



IISS

Newsletter

Vol. 2. No. 2

July - December 1999

National Seminar on Soil Testing

A National Seminar on Soil Testing was conducted on December 02-03, 1999 to review the current status of fertiliser recommendations in various states and recently formulated recommendations based on STCR derived adjustment equations, preparation of soil fertility maps and related aspects of soil testing. Senior Officials from Ministry of Agriculture, ICAR, State Department of Agriculture, Incharges of STCR Project Centres and some special invitees attended the seminar. The seminar recommended the implementation of fertiliser recommendations based on fertiliser adjustment equations and calibrations developed by various STCR centres and the preparation of soil fertility maps involving NBSS & LUP, IISS, STCR Centres and State Departments of Agriculture.

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From the Director's Desk...

Soil Testing : The future needs

Soil testing includes measurements made on soils with an objective of recommending fertiliser and manure application and assessing the requirement of soil ameliorants for problem soils. This is a tool to predict probability of getting a profitable response to the nutrients, to help evaluate the soil productivity and to determine specific soil conditions which may be improved by the addition of soil amendments. Soil testing is the only tool to control the soil fertility which is not a permanent or long-lasting entity. The annual gap between nutrient additions and removals is of the order of 9-10 million tonnes. Since nutrient additions have never kept pace with nutrient removals by crops, the fertility status of Indian soils is fast declining. Even with the use of sizable amounts of fertilisers in the country, soil fertility in respect of N and P has not increased and remained low or medium. But soils in pockets of areas have got enriched with P. The deficiencies of K, S, Zn, Fe and B etc., have been fast increasing in time and space. Indian farmers, not alarmed at the declining soil fertility, continue to exploit soil resource with only marginal replenishments. In India complexity in nutrient demands arises due to great variety of soils, different climates, crops and management practices. In this context, soil testing has to play a vital role because soil test based nutrient recommendations not only ensure balanced nutrition of crops but also avoid the wasteful expenditure of this expensive input.

Presently there are 519 soil testing laboratories (392 static and 127 mobile) with analysing capacity of 6.5 million samples per annum. The total utilization of the capacity was about 4.8 million soil samples in 1998-99. Considering that 1 sample represents 1 acre of land these soil testing laboratories will cover an area of 2.6 million hectares in one year if run to their full capacity. Considering that a field may be tested only once in five years, the available facilities allow testing of soils in 13 million hectares which is less than 10% of the total cultivated area of the country. For increasing the analysing capacity of existing laboratories it is imperative to opt for automatization and mechanization. There is also a great need of not only increasing the existing soil testing infrastructure in the country but also evolving a more comprehensive approach to integrate the vast human resource potential from various sectors e.g., apex research institutions, a large number of students graduating from various Agricultural Universities, Krishi Vigyan Kendras and soil testing personnel already engaged in the service in order to realize the ever cherished dream of balanced nutrient use based on soil test and also the maintenance and build up of our soils' fertility. The vast soil test data generated can be utilized for preparing soil test summaries and soil fertility maps which have value in planning, marketing and policy decisions.

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Soil Test Crop Response (STCR): A Must for Efficient Soil and Nutrient Resource Management

The basic data required for formulating fertiliser recommendations for targeted yields have been generated over the last three decades by several cooperating centres located in fifteen State Agricultural Universities and two ICAR Institutes under the aegis of AICRP on STCR. These data were employed to generate numerous fertiliser adjustment equations and calibration tables for many crops. The fertiliser prescriptions derived from the adjustment equations were tested in a large number of follow-up and front-line demonstrations. In majority of cases, the yield targets were achieved within +/- 10% variation. The results of over 600 front-line demonstrations conducted in 10 states by 11 STCR centres have showed higher response ratios and benefit:cost ratios in treatments receiving fertilisers based on targeted yield concept in important crops.

A software has been developed for prescribing fertilisers under the condition of availability or non-availability of organic manures, different levels of monetary resources and soil test values.

Fertiliser application at lower targets helps to realize greater fertiliser use efficiency and also total production in a particular area. However, if this practice is continued over long term, the soil nutrient resources may get depleted.

If soil fertility is to be maintained or increased, relatively higher rates of fertilisers need to be added to take into account the inevitable losses due to leaching and fixation. When this approach was adopted the soil fertility improved and fertiliser rates needed to be applied decreased with time in treatments receiving fertilisers for higher targets.

Different statistical models were evaluated to arrive at more precise and profitable rates of fertiliser application. Among the models, the linear response and quadratic response plateau models proved better than others, especially for rice on lateritic soils.

In addition to the contribution of soil and fertiliser nutrients the contribution of organic manures, compost, bioculture etc., as nutrient suppliers for computing the fertiliser requirement under integrated nutrient management systems were worked out for rice, wheat, sunflower, maize and tapioca. Some of these systems tested under farmers' field conditions showed the saving in cost of fertiliser.

In order to schedule fertiliser rates to the crops following a particular crop in sequence, post harvest soil test prediction equations were developed incorporating initial soil test values, fertilisers applied and the yield/uptake of nutrients. Precise fertiliser schedules for pigeonpea-wheat, rice-rice-pulse and okra-sunflower crop sequences have been worked out.

Providing fertiliser recommendations on the basis of maps may be a very effective way of soil test technology transfer to farmers' fields. This may possibly work better in mono-cropped areas, agro-ecologically similar areas, low input rainfed areas and areas not accessible to soil testing facilities. Linking of crop models with GIS data base and also with STCR recommendation maps is now possible.

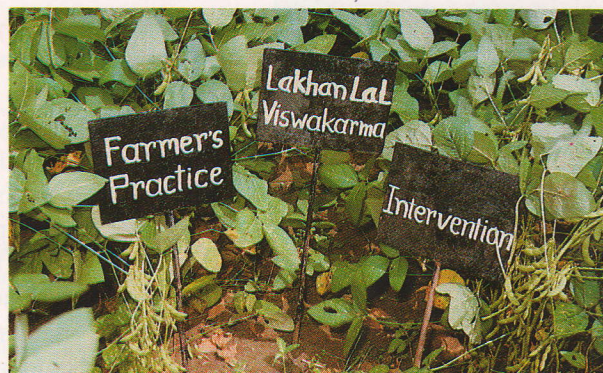
A. Subba Rao

Project Coordinator (STCR), IISS, Bhopal

Research Highlights

IPNS trials on farmers' fields

Under FAO/ICAR/IFFCO Collaborative Project field trials on soybean were conducted using various treatments. Yields under new intervention plots, which involved less investment on fertilisers through balanced application of organic resources available with the farmers and chemical fertilisers through soil test calibration, was the highest with an average of 23 q/ha of soybean seed compared with 18 q/ha under farmers' practice.



Soybean pod formation: Farmers' practice Vs new intervention
Impact of spentwash on crop production and soil health.

Work is being carried out to devise suitable management prescriptions for harmless utilization of spentwash in agriculture and the long term implications of its use on soil physical, chemical and biological health. The initial results showed that application of biomethanated spentwash under field conditions had considerable influence on soil salinity, organic C status, available N, P, K & S content. Soil salinity increased with increase in the level of spentwash application.

Glyricidia as a component of Natural Resource Management

Glyricidia is a nitrogen fixing and large biomass producing tree species. When detopping is done it has a high coppicing ability resulting in the production of large amount of biomass. In a watershed area of the Institute it has been raised in rows on experimental basis. In between the rows of *Glyricidia*, soybean and wheat are grown during 'Kharif' & 'Rabi' respectively, to study the impact of *Glyricidia* and addition of its lopping on crop production, nutrient economy and soil health.

Status of sulphur in Indian soils

Most of the Indian soils either have low sulphur or it has been depleted due to intensive cropping of high yielding crop varieties and continuous use of high analysis sulphur free fertilisers. Analysis of 47817 surface soil samples collected from different states indicated 11 to 78 per cent S deficient soils with a mean of 41 per cent. Among 240 districts surveyed, 60 districts have 30-40% S deficient area and 72 districts tested more than 40% S deficiency.

Sulphate sorption and desorption

Studies on sulphate sorption and desorption characteristics of four acid soils viz., Oxidic Haplustalf, Typic Haplomox, Aeric Haplaquept and Typic Haplustalf revealed that sorption and desorption of sulphate varied widely among the four soils. Typic Haplomox showed the maximum sulphate

sorption capacity, whereas the mean sulphate recovery was the highest in Aeric Haplaquept.

Quantity-Intensity (Q/I) relationships of soil K

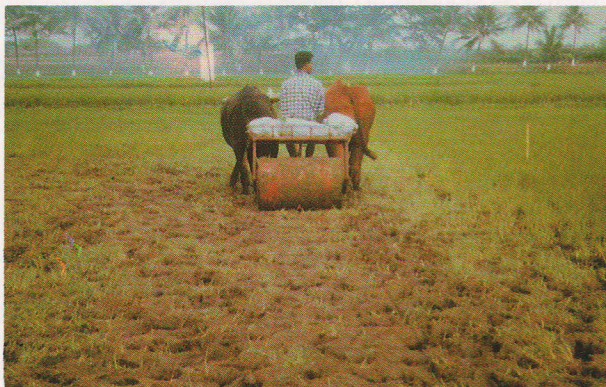
The effect of long-term cropping, fertilisation and manuring on the Q/I relationships of K in black soils (Typic Haplustert) under a soybean-wheat cropping system at Jabalpur and in alluvial soils (Aeric Haplaquept) under a rice-cropping system at Bhubaneswar showed that the values of equilibrium activity ratio, labile K and difficultly available K were in the following order : NPK+FYM > NPK > control > N > NP. The results caution that continuous cropping without K inputs affects adversely the K supply to crop plants and emphasize the need for integrated use of organics and K inputs regularly to sustain a steady supply of K to successive crop productivity.

FYM : A component of efficient water and nutrient use

Integration of FYM with recommended dose of NPK resulted in higher evapotranspiration (ET), seed yield, water and nutrient use efficiency (kg seed/kg nutrient) of soybean under rainfed condition in Vertisol.

Drum Roller - A new device for the management of fluffy paddy soil

Fluffiness, a recent creation of intensive wet cultivation of rice - rice - rice cropping sequence, leads to very low bulk density, very high hydraulic conductivity, poor anchorage to roots etc. Compaction before preparatory cultivation is recommended to manage such soils. Coimbatore centre of AICRP (Tillage) has developed "Drum Roller" having detachable parts (see photograph) with a total weight of 400 kg, required for compaction. The device has been evaluated and found effective in field.



Drum Roller : A new device for the management of fluffy rice soils - in operation.

Rice Biofertiliser trial on farmer's field

The AICRP (BNF) Centre at BHU, Varanasi has developed efficient strains of ammonia excreting BGA for rice. On a farmer's field in village Taria, Varanasi during 'Kharif 1999, combined inoculation of rice Var. HUR-36 (biofertiliser responsive) with BGA (20 kg/ha soil based inoculum), *Azospirillum* and phosphate solubilizing bacteria (2 packets each/ha) resulted in more height, greater vigour, more tillers and bolder grains than the uninoculated control. Due to inoculation 2.6 q/ha additional yield was obtained over and above 100% N application (66 kg N/ha as DAP and Urea).

Group discussion meeting of AICRPs on MD and LTFE at IARI, New Delhi

A group discussion on Farm & City Wastes Recycling in Agriculture (AICRP, MD) and Long Term Fertiliser Experiments (AICRP, LTFE) was held on July 12-13 and December 24, respectively at NBSS&LUP, Regional Station, IARI, New Delhi. Both the meetings were chaired by Dr. G.B. Singh, DDG(NRM). All the centre incharges of the respective AICRPs participated. Proposed changes in the technical programme of AICRPs on MD as well as LTFE were discussed.



Awards & Honours

Dr. C. L. Acharya received the Hari Om Ashram Trust Award from Shri Sompal, the then Union Minister of State for Agriculture, for the biennium 1997-98 on 16 July for his research contribution on Natural Resource Management (photo).



Dr. Tapan Adhikari was awarded Jawahar Lal Nehru Award for his outstanding Post-Graduate Agricultural Research for the year 1998 on July 16.

ICAR Zonal Sports Meet

During the ICAR Zonal Sports Meet held at CAZRI, Jodhpur, November 11-14, Mr. Anurag and Mr. Sukhchain Das bagged the first prize in 100 m sprint and second prize in cycling, respectively.

Events

Independence Day : Independence day was celebrated with great enthusiasm. All the staff members alongwith their families participated in various cultural activities.

Farmers' Day : A farmers' day was organized on September 29 in Mugaliahat village, Bhopal to demonstrate the benefits of IPNS technology. Around 200 farmers participated and visited the IPNS trials.



World Food Day : World Food Day was celebrated on October 16. On this occasion Dr. K.K. Chakravarty (IAS), Director, *Indira Gandhi Rashtriya Manav Sangrahalaya*, Bhopal delivered a talk on the theme "Youth Against Hunger". A symbolic "Run for Food Security" was also organized in which all the scientists and staff of the Institute participated.



Inter-Institutional Collaboration

Inter-Institutional (IISS and CIAE) collaborative project on 'Long-term tillage management with differential nitrogen on soybean-wheat and rice-wheat cropping systems in Vertisols' has been initiated.

Participation in Seminar/ Symposium/Training Programme

Dr. C. L. Acharya: Workshop on DFID-Integrated Nutrient Management Research Project at Ranchi, October 4-7; 64th Annual Convention of ISSS at TNAU, Coimbatore, November 26-28 and FAI Annual Seminar at Delhi, December 9-11.

Dr. K.G. Mandal: Group Meeting on Strategic Issues for Doubling the Productivity of Oil Seed based Production System by 2010 AD at GAU, Junagarh, September 10-12.

Drs. A.K. Misra and D. Damodar Reddy: Training Workshop on Data Base Management System at ICRISAT, Hyderabad, November 15-26.

Dr. T. R. Rupa: 64th Annual Convention of ISSS at TNAU, Coimbatore, November 26-28.

Dr. M.V. Singh: Indo-Italian Workshop on Organic and Organo-Mineral Fertilisers Market Research as expert at FEDERCHIMA, Milan, Italy, October 11-13.

Dr. A. Subba Rao: Workshop on DFID-Integrated Nutrient Management Research Project at Ranchi, October 4-7 and Regional Seminar on Soil Testing MPAU, Rahuri, December 16-17.

Dr. Anand Swarup: As member accompanied a team of experts for reviewing the IRRI's Project at Thanjavur, India and Manila, Phillipines, September 7-16.

Drs. R. B. R. Yadav and S. Ramana: 69th Annual Session of The National Academy of Sciences (India), Barkatullah University, Bhopal, November 11-13.

Distinguished Visitors

Drs. Ram Dalal and Tony Fischer, ACIAR, Australia on August 24-27.

Dr. Joe T. Richie, Professor, Homer Nowlin Chair, Michigan State University, USA on August 25-27.

Dr. Patricia Imas, IPI Coordinator for India and Mr. S.K. Bansal, Potash Research Institute of India, Gurgaon on August 30.

Dr. R.G. Saxena, Jt. Secretary to Govt. of India, Commission for Agricultural Costs & Prices, New Delhi on November 10.

Drs. Sahidul Islam, M. Mahbubur Rahman and G.M. Panullah, Bangladesh Delegation on November 10.

Dr. Ramazan K. Kuziev, Director, Institute of Soil Science and Agrochemistry, State Committee of Land Resources, Republic of Uzbekistan on November 16.

Prof. Abit Ramazanov, Tashket Institute of Irrigation and Mechanisation, Tashkent, Republic of Uzbekistan on November 16.

Dr. R.N. Roy, Senior Officer, FAO of the United Nations, Rome, Italy on November 19.

Dr. K.D. Singh, Head, Central Soil & Water Conservation Research & Training Institute, Research Centre, Kota on November 23.

A batch of 34 students of College of Forestry, Dr. Y. S. Parmar Univ. Horticulture & Forestry, Naini, Solan on December 27.

Dr. H.P. Singh, Director, CRIDA, Hyderabad on December 30-31.

Staff News

New Staff Joined the Institute

Smt. Indu Modyani, Jr. Clerk, July 24.

Dr. A.K. Biswas as Sr. Scientist, August 23.

Dr. Ajay, Sr. Scientist, August 31.

Dr. J.K. Saha as Sr. Scientist, September 1.

Dr. P. Ramesh, Sr. Scientist, September 10.

Dr. P.K. Ghosh, Sr. Scientist, September 13.

Shri Somnath Mukherjee, Jr. Clerk, September 30.

Shri Manoranjan Mohanty, Scientist, November 10.

Dr. K.K. Bandopadhyay, Scientist, November 15.

Dr. R.S. Choudhary, Sr. Scientist, December 8.

Shri N. Showri Raju, Scientist, December 8.

Mrs. K. Alivelu, Scientist, December 9.

Staff left the Institute

Shri V.B. Padmanabha, July 31.

Dr. K.K. Barman, Scientist, September 15.

Dr. Tapan Adhikari on Deputation to Israel, November 17.