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## 22 वीं अनुसंधान सलाहकार समिति की बैठक की कार्यवाही

Proceedings of XXII Research Advisory Committee Meeting

४-५ अप्रैल, २०१६

4-5 April, 2016



भा.कृ.अनु.प.- भारतीय मृदा विज्ञान संस्थान  
नबीबाग, बैरसिया रोड, भोपाल - 462038

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

## **Proceedings of the XXII RAC meeting of ICAR-IISS held on April 4-5, 2016**

The XXII meeting of the Research Advisory Committee (RAC) of the Institute (Second meeting of the current RAC) constituted vide the council letter no. NRM/12-16/2014-IA-II dated November 7, 2014 was held on April 4-5, 2016 at the Committee Room of ICAR-IISS, Bhopal. The following members were present:

1. Dr. C.L. Acharya	Chairman
2. Dr. T.K. Adhya	Member
3. Dr. N.S. Raghuwanshi	Member
4. Dr. S.K. Chaudhari, ADG (SWM), ICAR	Member
5. Dr. A.N. Ganeshamurthy	Member
6. Dr. A.K. Patra, Director, ICAR-IISS	Member
7. Dr. Pradip Dey, PC(STCR)	Member Secretary
8. Dr. Muneshwar Singh, PC(LTFE)	Special Invitee
9. Dr. A.K. Shukla, PC(MSN)	Special Invitee
10. Dr. D.L.N. Rao, NC (SBB&BF)	Special Invitee
11. Dr. A.K. Biswas, HOD, SC&F	Special Invitee
12. Dr. R.S. Chaudhary, HOD, Soil Physics	Special Invitee
13. Dr. M.C. Manna, HOD, Soil Biology	Special Invitee
14. Dr. J.K. Saha, HOD, ESS	Special Invitee

In addition to above, all the scientists of ICAR-IISS, Bhopal were present. Dr. (Mrs.) A. Juwarkar, Sh. Vilasrao Vishwanath Shringarpawar and Sh. Sunil Tanaji Katkar could not attend the meeting due to their preoccupations. The RAC deliberated on the work in progress and thrust areas of research keeping in view the mandate and vision of the Institute and made recommendations. A visit to the farm and research facilities including in laboratories was also organized. The Agenda Notes and Action Taken Report on the proceedings of the XXI meeting of the RAC held on January 30-31, 2015 were circulated beforehand. Action taken report has been provided in Table 1 and detailed Programme of XXII RAC Meeting in Annexure-I.

### **Welcome by the Member-Secretary**

The meeting started with ICAR song. This was followed by lighting of lamp by Chairman and Members of RAC. At the outset, Dr. Pradip Dey, Member Secretary welcomed the Chairman and all other Members including Special Invitees of the RAC along with other scientists and informed that as a follow up of the Proceedings of the XXI RAC meeting (January 30-31, 2015) a critical review of the research projects was done in the IRCs. He also mentioned that ICAR-IISS is eagerly looking forward for objective reinforcement of research work of the institute from the RAC.

## Confirmation of the minutes of the last (XXI) meeting of RAC

The Member-Secretary informed that the proceedings and recommendations (Council letter No. NRM-1-18/2013-SW&DF dated 10<sup>th</sup> April, 2015) of the last (XXI) meeting of the RAC held on January 30-31, 2015 has already been circulated to all.

## Review of the Action Taken Report (ATR) on the XXI RAC Meeting

The Member Secretary presented the Action Taken Report on the issues raised in the XXI meeting of the RAC. The Action Taken Report with respect to action points raised during the last (XXI) RAC Meeting and the action taken on those points are mentioned in Table 1 below which, after elaborate discussions, was confirmed and approved by the RAC.

**Table 1. Action Taken Report on the recommendation of the XXII RAC Meeting**

S.No.	Recommendation	Action taken report
1.	In the context of changing climate and input use scenario, effect on crop productivity and soil health through initiating satellite experiments as well as studies on water and nutrient interaction, water balance, soil physical health and water management under conservation agriculture should be taken up.	<ul style="list-style-type: none"><li>• Under the Consortium Research Platform on conservation agriculture a project “Development, refinement and validation of conservation agriculture (CA) in Vertisols of central India and quantifying impact of CA practices on soil and environment” has been initiated.</li><li>• Changing climate has got its influence on productivity as evident of decline in productivity at Jabalpur. It is due to increase in minimum temperature during rainy season especially during August and rain distribution pattern. On the other hand increase in productivity of winter wheat is due to decline in minimum temperature during the month of December and January and total no. of cold days which was increased seems to be responsible.</li><li>• To confirms the results of on farm experiments, satellite experiments including TSP demonstrations are being conducted at farmers’ fields and results are more or less similar. It has been noted that wherever farmers are getting more productivity, the soil health is better than the farmer’s’ gets the less yields.</li><li>• The institute has initiated a CRP on CA wherein a total of 11 institutes are involved in a consortia mode to work on all issues pertaining to soil health including nutrient and water interaction water storage and balance, soil physical, chemical and biological parameters to study tangible and intangible benefits under CA vis-a-vis conventional</li></ul>

		agriculture.
2.	Measurement of root architecture in non-symbiotic fungal endophytes under upland situation, standardization of medium and comparative efficacy of the strains on <i>Frankia</i> as well as nutrient cycling microbes particularly C, N, P, S and Zn for enhancing nutrient use efficiency and feasibility of organic farming in different areas of India should be attempted.	<ul style="list-style-type: none"> <li>• Non-symbiotic fungal endophytes (<i>Aspergillus</i> sp., <i>Trichoderma</i> sp. and <i>Fusarium</i> sp.), did not improve root dry matter of rice var. Kalinga III at maximum tillering stage under moisture stress significantly. Root architecture study is in progress. Another expt. has been set with three other endophyte isolates.</li> <li>• Symbiotic-AM fungi (AMF- <i>Glomus intraradices</i>) improved the root length density, total root length, root diameter, root volume and root surface area in both AM-responsive (cv. Sathi 34-36) and non-responsive (cv. Jonga) rice varieties.</li> <li>• Growth of <i>Frankia</i> isolated from <i>Alnus</i> spp., and <i>Casuarina</i> spp showed that maximum growth was found in DPM medium. The colonies of <i>Frankia</i> were submerged in agar, very small (0.5-3.0mm), starfish shape and microscopically appeared as hyphae and vesicles. Isolates of two species <i>Casuarina equisetifolia</i> and <i>Alnus nitida</i> were screened for PGP traits (P-solubilization and growth on nitrogen free medium). The experiments on plant infection test under lab conditions and other PGP traits are in progress.</li> <li>• Lignocellulolytic thermophilic bacteria and actinomycetes have been identified and used them for recycling of wide C: N Ratio waste materials.</li> <li>• Quantified free living N fixing bacteria and phosphate solubilizing microbes (PSM) from different bio-dynamic preparation and used them for growth performance of wheat under organic farming.</li> <li>• The practice of organic farming in different areas of India has been reviewed and compiled for documentation.</li> </ul>
3.	Defining applicability, history of management and efficiency under different conditions for fertilizer prescription equations and critical limits of micronutrients should be tested.	<ul style="list-style-type: none"> <li>• District wise applicability of fertiliser prescription equations as influenced by history of management and response ratio under different agroecological regions have been documented and transferred to DAC, Ministry of Agriculture and Farmers Welfare which was included in the online DSS developed under soil health scheme of Govt. of India (<a href="http://soilhealth.dac.gov.in/">http://soilhealth.dac.gov.in/</a>).</li> </ul>

		<ul style="list-style-type: none"> <li>The critical limits found to vary with micronutrient, crops, soil, and the extractants used. Critical limits of micronutrients identified in a particular soil type may not be applicable in other soil types. For instance, critical limit for Zn is 0.60 mg kg<sup>-1</sup> soil for most of the soils, however it is different in Gujarat (0.50 mg kg<sup>-1</sup> soil) and Tamil Nadu (1.20 mg kg<sup>-1</sup> soil). Similarly critical limit for Fe varies from 3.5 to 7.0 mg kg<sup>-1</sup> soil.</li> </ul>
4.	<p>Work on alternatives to liming material and amelioration of sub-surface acidity, corrective measures by reframing Walkley-Black C rating and developing ready-reckoner of available N and mechanism of micronutrients enrichment for different soil types need be taken up.</p>	<ul style="list-style-type: none"> <li>A pilot project on working on alternatives to liming material has been taken up at the institute and data on the same are being presented in the RAC meeting.</li> <li>The division has already developed a C &amp; N model based on LTFE data. The model predicts available N based on WB-carbon and some simple measurable parameters like temperature, rainfall and silt plus clay content of soils. Predictability of available N has improved considerably across agro-ecological regions by this model.</li> <li>A wide variation in micronutrients concentration exists among the crops, and between the cultivars of same crops. The mechanism of variation is governed by large number of physiological, rhizosphere and anatomical factors; such factors were considered for selection of cultivars. The selected cultivars of rice and wheat were grown under sand cultivars/ hydroponics with and without Zn application which showed changes in solution pH. In rice, change in solution pH did not differ significantly except in cv. Jaya (inefficient). Under Zn stress condition cv. Jaya exuded higher concentration of organic acid than that of tolerant variety Pant Dhan 19. Similarly, under Fe stress condition the release of organic acid was more in pigeon pea in both efficient and inefficient cultivars. However, the rate of release was more in efficient cultivars than inefficient cultivars. In wheat, reduction in solution pH ranged from 0.20 to 0.47 units due to release of organic acid and phytosiderophores.</li> </ul>

5.	<p>Studies on determination of maximum safe concentration limits of heavy metals for major soil types of the country, bio-safety mechanism for working with nano particles and on-site reclamation of agricultural land in the identified industrially polluted area need to be taken up.</p>	<ul style="list-style-type: none"> <li>• As suggested by the chairman RAC, ESS division has taken up a new institute and extramural research project on “Determination of critical limits of Cd, Pb and Cr for major soil orders in India”. The bulk soil samples for the experimental study were collected from Indore (black soil) and Kanpur (alluvial soil) for determination of safe concentration limit of heavy metals. Bulk soil sample collection representing red soil from Coimbatore district and pot culture experiment study is initiated.</li> <li>• There is, at present, no evidence to suggest that nano particles (NP) pose a significant environmental hazard. The absence of evidence should not be taken as proof that environmental impact will not occur. Because of the several unknowns about possible health hazards due to NPs, we need to adopt some protective measures to reduce the extent of exposure to NPs in work place. In this line, Division of Environmental Soil Science published a pamphlet on “Understanding the behavior of NPs and their safe handling”.</li> <li>• Environmental Soil Science division is conducting on site Cr reclamation (phytoremediation-phytostabilization) experiments at farmers’ fields contaminated with heavy metals particularly in tannery belt of Unnao, Kanpur. On-site field experiments on phytoremediation are being conducted in sewage effluent irrigated villages of adjoining Patranala. Several mustard varieties from Directorate of Rapeseed-Mustard Research, Bharatpur are being evaluated for their efficiency of heavy metals removal.</li> </ul>
6.	<p>Data sharing at institute level and data harmonization at national level with proper IP protection should be ensured.</p>	<ul style="list-style-type: none"> <li>• As per ICAR guidelines, data is being maintained at PME cell. The GPS/GIS based soil fertility data has been handed over to NBSS&amp;LUP, Nagpur for archiving. Districtwise applicability of STCR equations transferred to DAC, Ministry of Agriculture and Farmers Welfare which was included in the online DSS developed under soil health scheme of Govt. of India (<a href="http://soilhealth.dac.gov.in/">http://soilhealth.dac.gov.in/</a>).</li> </ul>

7.	Water harvesting in ponds with silpaulin lining should be taken up to conserve water for raising good crops under different experiments.	<ul style="list-style-type: none"> <li>Action has been initiated; it is planned to procure the silpaulin departmentally and line the pond at Institute level.</li> </ul>
8.	In all experiments on conservation tillage (zero, minimum, zero tillage with surface retained residues) sowing and fertilizer application operations should be done with an appropriate implements/ machinery like Happy seeder.	<ul style="list-style-type: none"> <li>In all experiments on conservation tillage sowing operations were carried out with zero till seed drill, strip till seed drill and Happy seeder. The strip till seed drill and happy seeder were hired from CIAE, Bhopal. Two happy seeders, herbicide sprayer, strip till seed drill will be procured this year under CRP on Conservation Agriculture project.</li> </ul>

### Remarks of the Director and progress report of the Institute

At the outset Dr A.K. Patra, Director, ICAR-IISS welcomed the Honourable Chairman and Members of RAC and apprised them about the new initiatives taken after the last meeting of the RAC held on January 30-31, 2015 . In his introductory remarks, he briefly presented the salient achievements of the Institute. He highlighted several important issues related to soil health, nutrient use efficiency and soil health card for farmers. He also highlighted importance of soil in day-to-day life and overall well being. However, this also reposes a greater responsibility to Soil Scientists towards not only their usual role of doing research on the management of soil resource but also towards creating awareness among people on the roles of soils in the sustenance of whole civilization.

He also highlighted that institute has developed a quick and portable minilaboraotry named "Mridaparikshak" which can determine the important soil health parameters and prescribe fertilizer nutrient rates for different crops and soils based on computed parameters to the farmers. He also highlighted the work done on farmers' participatory research and demonstration of the technologies at farmers' fields. Notably the institute has worked in some tribal districts of Madhya Pradesh.

### Address by the RAC Members

Dr. T.K. Adhya, Member, RAC in his address, urged the feedback from end users should be used. He emphasized for developing enrichment technique of FYM with biofertilisers and micronutrients. He further added that the role of soil biology in eco-efficient agriculture should be studied / refined with feedback from end users. He also emphasized the importance of the utilizing microbial diversity in enhancing farmers' income vis-à-vis soil fertility and human health.

Dr. A.N. Ganeshamurthy Member, RAC in his address mentioned that the second green revolution will come from judicious management of natural resources. He urged to initiate work on microbial consortium for improving crop yield. He highlighted the importance of

technology commercialization and asked for focused attention of the Institute in this regards.

Dr. N.S. Raghuwanshi, Member, RAC in his address mentioned that Indian agriculture is at a cross road and climate change is a reality. Water availability and climatic data needs to be documented in different experiments. He added that soil-plant-human health vis-à-vis food chain contamination need to be addressed. He stressed upon the requirement of enhancement of international visibility of the Institute and opined that the same may be achieved by publishing good papers in high impact journals.

Dr. S.K. Chaudhari, ADG (SWM) in his address congratulated the soil scientists who have helped in winning the Mahindra Samridhi Krishi Sansthan Samman 2016, as National Winner, a recognition given to a Public Sector Organization (PSO). He urged that ICAR-IISS should intensify the research programme on water and nutrient use efficiency jointly and not in isolation. He opined that climate change by global warming, which refers to the average increase in global temperature, has become a megatrend that will lead to significant global changes in the future. Everywhere, rising temperatures will translate into increased crop water demand. Both the livelihoods of rural communities and the food security of a predominantly urban population are therefore at risk from water-related impacts linked primarily to climate change. The rural poor, who are the most vulnerable, are likely to be disproportionately affected.

### **Address by the Chairman**

Dr. C.L. Acharya, Chairman, RAC in his introductory remarks expressed his satisfaction to the scientific work being carried out by ICAR-IISS, Bhopal and large number of technology demonstrations at farmers' fields, but stressed the need to accelerate the technology and knowledge empowerment of farmers. He advised the scientists to organize the activities so the results are more oriented towards the goals and mandate of the Institute. Chairman stressed upon the need to take up the research activities on pulse and fodder production as livelihood system. He called for greater efforts for developing national and international linkages and focus on farmers' centric research and value addition to enhance the income of the farmers. He highlighted about the challenges of land diversion and pollution of groundwater besides climate change. He opined that conservation agriculture is not a myth any more, it's a reality and hence it has to be taken to a logical point for sustainable intensification of agriculture. He also mentioned that favourable change in hydro-thermal regime and enhancement of nutrient use efficiency will help in mitigation of climate change and improvement of soil health.

### **Presentation by Head of Division and Project Coordinator**

Earlier achievements of all the Divisions and AICRPs were presented by respective HoDs and PCs, the brief of which is given below:

#### ***Division of Soil Chemistry and Fertility***

Dr. A.K. Biswas, Head, Soil Chemistry and Fertility Division (SC&FD) highlighted the research activities and other developmental works undertaken by the Division. The Division has been working on issues concerning soil health improvement and enhancing input use efficiency through product development strategy including use of nano particles of micronutrients, agronomic interventions, use of soil amendment like biochar, integrated

nutrient management and conservation agriculture. The study on use of biochar on acid soils suggests that *Leucaena* biochar may serve as an alternative liming material in highly acidic soil. A new mini lab named *Mridaparikshak*, for estimating 15 soil parameters and generating fertilizer recommendations for specified targets of selected crops has been developed in collaboration with M/s Nagarjuna Agrochemicals Pvt. Ltd., Hyderabad; soil health cards can also be generated which can be transmitted to farmers' mobiles. Two externally funded projects on effect of climate change on nutrient uptake and monitoring changes in soil health in important crop growing regions of the country have been initiated.

### ***Division of Soil Physics***

Dr. R.S. Choudhary, Head, Soil Physics Division (SPD) highlighted the achievements made under conservation agriculture, the division has worked on refinement of CA and its component technologies viz. weed control, tillage machinery and cropping system through on station and farmers field trials. He also mentioned that under long term fertilizer and manure management practices, the balanced fertilization and addition of FYM was found to be superior management practice with respect to carbon sequestration (soil aggregate carbon fractions) in Vertisols. Under climate change scenarios, each degree centigrade increase in temperature resulted in 0.3 tons/ha reduction of maize grain yields in the state of Madhya Pradesh. He also highlighted the study initiated to develop and validate chemometric models for prediction of soil properties using middle infra-red spectroscopy techniques. The results indicated that MIR spectroscopy could potentially be used for prediction of soil properties in Vertisols.

### ***Division of Soil Biology***

Dr. M.C.Manna, Head, Soil Biology Division (SBD) highlighted the brief achievements of different projects. Microbial species associated with bioenergy crop *Jatropha curcas* found to produce significant amount of phytohormone Indole Acetic Acid (IAA), phosphatase and ACC deaminase activity which can be exploited further for agricultural use. Metagenomic diversity of bacteria associated with bioenergy crop *Jatropha curcas*, revealed high microbial diversity in phyllosphere and rhizosphere. *Methylobacter* sp can minimize greenhouse gas (CH<sub>4</sub>) emission from compost pits when were inoculated with these methanotrophs. He also mentioned that after 39 years of Maize-wheat system, the content of water soluble carbon, carbohydrates and particulate organic matter carbon decreased substantially with decrease in aggregates size classes. However glomalin content was relatively greater in silt+clay fraction as compared to microaggregate. Mesophilic fungi such as *Trichoderma viride*, *Aspergillus heteromorphus*, *Rhizomucor pussilus*, *Aspergillus flavus*, *Aspergillus terrus* and *Aspergillus awamori* have significant role for removal of heavy metals from MSW compost. Cotton crop exhibited tolerance to different heavy metals i.e., Cd (200 mg kg<sup>-1</sup>soil), Pb (1000 mg kg<sup>-1</sup>soil) and Cr (50 mg kg<sup>-1</sup>soil).

### ***Division of Environmental Soil Science***

Dr. J.K. Saha, HOD (ESS) highlighted the application of sludge from effluent treatment plants enhanced production of maize, wheat (food grain) and spinach (vegetable) but at the same time concentration of heavy metals Cd, Pb and Zn in soil and Cd, in Spinach leaves increased significantly. In an interaction study, Sodium and Calcium were found to reduce chromium uptake by spinach. Long-term use of sewage water irrigation was found to be a good means of carbon sequestration in Vertisol in addition to saving in fertilizers

requirement. The Division accomplished information on baseline concentration of heavy metals in black soils for delineating contaminated areas of central India. Soil Quality Assessment was carried out in Tribal Districts Alirajpur of Madhya Pradesh for the purpose of enhancing crop productivity in the area. Nano porous synthetic zeolite, nano rock phosphates and nanoZnO were investigated for their role in enhancing nutrient use efficiency. Effect of seed soaking pre-treatment with nano-anatase (TiO<sub>2</sub> nano particles) on some physiological attributes of maize was studied. A telemetry network has been developed and installed in response to an increasing need for accurate, real time soil moisture data to assist irrigation scheduling in time on CIAE farm.

### ***AICRP (Long Term Fertiliser Experiment)***

Dr. Muneshwar Singh, PC (LTFE) presented the highlights of AICRP (LTFE). Use of urea alone is detrimental to soil health particularly in Alfisols. Organic manure is an alternative to lime for sustaining acid soil productivity by chelating Al<sup>3+</sup>. In Western Ghat *in situ* green manuring saved 50% NPK and sustained soil productivity and increased profit of farmers by Rs. 5000/ ha<sup>-1</sup>. In intensively cultivated area reduction in P dose to half to reutilize accumulated P saved Rs. 5000 crores on foreign exchange on P import. Sulphur and Zn are essential to sustain rice-wheat productivity in *Tarai* belt. To maintain present level of soil carbon, needs to add annually 2200 and 2500 kg C ha<sup>-1</sup> in Vertisols of Jabalpur, and Akola respectively and 1800 kg C ha<sup>-1</sup> in Alfisols of Ranchi. Threshold values of carbon in incetisols of Ludhiana is 2000 kg C ha<sup>-1</sup> whereas in Delhi it was 3700 kg C ha<sup>-1</sup>. The threshold values of carbon differ with soil to soil because it depends on initial carbon status, clay and silt content, temperature and rainfall of area. Vertisols are rich in clay so amount of carbon added is retained by clay and the loss is less. The higher threshold value of carbon at Delhi is due to initial higher carbon content compared to Ludhiana. The soil of Ranchi is light textured and initial content was less so values is less.

### ***AICRP (Micro and Secondary Nutrients)***

Dr. A. K. Shukla, PC (MNS) highlighted the GPS based delineation in 45 districts for micro and secondary nutrients. He reported that the overall deficiency status was Zn-39.9%, Fe-14.8%, Mn- 8.6%, Cu-6.2%, S-33% and B-21.8%. It was observed that critical limits of micronutrients identified in a particular soil type may not be applicable in other soil types. For instance, critical limit for Zn is 0.60 mg kg<sup>-1</sup> soil for most of the soils, however, it is different in Gujarat (0.50 mg kg<sup>-1</sup> soil) and Tamil Nadu (1.20 mg kg<sup>-1</sup> soil). He further added that the critical limits of S, Zn, B, Mn and Cu in different crops and soils were revisited. AICRP (MSN) identified genetically and/or agronomically efficient cultivars of rice, wheat, maize, chickpea and pigeon pea for soils having low Zn, Mn and Fe status. Also studies on trace elements in soil-plant-animal/human continuum in collaboration with AIIMS, Bhopal have been initiated.

### ***AINP (Soil Biodiversity- Biofertilizers)***

Dr. D.L.N. Rao, PC (SBB) highlighted about microbial diversity studies in which several hundred rhizobial isolates of legumes in arid regions of Haryana and hyper-arid zone of Rajasthan were isolated and characterized for nodulation, plant growth promoting activity, drought and temperature tolerance. Promising strains identified were for cluster bean, pigeonpea and mung bean in field screenings. He also added that in soil genomics studies the relative proportion of copiotrophic bacteria like Actinobacteria and Proteobacteria (Alpha, Beta and Deltaproteobacteria) were higher in organic soil; whereas the proportion

oligotrophic bacteria like Gammaproteobacteria were more in chemically fertilized soils. Dr. Rao highlighted further work on developments of new microbial inoculants like *Arthrobacter* and *Actinomycetes* in Vertisols; work on post-sowing application of liquid biofertilizers, biofertilizer packages and trials all over India for various crops, organic packages in north-east based on microbially enriched composts; revenue generation from biofertilizers and demonstrations in tribal areas and livelihood improvement.

### ***AICRP (Soil Test Crop Response)***

Dr. Pradip Dey, PC (STCR) highlighted that district wise applicability of fertiliser prescription equations as influenced by history of management and response ratio under different agroecological regions have been documented and transferred to DAC, Ministry of Agriculture and Farmers Welfare which was included in the online DSS developed under soil health scheme of Govt. of India (<http://soilhealth.dac.gov.in/>). He further added about the development of prescription equations for different crops and cropping systems besides IPNS-STCR to recommend nutrients through inorganic and locally available organics. He also apprised RAC about multi-locational follow-up trials and FLDs conducted at different centers as well as under Tribal Sub Plan (TSP) resulting higher response and benefit: cost ratio. STCR long-term demonstration trials in progress across the country demonstrated the value of targeted approach in terms of yield sustainability and soil fertility maintenance.

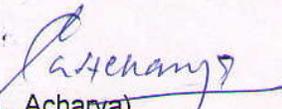
On the second day the committee members reviewed the suggestions, observations and recommendations made in general, and specific to individual projects during the presentations.

### **After detailed discussion, RAC finalized the following recommendations:**

1. Strategic entry point of every project including conservation agriculture has to be conservation of water and soil resources apart from other inputs; all Institute projects have to be mandated to create facility for generation, conservation and management of water resources and other inputs. Focused work on conservation agriculture for chickpea and soybean should be taken up.
2. As per Government mandate, entire urea is going to be distributed as *neem* coated urea and hence the institute needs to initiate work on efficiency and savings N from *neem* coated urea.
3. Critical analysis of soil organic carbon, micronutrient and setting up long-term ecological sites for addressing microbial diversity in major agro-ecological regions need to be taken up.
4. Studies on impact of disposal of municipal waste, sewage application in peri-urban agriculture and ground water pollution due to  $\text{NO}_3^-$  and pesticides may be attempted.
5. Methodology for easily measurable parameters for soil physical and biological properties should be developed and disseminated.
6. Economic evaluation and scope of applicability of technologies developed by the Institute should be done.

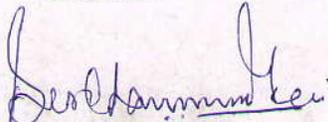
The meeting ended with the vote of thanks to the Chair, Hon'ble Members of the RAC and all others present in the meeting as well as all those who helped directly and indirectly for successful organization of the XXII RAC Meeting.

Chairman and Members of the Research Advisory Committee of ICAR-Indian Institute of Soil Science, Bhopal express their heartfelt thanks to Dr. Trilochan Mohapatra; Secretary, DARE and Director General, ICAR and Dr. A.K. Sikka; DDG (NRM) for providing opportunity to strengthen the research work of the Institute. They also thank the Director, Member Secretary and all Staff ICAR-IISS for facilitating the work and visit of the Research Advisory Committee on April 4-5, 2016.

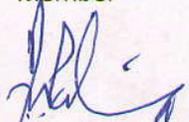
  
(C.L. Acharya)  
Chairman

  
(T. K. Adhya)  
Member

  
(N.S. Raghuwanshi)  
Member

  
(S.K. Chaudhari)  
ADG (SWM)  
& Member

  
(A. N. Ganeshamurthy)  
Member

  
(A.K. Patra)  
Director  
& Member

  
(Pradip Dey)  
PC (STCR) & Member -Secretary



## Programme of XXII RAC Meeting of ICAR – Indian Institute of Soil Science, Bhopal

**Date: April 4-5, 2016**

**Venue: Committee Room**

<b>April 4, 2016</b>		
<b>Time</b>	<b>Topic</b>	<b>Speaker</b>
10:00 – 10:03	ICAR Song	
10:03 – 10:05	Lightning of Lamp	
10:05 – 10:15	Brief Welcome	Dr. Pradip Dey Member Secretary, RAC
10:15 – 10:25	Welcome	Dr Ashok K. Patra Director, ICAR - IISS
10:25 – 10:40	Remarks	Members of RAC
10:40 – 10:55	Inaugural Address	Dr C.L. Acharya Chairman, RAC
10:55 – 11:15	Presentation of ATR and Confirmation of proceeding of previous meeting	Dr Pradip Dey Member Secretary (RAC)
10:15 – 11:30	Salient achievements of the Institute	Dr Ashok K. Patra Director, ICAR-IISS
11:30 – 11:45	Hi - Tea	
<b>Presentation of Significant Achievements by HoDs</b>		
11:45 – 12:00	Division of Soil Chemistry & Fertility	Dr A.K. Biswas
12:00 – 12:15	Division of Soil Physics	Dr R.S. Choudhary
12:15 – 12:30	Division of Soil Biology	Dr M.C. Manna
12:30 – 12:45	Division of ESS	Dr J.K. Saha
12:45 – 13:45	Remarks of RAC on the above presentation	Chairman & Members of RAC
13:45 – 14:30	Lunch Break	
14:30 – 16:00	Laboratory visit	Chairman & Members of RAC, Director, HODs and PCs
16:00 – 17:00	General Discussions	Chairman & Members of RAC, Director, HODs and PCs
<b>April 5, 2016</b>		
<b>Presentation of Significant Achievements of AICRPs by PCs</b>		
10:00 – 10:15	AICRP on Long Term fertilizer Experiment	Dr Muneshwar Singh
10:15 – 10:30	AICRP on Micro and Secondary Nutrients	Dr A.K. Shukla
10:30 – 10:45	AINP on Soil Biodiversity & Biofertilisers	Dr D.L.N. Rao
10:45 – 11:00	AICRP on Soil Test Crop Response	Dr Pradip Dey
11:00 – 12:00	Remarks of RAC on the above presentation	Chairman & Members of RAC
12:00 – 13:30	Field visit	Chairman & Members of RAC
13:30 – 14:30	Lunch Break	Chairman & Members of RAC, Director, HoDs and PCs
14:30 – 16:30	Finalization of Recommendations	Chairman & Members of RAC
15:30 – 16:55	Concluding Remarks	RAC and all participants
16:55 – 17:00	Vote of Thanks	Dr Pradip Dey Member Secretary, RAC