Proceedings of the National Seminar on

Managing Land Resources for Sustainable Agriculture

October 12-13, 2012

Organized by

Indian Society of Soil Survey and Land Use Planning,

National Bureau of Soil Survey & Land Use Planning, Nagpur

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CONTENTS

Proceedings of the Seminar

A two day National Seminar on "Managing Land Resources for Sustainable Agriculture" was organized by Indian Society of soil Survey and Land Use Planning (ISSLUP) and National Bureau of Soil Survey and Land Use Planning (NBSS&LUP), Nagpur during October 12-13, 2012 at NBSS & LUP Campus, Amravati Road, Nagpur.

12th October, 2012 (Friday)

Inaugural Session

The inaugural function commenced with the invocation song. Dr. Dipak Sarkar, President ISSLUP and the Chairman, Organising Committee welcomed the dignitaries and the delegates. Brief remarks of Dr. M. Velyutham, Former Director, NBSS&LUP, Nagpur; Dr. S.M. Virmani, Former Principal Scientist, ICRISAT, Hyderabad and Dr. R.G. Dani Vice Chancellor, Dr. PDKV, Akola were contemporary and set the tone of the National Seminar. During this auspicious occasion the guests released the following publications.

Chief Guest and Guests of Honour lightening the traditional lamp at the inaugural function.

Later Dr. A.K. Singh, DDG (NRM), ICAR, and the Chief Guest New Delhi gave an inaugural address which was followed by the presidential address by Dr. C.D. Mayee, Former Chairman, ASRB, New Delhi.

Dr. A.K. Singh, DDG (NRM), ICAR, New Delhi delivered the *inaugural address.*

Dr. Dipak Sarkar, Director, NBSS&LUP, Nagpur and President ISSLUP presided over the function and welcomed all the dignitaries and delegates of the Seminar and presented an overview of the Seminar and Dr. S. Chatterjee, Principal Scientist NBSS&LUP conducted the programme. The inaugural function came to an end with a formal vote of thanks by Dr. T.K. Sen, Organizing Secretary.

There were three memorial lectures, one special lecture; three oral technical sessions and two poster presentations sessions in the technical session. The first memorial lecture was given by Dr. A.K. Singh on "Soil survey – need for a paradigm shift" in the memory of Late Dr. S.V. Govindarajan. This was chaired by Dr. M. Velayutham, co-chaired by Dr. Ramesh Chand and Dr. Rajeev Srivastava acted as rapporteur. The detail of this presentation is given below.

The details of the programme are provided in **Annexure I**.

A total 156 delegates were registered. The registration was completed in the first hour of the inaugural programme on 12th October, 2012. **Annexure II.**

Special Moments

Dr. S. V. Govindrajan Memorial Lecture

The first memorial lecture was given by Dr. A.K. Singh on "Soil survey – need for a paradigm shift" in the memory of Late Dr. S.V. Govindarajan. This was chaired by Dr. M. Velayutham, Co-chaired by Dr. Ramesh Chand and Dr. Rajeev Srivastava acted as rapporteur. The detail of this presentation is given below.

Dr. A.K. Singh highlighted the importance of soil information system and maintenance of land quality for raising agricultural production to meet the needs of growing population on a sustainable basis. He presented a sample of soil parameters routinely incorporated in soil survey report and urged the scientists to have a relook into the parameters and incorporate some additional parameters such as biological parameters, types of clay mineral, water retention properties etc. which could be useful for assessing the soil quality and appropriate cropping systems suited to different AESRs. He emphasized the need for development of robust soil PTFs using mathematical models to derive information about additional soil quality parameters (in the soil survey reports), which are not readily measurable (e.g. hydrological parameters).

The role of cadastral map in the transfer of agro-technology from lab to land work was highlighted. He further stresses upon the farm level planning for sustainable agriculture .finally he advised that land use plan will be viable only if it is based on reliable soil information emanating from soil survey and mapping. The criteria for soil rating for plant growth (SRPG) based on soil properties and landscape information. Physical and chemical condition should be given due weightage while developing of land use plans.

The Oral presentations in different Technical Sessions started after lunch.

Oral Presentations

The special lecture presented by Dr. Ramesh Chand on "Agricultural issues and concerns for XIIth five year plan" was chaired by Dr. C.D. Mayee, Dr. G.S. Sidhu acted as rapporteur. The brief of this presentation is shown below.

Dr. Ramesh Chand at the outset compared the land as the 'Mother' which should be cared properly and should be saved from its misuse and abuse. Relation between land and economics is very old. Since old ages while reciting the sacred Guru Granth Sahib, the importance of land and its proper use is the need of the day. He shared that 'Land Rent' is the main economic factor for rural economy. Land is considered as 'factor' for agriculture production not as commodity. He listed twelve challenges for XIIth five year plan with respect to agricultural development issues. These are (i) growth rate: maintaining recovery shift drivers of growth, price, stability; (ii) address imbalance: structural production, regional, demand; (iii) judicious use of inputs like fertilizers and chemicals; (iv) blending modern science with traditional knowledge; (v) improving food and nutritional scarcity; (vi) arresting decline in inefficiency raise competitive challenge, food, inflation; (vii) bringing market reform – value addition; (viii) increased private sector participation at all levels; (ix) reinvigorate technology generation and delivery system; (x) prepare agriculture to

face changes in operating environment and harness modern science, climate change technology policy; (xi) maintain incentive in farming; and (xii) regional crop planning. He shared his views on seed policy and seed distribution system and informed that seed distribution by private company has decreased since last 2-3 decades. Dr. Ramesh Chand, while comparing the cropping intensity under irrigated and rainfed conditions, expressed satisfaction that it has increased under all these conditions. He emphasised on crop diversification to animal husbandry, fishery and horticulture. He also felt that water use efficiency and nutrient use efficiency is far less than developed countries like China and Japan. He cautioned that population growth at alarming rate is real threat to economy in coming years. He also placed the data that in agriculturally developed states likes Punjab, the farmers accrued their 80% benefits only from subsidiary in one or another form. While comparing land scenario, he expressed that the prime land being converted for urbanization while the bad lands are being brought under cultivation. Dr. Chand listed some issues towards sustainable land use *viz.* (i) land use plan, who should do it?, (ii) major emphasis should be on price inflation, climate change and sustainability and regional crop planning : crop sustainability in light of climate change, water, soil, diseases, etc. Chairman mentioned that extending cash subsidiary to farmers should be given a relook by the Planning Commission. He also felt that it is very interesting that contribution of private companies towards seed production has decreased. He shared that the issues and challenges mentioned by Dr. Ramesh Chand will definitely contribute towards healthy agricultural development policies by the Planning Commission for the XIIth five year plan.

The first poster presentation session was on "Land resource mapping and management". Out of 64 presentations, 40 were presented on various topics like land and soil resources, natural resources and their mapping, managing natural resources from various institutes of ICAR. State Agricultural Universities and other Universities.

The first technical session for oral presentation was on "Recent advances in land use, land cover mapping, characterization and management of land resources", which was chaired by Dr. D.K. Das; Dr. A.K. Sahoo acted as rapporteur. Total four presentations were made by Dr. S.M. Virmani, Dr. A.K. Joshi, Dr. A. Natarajan and Dr. G.S. Sidhu. The details of this presentation are as shown in the following.

First paper was presented by Dr. S.M. Virmani on "Land Use Planning for sustaining soybean production and conservation agriculture: use of high science tools". He pointed out that the management of land resources for sustainable agriculture is dependent on two interacting factors; *viz.* (i) evaluation of land resources and (ii) its productive capacity for a given land use on a sustainable basis. In this study he emphasized that the soybean-growing lands in India are mainly located in black soil areas (Vertisols and its associated soils) covering the agro-ecological subregions 5.2, 10.1, 10.2 and 6.3 in the states of Madhya Pradesh, Maharashtra, Karnataka and a part of Rajasthan. He also mentioned that the area under soybean has been increased significantly i.e. 9.2 mha (2010) in comparison to the year 1990 which was only 1 mha, but the productivity has remained low

i.e. 1.06 ton ha^{-1} in comparison to average world yield i.e. 2.6 t ha^{-1}. The speaker also pointed out that area, production and productivity of soybean at 67 districts for the year 2005-06 was mapped by GIS using secondary data with the cooperation of NBSS&LUP. The average productivity of soybean was 1.1 t ha^{-1} but it varied from 0.36 to 2.27 t ha^{-1}, inspite of land resources showing similar behaviour in different agro-ecological subregions. He also emphasized that the low yields of soybean area in India is related to (i) land management practices; (ii) not adequate P, N and Zn fertilization; (iii) seed not renewed at regular intervals (iv) poor soil drainage; and (v) poor germination / plant stand. From this study he surmised that (i) the land resources characterize the suitability of a given ecoregion for a crop/cropping system / or a land use (ii) but for judging the appropriate management of land resources for sustainable conservation agriculture, holistic study involving personnel from different disciplines are needed for efficient management of land resources for sustainable agriculture and for providing livelihood security to farming communities. The use of high sciences space technology tools like GIS, GPS and remotely sensed data would expedite the process.

Dr. A.K. Joshi presented a paper on "High Resolution Satellite Data and DEM for Characterisation and Management of Land Resources". He emphasized on the use of high resolution satellite data of India viz. CARTOSAT (Mono) and LISS-4 (multi-spectral) which may be utilised for comprehensive land use planning for various applications. He also stressed upon the high resolution merged data i.e. CARTOSAT and LISS-4 which not only provide the distinct wastelands but also the type, severity and status of the degraded process. He also highlighted the importance of satellite-based remote sensing data to view the surface in 3D mode. These modern tools for the interpretation of the stereo satellite data to assess the terrain characteristics and generate the DTM (Digital Terrain Model) and DSM (Digital Surface Model). These latest tools enhance the ability to understand spatial distribution of the land cover and also assist in modelling the water flow dynamics and its interaction with nature. He emphasized that the resulting land use map generated from the high resolution satellite image is more comprehensive and accurate thus leading to accurate spatial land cover management.

The next paper was presented by Dr. A. Natarajan on "Soil Survey Approach for Resource Conservation, Management and Food Security in India". He emphasized that the neglect and deterioration of the land resources and consequent decline in the productivity is continuing without any check for the many years in the country. He also reported that various land resource management schemes in the country under the successive Five Year Plans has not shown any change and on the other hand there is a continuing deterioration observed at field level. The main causes for the failure of most of the schemes due to the lack of site-specific data and situation specific recommendations based on the inherent capacity and suitability of the resources present at village/farm/ watershed level. He also pointed out that the root cause for the degradation, neglect and irrational use of land resources exists at the grassroots level in the country. To address the emerging issues at this level, the first and foremost thing needed is a detailed site-specific database on land resources at the farm level for all the villages in country through detailed resources survey (climatic, physical, biological and socio-economic). He also suggested that the database generated from the resource survey needs to be converted into a digital form (Digital Library) and made available to the various line departments/developmental agencies/farmers at the village or grassroot levels on a real time basis through web services which will help greatly in evolving site-specific, rational and sustainable land use plans appropriate for any given location in the country.

The Fourth paper was presented by Dr. G.S. Sidhu on "Benchmark Soils of North India: Historic aspects, temporal changes of properties of salt-affected soils under different management levels – a case study of Zarifa Viran Benchmark Soils adopting geo-referenced database approach". The study in Zarifa Viran soils includes historic aspects, temporal changes of soil properties under two management levels i.e. High Management (HM) at CSSRI Farm, Karnal and Low Management (LM) at village Guda (Old CSSRI Farm) and original soils at CSSRI, Karnal. The data on soils in original plot pertaining to year 1970 indicate high pH (10.6), EC (22.34 dSm^{-1}), Na (2.78 meL^{-1}), CO_3 (141.6 meL^{-1}), HCO_3 (136.0 meL^{-1}) at surface in comparison to the data of the soils collected in the year 2007 (pH 7.7, Na 2.2 meL^{-1}, CO_3 – Nil, HCO_3 3.7 meL^{-1}). The change of salt-affected soils to normal soil may be due to continuous luxurious growth of native vegetation and effect of amendments in the adjoining fields. Physical properties of the soils indicate high bulk density in surface soils of low management (1.59 Mgm^{-3}) as compared to high management soils (1.48 Mgm^{-3}) at surface. Chemical properties of soils indicate significantly high organic carbon (0.95%) in HM soils as compared to LM soils (0.4%) at surface, but low pH (8.17) and EC (0.3 dSm^{-1}) in HM soils as compared to LM soils (pH 8.8, EC 0.57 dSm^{-1}). Available NPK content was low in HM soils possibly due to high uptake by crops but micronutrients (Zn and Cu) was high which may be due to application of fertilizers containing micronutrients in HM soils. He concluded that based on the historic aspects, temporal changes in land use affect the soil properties significantly at different management levels, it being more pronounced in HM soils as compared to LM and original soils.

On 13th October, 2012, the seminar began with Dr. **J.L. Sehgal Memorial Lecture**. It was delivered by Dr. Y.V.N. Krishnamurthy on "Remote sensing and geospatial technologies for land resources management and sustainable agriculture". This was chaired and co-chaired by Dr. D.K. Das, and Dr. U.C. Sharma, respectively, Dr. S.K. Singh acted as rapporteur. The detail of the presentation is shown below.

Prof J L Sehgal Memorial Lecture on "Remote sensing and Geospatial technologies for land resources management and sustainable agriculture" delivered by Dr. Y.V.N. Krishna Murthy, Director, Indian Institute of Remote Sensing, Dehradun. Dr. D K Das illustrated the contribution of Dr J.L. Sehgal in the field of soil survey, pedology, land use planning and land degradation. His contribution was also remembered in light of the present day research requirement such as land degradation dynamics, nutrient depletion, yield plateauing and climate change. Dr. U. C Sharma introduced the speaker and briefly accounted his achievement and contribution in the field of soil survey, pedology, remote sensing and GIS application in natural resource management. Dr. Krishnamurthy also acknowledged Dr. Sehgal's contribution in the field of soil survey and in developing soil maps for the entire state on 1:250, 000, and 1:500,000 and the country as a whole on 1:1 million scales. In his presentation Dr. Krishnamurthy pointed out the data generated in NNRMS programme, State Remote sensing Centre with state line Departments and Satellite Data from AWIFS of 180 m resolution to Cartosat-I of <1 m resolution for modeling in GIS. He also hinted the utility of radiometric resolution data for monitoring the state of natural resources.

Dr. Murthy highlighted the effect of increasing Spatial Resolution in RS data on the clarity and extent of information generated. Few examples were illustrated which dealt with Inter and Intra-Annual variations in water logged areas, temporal and spatial variations of water and wind erosion, change detection in wastelands from 2005-06 to 2008-09. The methodology for groundwater prospect mapping with examples of Karnataka state and locations for site-specific recharge structures were presented. The utility of high resolution remote sensing data overlaid on geo-referenced cadastral maps was shown to address the water and land management problems at farm level in Chhattisgarh state. He specifically pointed out the identification of degraded area, degradational process, suitable sites for energy plantations & catchment treatment on cadastral and watershed scale which leads to holistic management of watershed and livelihood support activities. The utility of remote sensing data in monitoring the impact of treatment on the natural resources was also presented. In the programme "Space Based Information Support for Decentralized Planning" generated by bringing IMSD, NRIS, NRR, NRC, Rajiv Ganghi Drinking water Mission on one platform. In the programme more than 10000 Cartosat-I stereo pairs were used for rectification of these data by 296 trained manpower in Satellite Photogrammetry to bring State Level Block Accuracy (X, Y, Z) better than 2m. The utility of space-based support for decentralized planning was shown through some examples like terrace cropping system on plateau slopes, South Urmodi Dam, Parali, Maharashtra, terrace agriculture pattern (at Ramoli gaon) near new Tehri, cultivation in Sand dune areas in Bhiwani Dist. Haryana, siltation of tanks in Raipur District, Chhattisgarh, waterlogged area in Bhatinda district, Punjab, strong saline sodic land in Kannauj UP, Agriculture pattern (at Gaula river) near Haldwati city, potential and problems for agriculture in Jharkhand state. In the end, utility of digital elevation model was projected to highlight the quantitative measurement of runoff potential. Water and land resource development plan for Lahardaga district of Jharkhand, blended with the input of traditional knowledge of farming community. The Bhuvan portal with its capability for citizen-centric data updation, change analysis using temporal images, MIS Tools, capacity building and its utility was also highlighted. Bhuvan-Thematic Services facilitate the users to select, browse and query the thematic datasets. It is integrated with Web Services. The utility of Bhuvan for town planning was also presented. Dr. Krishnamurthy concluded his talk with the slogan "space technology for development at grass-root level".

Dr. B.B. Roy memorial lecture was delivered by Dr. S.C. Datta on "Modelling phosphorus dynamics in soil", which was chaired by Prof. S.K. Sanyal, co-chaired by Dr. N.S. Pasricha, and Dr. S. Mukhopadhyay acted as rapporteur. The detail of presentation is shown below.

The session preceded by paying a rich tribute to Dr. B.B. Roy by all dignitaries. The Session was Chaired by Dr. Saroj Kumar Sanyal, Vice-Chancellor, BCKV, and Co-Chaired by Dr. Nanak Singh Pasricha. Speaking about the lecture, Dr. Sanyal mentioned that he was blessed being in close proximity of Dr. B.B. Roy, who apart from being a distinguished professor, was a kind-hearted person. He worked on soil chemistry and soil genesis and laid foundation to the soil research of today, and his papers are extensively cited.

Dr. Pasricha introduced the speaker. Dr. Samar Chandra Datta began his lecture by reminding that phosphorus is not only a costly input, but also its use efficiency is very low. Soil test approach neither take into consideration which fraction of P is solubilised, nor how much is practically available to plants, nor the soil processes involved in fixation, precipitation and release mechanism. However, data generated through experiments conducted under Soil Test Crop Response Project under All India Coordinated mode, could be utilized for developing models for phosphorus availability to plants. He graphically represented dynamic nature of P in soil-plant continuum with additional feature of P-added through fertilizer. He critically assessed the challenge of changing solution P-levels to attain optimum production. He explained how ligand exchange gets influenced due to co-occurrence of either of silic acid or, weak acid oxyanions. This phenomenon leads to increase of pH and increase of negative charge. He explained intricacies of mechanisms of P-models in details. He had shown nature of P isotherms, changing shapes of isotherms with bicarbonate concentrations, and attainment of the peaks when pH equals to pK. He had shown that Langmuir isotherms failed to reflect reality in soil-plant system, while Freundlich isotherms were better predictor in soils of Alfisols and Vertislos. He discussed about Goldberg and Sposito (1984)'s Constant Capacitance Model. He used various equations to interpret his own data obtained by working in the soils of India, and explained the validity. He had shown both protonation and dissociation reactions in soils. He also discussed pros and cons of Zachara Westall (1999) model in heterogeneous system like soils. He discerned relationships between labile and non-labile P in the soils of India. He explained these models taking a route from monolayer to multilayer adsorption environments. He briefed on effects of concentration and time over the precipitation-dissolution reactions. He compared data obtained through experiment and that of simulation modelling. He added another dimension taking kinetics of the reaction in various models. He highlighted models developed by Barrow (1980), and Nutrient Uptake and EPIC models that take into consideration transformation of organic P, and generate effective distribution coefficient values . He projected how P-gradient was created in soil-plant system. He had estimated P-transport under steady state environment for better P management.

Technical session II for oral presentation on "Land quality, degradation and management options for climatic resilient agriculture" was chaired by Dr. S.M. Virmani and Dr. R.S. Singh acted as rapportuer. Total two presentations were made by Dr. N.S. Pasricha and Dr. E.V.S. Prakash Rao. The detail of their presentation is shown below.

The session started with the introductory remarks by the chairman. The chairman mentioned that soil carbon is one of the important parameters for assessing the land quality and degradation to study the impact of climate change and its effect on crop productivity. He also stressed upon needs of the research and development for land management options for climate resilient agriculture. Out of four technical articles listed for presentation, two articles were presented. The first article was on the topic of the "Soil Quality and Crop Production as Influenced by the Interactive Effect of Factors of Climate Change" by Dr. N.S. Pasricha and the second was on "Modelling Climate Change – Soil Interactions for Efficient Land Use and Sustainable Agriculture" by Dr. E.V.S. Prakash Rao.

Dr. Pasricha elaborated that the climate change is associated with the increase in atmospheric carbon dioxide due to intensified demand for food and energy due to demographic pressure.

He presented picture of the interaction of CO_2 with other environmental factor especially temperature and water on the crop productivity with the climate change in Indian condition. The conservation agriculture can be the better management options to mitigate climate change. He showed some of the experimental findings on the effect of zero tillage and residue management on soil water content, organic carbon and crop yield over the conventional agronomic practices. Dr. Prakash Rao spoke on the modelling climate-soil interaction for efficient land use options integrating climate, soil and crops multifunctional simulation models. He emphasized the need to coordinate study involving the NBSS&LUP for the model validation for regional climate and downscaling for local variations. There is a need for effective policies on land use, environment, economics and sustainability for the mitigation of climate change.

The third technical session for oral presentation on "Policy issues and strategies in land use management towards livelihood security" was chaired by Dr. M.S. Kuhad and Dr. U. Baruah acted as rapporteur. Total two presentations were made by Dr. S.K. Dadhich and Mr. Prasanjit Saha. The detail of the presentation is given below.

Dr. S.K. Dadhich talked on "Development of integrated farming system (IFS) models for better land use in different categories of tribal farmers".

He mentioned that there is a need to develop suitable integrated farming system (IFS) model for the farmers because single crop production enterprise is subject to risk of uncertainty. Ten villages under landless, marginal, small and large holding tribal farmers of Rajasthan were selected. The main objective was to develop a technical model for land use and management for sustainable agricultural development, poverty alleviation and food security. The existing land use was unplanned with a low family income of Rs.15,885/- per annum per family. The education was low and their agricultural technological knowledge was also poor. High technological agriculture viz. integrated nutrient management, seed replacement with hybrid/quality seed materials, improvement livestock management practices, introduction of backyard poultry and goatery were introduced. Results revealed that seed replacement increased from 9 to 45% with earning of per family per annum with Rs.8724/- due to hybrid maize, Rs.22,091/- due to hybrid castor, Rs.15,985/- due to improved varieties of wheat and Rs.18,750/- due to fennel cultivation. Dr. Dadhich described the profitability of various types of IFS models in the study area. Net farm income realized by landless farmer was Rs.118400/- in the 3rd year by poultry + goatery, for marginal farmer Rs.50812/- per annum by adopting goatery + maize + castor + bajra fodder. Small farmers earned Rs.439559/- per annum by adopting IFS model of buffalo + maize-wheat + castor + fennel + vegetables + orchards. Large farmers earned Rs.790579/- per annum by adopting IFS model of animal husbandry + maize + wheat + castor + fennel + vegetables + fruit cultivation.

Another presentation was made by Mr. Prasanjit Saha on "A new innovation in atomic spectroscopy – The MP – AES and its applications in soil and agriculture science".

In this presentation Mr. Saha briefly demonstrated about the work functionality of the instrument indicating its wide advantages

for characterizing different micro, macro elements and heavy metals.

Dr. D.K. Das, Former President of ISSS made a brief oral presentation on "Policy issues and strategies in land use management". There should by increasing awareness of land degradation and improvement and land use management issues among the society and political leaders at various levels. These issues of land use management strategies should be integrated with educational programmes at different levels and in rural extension services. The planners and administrators and scientific personnel need to coordinate in assessing the types and degree of degradation issues which are critical for their respective regions and take appropriate action for remediation. Improved information system should be developed for dissemination of alternative sound management practices to the grass root level. Different departments under various Ministries/Organisations dealing with land degradation; land use and management may be brought under the umbrella of a coordinating agency. State Land Use Board may be strengthened and activated for state level implementation of land use management programmes. The potentials of waste lands, particularly culturable waste lands, which can be brought under agriculture should be identified and suitable measures need to be taken for their optimum utilization. There should be appropriate policies and legal framework for community based land and water management *viz.* in watershed management, participatory irrigation management in command areas, in solving scarcity problems in rural communities. Soil and water health clubs should be developed on Panchayat levels for effective land and water management.

The second technical session for **poster presentation was on "Land quality, climate change, policies and soil fertility".** Out of seventy posters, forty were presented.

Glimpses of poster sessions

The plenary session was chaired by Dr. M.V. Velayutham with Dr. C.J. Thampi and Dr. Dipak Sarkar as co-chairman and Dr. S. Chatterji and Dr. P. Chandran acted as rapporteurs. The Plenary Session commenced with the brief remarks by the chairman, which was followed by the detailed presentation of the rapporteurs of different sessions. The Organising Committee nominated Dr. D.K. Pal as the chairman of the Judging Committee for selecting the best posters of both the poster presentations on 12th and 13th October, 2012. Dr. Pal made a brief remark about the quality of posters and he observed that in most of the cases the focal theme of posters was lacking. The technical sessions had the privilege of comments of both the co-chairpersons. Later chairman briefed the outcome of the project.

The organizing committee declared the four best posters award and the certificates were awarded by the chairman of the Plenary Session. The National Seminar came to an end with the formal vote of thanks by the Organizing Secretary.

Recommendations

The first and foremost action required to address the issue of land degradation,neglect and irrational use of land resources is to develop a detailed site-specific database on land resources at the farm level for all the villages in country through detailed resources survey (climatic, physical, biological and socio-economic). Moreover, the database generated from the resource survey needs to be converted into a digital form (Digital Library) and made available to the various line departments/developmental agencies/farmers at the village on a real time basis through web services which will help greatly in evolving site-specific, rational and sustainable land use plans appropriate for any given location in the country.

2. There is need of undertaking holistic study involving personnel from different disciplines for efficient management of land resources for sustainable agriculture and providing livelihood security to farming communities. The use of space technology tools like GIS, GPS and remotely sensed data would expedite the process.

3. High resolution satellite data viz. CARTOSAT (Mono) and LISS-4 (multi-spectral) need to be utilized for comprehensive land use planning. These tools enhance the ability to understand spatial distribution of the land cover and resulting land use map generated from the high resolution satellite image is more comprehensive and accurate thus leading to accurate spatial land cover management.

4. There is a need to develop suitable integrated farming system (IFS) model for the farmers because single crop production enterprise is subject to risk of uncertainty. Moreover, there is also a need to develop a technical model for land use and management for sustainable agricultural development, poverty alleviation and food security.

5. Soil carbon is one of the important parameters for assessing the land quality and degradation to study the impact of climate change and its effect on crop productivity. Sound research and development programmes for developing land management options for climate resilient agriculture need to be developed and implemented. Conservation agriculture can be another viable management option to mitigate climate change.

6. There is a strong need to enhance awareness in different facets of society on consequences of land degradation and need for viable land use management strategies to check it. These strategies should be integrated with educational programmes at different levels and in rural extension services.

7. Increased use of precision agriculture tools in facilitating adoption of ensuring right land use, right technology (i.e. Remote Sensing and Geographic Information System, etc.) at the right place and at the right time need to be taken up on a larger scale in enabling holistic management of land resources. There is also an essential need of increased use of anticipatory (Land Use models, Decision Support System) and participatory (Participatory Rural Appraisal) tools for land use planning at different levels.

8. The planners and administrators and scientific personnel need to coordinate in assessing the types and degree of degradation issues which are critical for their respective regions and take appropriate action for remediation. Improved information system should be developed for dissemination of alternative sound management practices to the grass root level. Different departments under various Ministries/Organisations dealing with land degradation, land use and management may be brought under the umbrella of a coordinating agency. The potentials of waste lands, particularly culturable waste lands, which can be brought under agriculture, should be identified and suitable measures need to be undertaken for their optimum utilization.

9. There should be appropriate policies and legal framework and community- based land and water management *viz.* in watershed management, for solving resource scarcity problems among rural communities through participatory irrigation management in command areas,etc. Soil and water health clubs should be developed at Panchayat levels for effective land and water management. State Land Use Boards (SLUB) need to be entrusted with the responsibilities of developing special agricultural zones (SAZs) to enable them reduce conversion of productive agricultural lands to non-agricultural uses.

Special Moments

Annexure I

National Seminar

On

MANAGING LAND RESOURCES FOR SUSTAINABLE AGRICULTURE

OCTOBER 12-13, 2012

NBSS & LUP, NAGPUR, MAHARASHTRA, INDIA

P R O G R A M M E

12th October, 2012 (Friday)

09 00 -10 00 hrs	Registration	
10 00 -10 05 hrs	Invocation	
10 05 -10 15 hrs	Welcome Address & An overview of Seminar	**Dr. Dipak Sarkar,** President, ISSLUP & Chairman Organising Committee
10 15 -10 20 hrs	Lighting the Lamp	Dignitaries
10 20 -10 40 hrs	Remarks:	**Dr. M. Velayutham,** Former Director, NBSS & LUP, Nagpur. **Dr. S.M. Virmani,** Former Principal Scientist, ICRISAT, Hyderabad **Prof. S.K. Sanyal,** Vice-Chancellor, BCKV, Mohanpur, Nadia, W.B. **Dr. R.G. Dani,** Vice-Chancellor, Dr. PDKV, Akola, M.S.
10 40 -10 50 hrs	Release of Publications	
10 50 -11 05 hrs	Inaugural Address	**Dr. A.K. Singh,** DDG (NRM), ICAR, New Delhi
11 05 -11 15 hrs	Presidential Address	**Dr. C.D. Mayee,** Former Chairman, ASRB, New Delhi
11 15 -11 25 hrs	Vote of Thanks	**Dr. T.K. Sen,** Organising Secretary
11.30 – 12.00 hrs	**TEA**	

12.00 – 13.00 hrs : **MEMORIAL LECTURES**

Dr. S.V. Govindarajan Memorial Lecture

Speaker : Dr. A.K. Singh, DDG (NRM), ICAR, New Delhi

Topic: Soil survey – need for a paradigm shift

Chairman: Dr. M. Velayutham Co-Chairman: Dr. Ramesh Chand

Rapporteur : Dr. Rajeev Srivastava

13.00 – 14.00 hrs : **Special Lecture**

Speaker : Dr. Ramesh Chand, Director, NCAP, New Delhi

Topic: Agricultural Issues and Concerns for XIIth five year Plan.

Chairman : Dr. C. D. Mayee Rapporteur : Dr. L.G.K. Naidu

14.00 – 14.45 hrs : LUNCH

14.45 – 16.15 hrs : **POSTER PRESENTATION**

Technical Session I : Land Resource Mapping and Management

16.15 – 18.30 hrs : **Technical Session I : Recent Advances in Land Use, Land Cover Mapping, Characterization and Management of Land Resources**

Chairman : Dr. D. K. Das Rapporteur : Dr. A.K. Sahoo

16.15 – 16.35 hrs **1. Dr. S.K. Saha** – Quantitative analysis of soil quality with hyperspectral and microwave remote sensing techniques

16.35 – 16.55 hrs **2. Dr. A.K. Joshi** – High resolution satellite data and **DEM** for characterization and management of land resources

16.55 – 17.15 hrs **3. Dr. A. Natarajan** – Soil survey approach for resource conservation, management and food security in India

17.15 – 17.35 hrs **4. Dr. G.S. Sidhu** – Benchmark soils of North India : Historic aspects, temporal changes of properties of salt-affected soil under different management levels – A case study of Zarifa Viran benchmark soil adopting georeferenced database approach

17.35 – 17.55 hrs **5. Dr. A.K. Srivastava** – Exploiting spatial variability in soil fertility for improved citrus orchard productivity

17.55 – 18.10 hrs **Chairman's remarks**

18.10 – 18.40 hrs : TEA

18.40 hrs onward : GENERAL BODY MEETING FOLLOWED BY DINNER

13th October, 2012 (Saturday)

9.30 – 10.30 hrs : **MEMORIAL LECTURE**

Dr. J.L. Sehgal Memorial Lecture

Speaker : Dr. Y.V.N. Krishnamurthy

Topic : Remote sensing and geospatial technologies for land resources management and sustainable agriculture

Chairman : Dr. D.K. Das Co-Chairman : Dr. U. C. Sharma Rapporteur : Dr. S. K. Singh

10.30 – 11.30 hrs : **Dr. B.B. Roy Memorial Lecture**

Speaker : Dr. S.C. Datta, Principal Scientist, Division of Soil Science and Agricultural Chemistry, IARI, New Delhi

Topic : Modeling phosphorus dynamics in soil

Chairman : Prof. S. K. Sanyal Co-Chairman : Dr. N. S. Pasricha

Rapporteur : Dr. G. S. Sidhu

11.30 – 11.45 hrs : TEA

11.45 – 13.45 hrs : **Technical Session II : Land Quality, Degradation and Management Options for Climatic Resilient Agriculture**

Chairman : Dr. S. M. Virmani Rapporteur : Dr. R.S.Singh

11.45 – 12.15 hrs 1. **Dr. N. S. Pasricha –** Soil quality and crop production as influenced by the interactive effect of factors of climate change

12.15 – 12.45 hrs 2. **Dr. E.V.S. Prakash Rao** - Modelling climate-soil interactions for efficient land use and sustainable agriculture

12.45 – 13.15 hrs 3. **Dr. P. Dey** – Potassium availability in Vertisols and its implications on soil-test-based K-fertilizer recommendation for sustainable crop productivity

13.15 – 13.45 hrs 4. **Dr. H. Pathak** – Agriculture in the international climate change negotiations : issues, opportunities and constraints

Chairman's remarks

13.45 – 14.30 hrs : LUNCH

14.30 – 16.00 hrs : **Technical Session III : Policy Issues and Strategies in Land Use Management towards Livelihood Security**

Chairman : Dr. M. S. Kuhad Rapporteur : Dr. U. Baruah

14.30 – 14.50 hrs 1. **Dr. S.M. Virmani** – Land use planning for sustaining soybean production and conservation agriculture : use of high science tools

14.50 – 15.10 hrs 2. **Dr. S.K. Dadhich** – Development of integrated farming system (IFS) models for better land use in different categories of tribal farmers

15.10 – 15.30 hrs		**3. Dr. A. Chaturvedi** – Integrated landscapes & land use synergy : future strategies for land use planning
15.30 – 15.45 hrs		**Chairman's remarks**
15.45 – 16.00 hrs		**Prasenjit Kar –** A new innovation in atomic spectroscopy – The MP-AES and its applications in Soil and Agricultural Science.
16.00 – 17.15 hrs	:	**POSTER PRESENTATION** **Technical Session II : Land Quality, Climate Change, Policies and Soil Fertility**
17.15 – 17.30 hrs	**:**	**TEA**
17.30 – 18.30 hrs	**:**	**PLENARY SESSION** **Chairman : Dr. M. Velayutham** **Co-Chairman: Dr. C. J. Thampi and Dipak Sarkar** **Rapporteurs : Dr. S. Chatterji and Dr. P. Chandran**
18.30 – 18.35 hrs	**:**	**VOTE OF THANKS**

Annexure II

List of Participants

National Seminar on Managing Land Resources for Sustainable Agriculture
October, 12-13, 2012

Sl No.	Name	Sl No.	Name
1	Dr.A.K.Singh	2	Dr. C.D.Mayes
3	Dr.T.Ravishankar	4	Prof. S.C.Mukhopadhyay
5	Dr.U.C. Sharma	6	Dr. A.N.Singh
7	Dr. M.S.Kuhad	8	Dr.M.Velayuthan
9	Prof. S.K.Sanyal	10	Dr. S. Vadivelu
11.	Dr. E.V.S.Prakash Rao	12	Dr. V.N.Sharda
13	Dr. Pradip Dey	14	Dr. Himanshu Pathak
15	Dr. S.K.Saha	16	Dr. A.K.Joshi
17	Dr. Ramesh Chand	18	Dr. S.M.Virmani
19	Dr. C.J.Thampi	20	Dr. Raviprakash G. Dani
21	Dr. G.S.Sidhu	22	Dr. B. Venkateswarlu
23	Dr. N.S.Pasricha	24	Dr.D.K.Das
25	Dr. D.P.Roy	26	Dr. A.K.Srivastava
27	Dr.A.Chaturvedi	28	Dr.Y.V.N.Krishnamurthy
29	Dr. S.C.Dutta	30	Dr. S.K.Ddhich
31	Dr. G.S. Sidhu	32	Dr. A.Natarajan
33	Dr. U.Baruaha	34	Dr. R.S. Singh
35	Dr. L.G.K.Naidu	36	Dr. Deepak Sarkar
37	Dr.S.K.Sigh	38	Dr.D. Balasubramaniam
39	Mr. Satish B. Aher	40	Dr.Gopali Bardhan
41	Dr.Babita Singh	42	Dr.P.V.Geetha Sireesha
43	Dr.Siladitya Bandyopadhyan	44	Dr. T. Chattopadhyay
45	Dr.S.K.Reza	46	Dr.D.Y.Hirey
47	Dr.A.S.Cheke	48	Dr.M.V.S.Naidu
49	Dr.Vinayak K.Kulkarni	50	Dr.V.D.Guldeokar
51	Miss Neha K.Chopde	52	Dr.R.N.Katkar
53	Dr.W.P.Badole	54	Dr.Harshal S. Salunke
55	Dr.A.J.Patangray	56	Dr.Ommla D. Kuchanwar
57	Dr.S.S.Balpande	58	Dr.Punit Raj, T.
59	Dr.B.K.Madhi	60	Dr.Sisir Kumar Si
61	Dr.V.K.Singh	62	Dr.Ashaikh Mohitpasha
63	Dr.Vijaya Kumar	64	Dr.B.R.Gajbhiye
65	Dr.A.N.Puri	66	Dr. P.B.Adsul
67	Miss Priya P. Gurav	68	Dr.B.P.Bhaskar
69	Dr. S.N.Goswami	70	Dr. D.K.Mandal
71	Dr. Y.D.Pawar	72	Dr. Grishma Ale
73	Dr. Kamal Rathod	74	Dr. Savita B. Ahire
75	Miss Priyadarshani A. Khambalkar	76	Mr. Pushpajeet L.Choudhari
77	Miss Yogita D. Gore	78	Dr. Parijat Saikia
79	Dr. A.A.Jadhav	70	Dr. Rakesh Sahu

81	Miss Ankita Deshmukh	72	Dr. S.S.Baghel
83	Dr. S.K.Gangopadhyay	84	Dr. A.K.Sahoo
85	Dr. K.Das	86	Dr. D.C.Nayak
87	Dr. S.Ghoshal Chaudhari	88	Dr. T.H.Das
89	Dr. V.P.Babhulkar	90	Dr. S.D. Jadhao
91	Dr. P.R.Kadu	92	Dr. Suresh Kumar
93	Dr. Narendra Chouhan	94	Mr. Avinash D. Pawar
95	Dr. R.D.Chaudhari	96	Dr. K.Boomiraj
97	Dr. B.T.Dhale	98	Miss Jayshree A. Khuspure
99	Dr. (Mrs.) C.Mandal	100	Dr. Nilay Borah
101	Mr. D.G.Padekar	102	Miss Rohini B. Dashiphale
103	Dr. P.Chandran	104	Dr. S.S.Prasad
105	Dr. K.Karthikeyan	106	Dr. D. Dutta
107	Dr. Jagdish Prasad	108	Dr. U.K.Maurya
109	Dr. S.K.Ray	110	Dr. S.C.Ramesh Kumar
111	Mr. Malathi B.	112	Dr. N.G.Patil
113	Miss J.N.Giri	114	Dr. Velmourougane, K.
115	Dr. C.S.Walia	116	Dr. N.C.Khandare
117	Dr. S.M.Jadhao	118	Miss S.D.Patil
119	Dr. R.K.Naitam	120	Dr. G.P.Obi Reddy
121	Dr. S.K.Mahapatra	122	Dr. T.P.Verma
123	Dr. P.N.Tripathi	124	Dr.(Mrs.) Jaya N.Surya
125	Dr. T.K.Sen	126	Dr. T.N.Hajare
127	Dr. R.P.Sharma	128	Dr. R.Srinivasan
129	Dr. Nirmal Kumar	130	Dr. Anil R. Chinchmulatpure
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135	Dr. Rokolhum Keditsu	136	Mrs. Shubhangi Girgaonkar
137	Miss Mamta Mokde	138	Mr. Layant Borkar
139	Mr. G.N.Bhangale	140	Miss Saroj Deshmukh
141	Dr. A.K.Mandal	142	Dr.D.V.K.Naageswara Rao
143	Dr. (Mrs.) P.L.A.Satyavathi	144	Dr. S. Thayalan
145	Dr. R.M.Karmakar	146	Miss Vishakha T. Dongare
147	Dr. Sidhardha S. Mukhopadhyay	148	Dr. R.A. Nasre
149	Mr. D.S.Mohekar	150	Dr.J.D.Giri
151	Dr.Suparno Ghosh	152	Mr. M.Ramesh
153	Dr.Chritopher	154	Dr.Jayanta Roy
155	Mr. H.M.Dhanvijay, NABARD	156	Dr.K.S.Gajbhiye
157	Dr. A.K.Maji	158	Dr.A K.Kalbande

Annexure III

Working Committees
National Seminar on Managing Land Resources for Sustainable Agriculture
October 12-13, 2012
NBSS&LUP, Nagpur

S.No.	Committee	Chairperson/Co-Chairperson
1	Reception & Registration	**Dr. (Mrs.) C. Mandal, Chairperson** Mr. Nirmal Kumar, Co-Chairperson Mrs. Malathi Bommidi, Member Mr. Sunil Gharami, Member Mr. Prakash Ambekar, Member Mr. Sanjay Mendhekar, Member Mr. Y.L.Misal, Member Mrs. Rohini Watekar, Member Mrs.Vaishali Arbat, Member Mrs. Ujwala Tijare, Member Mrs. Vandana Roy, Member
2	Hall Arrangement	**Dr. D.S. Singh, Chairperson** Dr. D.K. Mandal, Co-Chairperson Dr. B.P. Bhaskar,Member Mr. A.K. Barthwal, Member Mr.Vijay Bhongade,Member Mr. D. S. Mohekar, Member Mr. Sunil Gharami, Member Mr. T.L. Khobragade, Member Mr. A.M. G. Sheikh, Member
3	Technical Programme & Poster Display	**Dr. Tapas Bhattacharyya, Chairperson** Dr. S.K. Ray**,** Co-Charperson Dr. P. Chandran, Member Dr. P. Tiwary, Member Dr. K. Karthikeyan, Member Dr. A.M. Nimkar, Member Mr. R.K. Bhalsagar, Member Mr. Prakash Ambekar, Member
4	Publication	**Dr. Jagdish Prasad, Chairperson** Dr. S. Chatterji, Co-Chairperson Dr. K. Karthikeyan, Member Dr. P.N. Dubey, Member Dr. A.M. Nimkar,Member
5	Exhibition	**Dr. Rajeev Srivastava, Chairperson** Dr. M.S.S. Nagaraju, Co-Chairperson Mr. A.K. Barthwar, Member Dr. R.A. Nasre, Member Mr. V.N. Parhad, Member Mr. D.S. Mohekar, Member Mr. Bache Gowda, Member Mr. W.B. Mate, Member
6	Transport	**Dr. Jagdish Prasad, Chairperson** Mr. B.D. Phansal, Co-Chairperson Dr. K. Karthikeyan, Member Mr. Virendra Sahu, Member Mr. G.V. Manmode, Member Mr. S. N. Nandeshwar, Member

7	Accommodation	**Dr. N.G. Patil, Chairperson** Dr. T.N. Hajare, Co-Chairperson Dr. R.A. Nasre, Member Mr.R.S.Gawande,Member Mr.Vinay Lande, Member Mr. Sunil Meshram, Member Mr. W.B. Mate, Member Mr. Shyam Bhoyar, Member
8	Refreshment	**Dr. S. Chatterji, Chairperson** Dr. J.D. Giri, Co-Chairperson Dr. P.N. Dubey, Member Dr. N.C. Khandare, Member Dr. (Mrs.) Jiji Cyriac, Member Mr. Vijay Patil, Member Mr.Vinay Lande, Member Mrs. Smita Patil, Member Mrs. Wasudha Khandwe, Member Mrs. Ranjana Sharma, Member
9	Resource Mobilization	**Dr.T.K. Sen, Chairperson** Mr. G.C. Prasad, Co-Chairperson Mr. B.D. Phansal, Member Mrs. Bhanu Narayanan, Member Dr. A.P. Nagar, Member Mrs. Sunanda D. Lade, Member Mr. C.K. Kharche, Member Mr. Nitin Mankar, Member
10	Secretarial Support	**Dr. P. Chandran, Chairperson** Dr. G.P.Obi Reddy, Co-Chairperson Dr. S.S. Nimkhedkar, Member Mr. Pravin Shriram Butte, Member Mrs. S.K. Hayat, Member Mr. D.K. Nandanwar, Member Mr. M.M. Khan, Member Mrs. Rohini Watekar, Member Mrs. Vaishali Arbat, Member Mr. M.C. Patre,Member
11	Press/Media	**Dr. Jagdish Prasad, Chairman** Dr. S.K.Ray, Co-Chairperson Mr. S.S. Nimkhedkar, Member Dr. M.T. Sahu, Member Mr. M.M. Khan, Member

Annexure IV

Indian Society of Soil Survey and Land Use Planning

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