidity. In acid soils with severe K deficiency (Bangalore), full benefits of N and P doses could not be realized. The yields improved dramatically when optimal NPK dose was applied.

Need for application of S has been established by the continuous use of S-free NPK at many locations. Zinc has also been observed as a yield limiting factor for rice at Pantnagar, maize at Ludhiana and soybean at Jabalpur. Addition of FYM in optimum quantity (@10/15 t ha⁻¹) has synergistic effect on improving efficiency of optimum doses of NPK and correcting deficiency of Zn and S in most of the cases. A definite increase in organic carbon was recorded in long-term fertilizer experiments at Ludhiana, Jabalpur, Bangalore, Ranchi and Bhubaneswar soils under balanced NPK treatment over the unmanured (control) treatment. Balanced fertilizer use, thus, maintained soil organic carbon (SOC).

Long-term fertility experiments have thus clearly established that fertilizer is the key input for increasing crop productivity and the balanced optimum application of NPK based on soil tests is essential for sustainable high productivity. The integrated use of NPK + FYM can correct the micro and secondary nutrient deficiencies (which otherwise are becoming yield limiting factors) and also soil acidity problems. Therefore,

balanced fertilizer use is absolutely essential for maintaining vital soil health parameters and sustained productivity at higher levels.

Anand Swarup

Project Coordinator (LTFE)

Research Highlights

K- balance in rainfed rice-wheat system in Vertisol

Potassium balance from 8-years old rice-wheat system showed that conjunctive use of organic manure and fertilizer N at a higher rate increased the non-exchangeable K release. Incorporation of organic manure with fertilizer N increased the cumulative non-exchangeable K release and maintained greater amounts of K in solution by re-establishing the equilibrium among the forms of K on exchange sites.

Organic pools and carbon sequestration under land use management

C- sequestration quantification results reveal that the particulate organic matter increased with the decrease in the particle size aggregate and sequestered high amount of C. HA-C and FA-C and enzyme activity decreased with the soil depth. Horticultural based cropping system improved the active pool of C. C- sequestration was positive under higher fertility zones. NPK and NPK+ FYM maintained organic pools of C, N, P and S in the rhizosphere.

Quality comparison of various composts

Enriched compost and vermicompost were found to have significant lower values of water-soluble carbon, higher values of phenol and enzymes and high total nutrient (NPK) recovery as compared to that of conventional compost. The vermicomposting process also doubled the yield of worms.

Effect of water-logging on N₂-fixation in soybean

Total chlorophyll content of soybean leaves decreased with the increase in the duration of water-logging at different growth stages. Water-logging (8/12 days) at early vegetative and reproductive stage intensively reduced the nodule biomass. The plants resorted to form adventitious roots on the stem when water-logging exceeded 4 days for meeting the oxygen demand and withstanding the water-logging shock.

Survival of *Rhizobium* in plough layers in summer

In a network experiment in AICRP- BNF at seven locations of varying soil types in various agroclimatic zones, rhizobial population were monitored in summer and monsoon in surface soils. While there was a spurt after monsoon, the populations even in soils continuously cropped with legumes were very low and well below the threshold required for optimal nodulation due to prevailing high temperature and low moisture, reinforcing the need to practice legume inoculation each year with biofertilizers.

Soil-water-nutrient management in landscape watershed

Higher moisture storage, lower root penetration resistance (0-14 cm), bulk density, nitrogenase activity and microbial biomass C and N were observed in broad bed and furrow (BBF) than flat on grade (FOG) land system. The yields of soybean and wheat were higher in BBF than FOG. P availability also contributed to higher yield in BBF.

Management of nutrient and water in cropping systems

Sole sorghum led to more runoff and soil loss compared to intercropping system and sole soybean. 75% NPK+organic (FYM/poultry manure/phosphocompost) gave significantly higher yield of sorghum and soybean over inorganic.

Blood serum studies under Zn deficient soils

The survey of several blood samples taken from human beings in Andhra Pradesh and sheep in Gujarat indicated low zinc content in their blood serum when fed on food and forages produced on zinc deficient soils to those on zinc adequate soils. Similar studies on rats also highlighted low zinc content of blood serum which led to deformation of their femur bone.

Effect of distillery effluents in maize

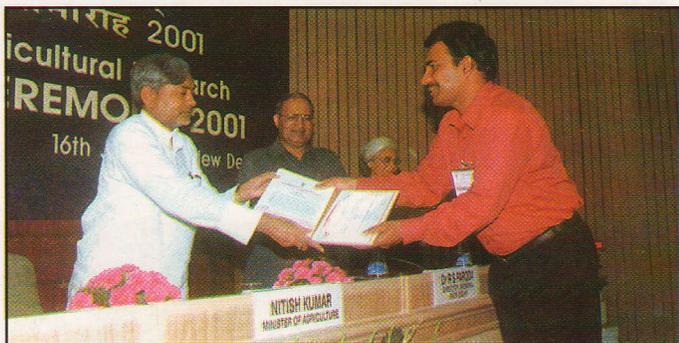
The application of distillery effluents resulted in an increase in leaf area, chlorophyll content, nitrate reductase activity, total dry weight and grain yield of maize. Among the effluents, the highest grain yield was obtained in biometanated spent wash followed by raw spent wash and lagoon sludge, however, it was lower than under NPK + FYM.

Effect of post-methanated spent wash on soybean

The application of post-methanated spent wash to soybean resulted in production of broader and dark green leaves and increased the crop growth rate, relative growth rate, net assimilation rate and leaf area ratio leading to higher total dry weight. S-containing amino acids (methionine and cystine) of seed also increased. It also increased nitrate content of the rhizosphere soil resulting in higher nitrate reductase activity of the leaf tissue. On the other hand, it significantly inhibited nodulation.

Awards/Honours/Recognitions

Dr. D. Damodar Reddy, Sr. Scientist: Lal Bahadur Shastri Young Scientist Award 1999-2000 of ICAR, New Delhi, Jul. 16; Golden Jubilee Commemoration Young Scientist Award –2001, Indian Society of Soil Science, New Delhi, Oct. 30.



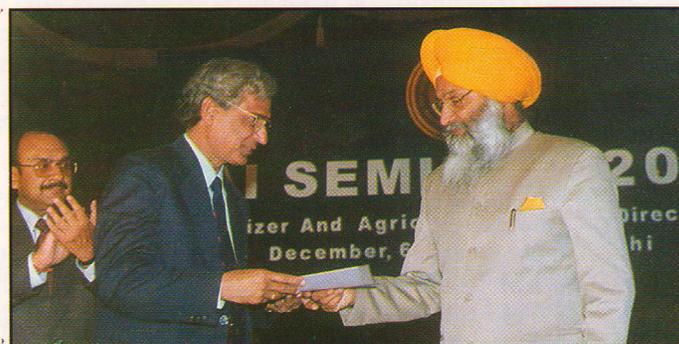
Dr. D. Damodar Reddy receiving Lal Bahadur Shastri Young Scientist Award 1999-2000 of ICAR

Drs. T. R. Rupa, S. Srivastava, A. Swarup and D. Singh: Best Poster Presentation Award, Int. Sym. on Importance of Potassium in Nutrient Management for Sustainable Crop Production in India, IPI and PRI, Dec. 3-5.

Dr. M. V. Singh, PC (Micronutrients): FAI Dhiru Morarji Third Prize for the article in Fertilizer News, New Delhi, Dec. 6→



Drs. Anand Swarup, A. K. Tripathi and A. K. Misra: FAI Sri Ram Third Prize for the article in Khad Patrika, New Delhi, Dec. 6. ↴



Dr. T. K. Ganguly, Pr. Scientist, elected as Councilor of the Indian Society of Soil Science (ISSS) for the year 2000-2003.

Scientists' Participation

Seminar/Symposia/Conferences/Meetings

Dr. C.L. Acharya: India-ACIAR Consultations, New Delhi, Sept.10-11; Int. Sym. on Potassium, New Delhi, Dec. 3-5; FAI Seminar, New Delhi, Dec. 6.

Dr. A. Subba Rao: JNKVV, Jabalpur, Oct. 11-12; Int. Sym. on Potassium, New Delhi, Dec. 3-5; IFFCO, Gurgaon, Dec. 10.

Dr. M. V. Singh: JNKVV, Jabalpur, Oct. 11-12; Directorate of Millet Development, Gandhi Nagar, Gujarat, Nov. 27-28; FAI, New Delhi, Dec. 6-8; Int. Cong. Chem. Environ., Indore, Dec. 16-18.

Drs. C. L. Acharya, A. K. Misra, T. K. Ganguly, D.K. Painuli, Muneswar Singh, M.C Manna, A. K. Biswas, J. K. Saha, A. B. Singh, K. P. Raverkar, R. S. Chaudhary, D. Damodar Reddy, A. K. Tripathi, T. R. Rupa, Tapan Adhikari, K. M. Hati, R. H. Wanjari and K.K. Bandyopadhyay: 66th Annual Convention of ISSS, RAU, Udaipur, Oct. 30 - Nov. 2.

Dr. S. Srivastava: Int. Sym. on Potassium, New Delhi, Dec. 3-5.

Drs. Ajay and S. Ramana: UAS, Dharwad, Dec. 5-7.

Dr. Tapan Adhikari: Int. Cong. Chem. Environ., Indore, Dec. 16-18

Workshops

Dr. A. K. Misra: AICRP (SPC), MAU, Parbhani, Jul. 3-5.

Drs. M.C. Manna and R.H.Wanjari: CRIDA, Hyderabad, Jul. 10-12.

Dr. R.S. Chaudhary: NWDPR, IISS Bhopal, Aug. 25.

Drs. A.K.Biswas, J.K.Saha and R.S. Chaudhary: CRIDA, Hyderabad, Aug. 27-28.

Dr. A. Subba Rao: IARI, New Delhi, Oct. 4.

Dr. D. Damodar Reddy: JNKVV, Jabalpur, Dec. 21-22.

Trainings

Drs. K. P. Raverkar and R.H.Wanjari: Windows 98 and MS Office, JNKVV, Jabalpur, Sep. 27-29.

Dr. K. Sammi Reddy: GIS, NBSS&LUP Regional Centre, Bangalore, Oct. 3 – 23.

Dr. A. K. Misra, NAARM, Hyderabad, Nov. 21-27.

Lectures Delivered

Dr. C. L. Acharya, Director: JNKVV, Jabalpur, Oct. 11.

Dr. D.L. N. Rao, PC (BNF): ISCAR, Hyderabad, Nov. 20-22.

Workshops/Meetings Organised

AICRP (SPC) conducted its 21st Workshop at MAU, Parbhani, Jul. 3-5. Two Technical Bulletins were also released.

Workshop on "Our Land-Our Future" organised during National Land Resources Conservation Week, IISS, Bhopal, Nov. 24.



Group meeting of center in-charges under AICRP (Micronutrients), GAU, Anand, Dec. 3-5.

Foreign Visits

Dr. C. L. Acharya: Australia, Jul. 2-8.

Dr. K. Sammi Reddy: Australia, Jul. 2-20.

Dr. A.K. Misra: Khon Kaen, Thailand, Jul. 26-31.

Distinguished Visitors

Dr. T.N. Choudhary, Member, RAC, IISS, Bhopal, Jul. 5.

Dr. Bert H. Janssen, Assoc. Prof., Soil Fertility, Agricultural University of Wageningen, The Netherlands, Jun. 15 – Jul. 7.

M. Phil. Students from IIFM, Bhopal, Nov. 24.

Dr. N.S.L. Srivastava, ADG (Engg.), ICAR, New Delhi, Nov. 29.

Staff News

New appointments

Dr. D. Damodar Reddy: Sr. Scientist, Oct. 27.

Dr. Buddheswar Maji: Pr. Scientist, Dec. 31.

Mrs. Sunita Bhusari, Assistant, Nov. 13 (on deputation).

Staff left

Dr. R.B.R.Yadav: Pr. Scientist, retired on Aug. 31. His contact no. is 0522-700557

Events

Independence Day: Celebrated with great enthusiasm by all the staff members and their families.

Sports activities: IISS, Bhopal ranked third in ICAR Sports Meet – 2001 (Zone-II) Bhopal from 3-6 Nov. 2001 and won the team events of Badminton (Men) and Football.



Mrs. Babita Tiwari bagged 1st Prize in Shotput, Javelin and High Jump, 2nd prize in 100 mt race, Long Jump and Table Tennis and adjudged the best women athlete of the tournament.



RAC meeting: Nov. 6-7.

IMC meeting: Nov. 19.



RAC meeting in progress