Proceedings of the First Meeting held on
Development of the Unified National Soil Information System

As a part of the National Geospatial Policy (NGP)-2022, which was notified by the Gazette notification by the Govt. of India, the first meeting on soil thematic area was held on the Development of the Unified National Soil Information System (UNSIS) at ICAR-National Bureau of Soil Survey and Land Use Planning (ICAR-NBSS&LUP), Nagpur during 4-5th April 2024. About 45 participants from ICAR, SAU's and Industry participated in the two-day meeting. At the outset, Dr. G. P. Obi Reddy, Pr. Scientist & Head, Division of Remote Sensing Applications, ICAR-NBSS&LUP, Nagpur welcomed the dignitaries, and distinguished participants and gave a brief background of the meeting. Dr. N.G. Patil, Director, ICAR-NBSS&LUP emphasized and urged the participating institutes to join hands with ICAR-NBSS&LUP, which is the lead institute in building the UNSIS. The chief guest Dr. S.K. Chaudhari, Deputy Director-General (DDG)-NRM, ICAR, New Delhi informed that under NGP-2022, the task of building a national soil information system is assigned to ICAR-NBSS&LUP under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Govt. of India. He emphasized the need to collaborate and develop a UNSIS for the benefit of policymakers, planners and farmers of the country. He also emphasized the abundance of available soil information within ICAR, state universities, and other organizations, and stressed the importance of consolidating this wealth of data into a unified platform. This integration would greatly enhance the accessibility and facilitate collaborative efforts toward meaningful results.

Prior to that, the Guest of Honour Dr. Velmurugan, ADG (S&WM), NRM Division, ICAR, New Delhi emphasized the importance of data liberalization and compilation of soil data on a single platform. He also highlighted the necessity to join hands in building NUSIS to provide solutions to various agricultural development issues and provide policy inputs. He urged the participants to compile soil health card datasets and the need to update land records where private entities also can play an important role in maintaining the data quality and meeting global standards. The other Guest of Honour Shri Prashant Kumar, Dy. Surveyor General, Survey of India, Dehradun highlighted the importance of the NGP and its overall implementation to build a national-level geospatial database, especially on soils. He informed the house that SOI supports the initiative of building base-level information on administrative units, a high-resolution digital elevation model at 10m resolution, the services of a Continuously Operating Reference System (CORS) network to improve the accuracy in survey activities, and other cartographic features, which help to develop a unified base database.

Later, Dr. G.P. Obi Reddy made a detailed presentation on the Development of the UNSIS and outlined the important aspects of NGP and its significance in data acquisition, database management and building the UNSIS. He also emphasized the scope, characteristics, soil datasets to be assembled, associated challenges and road map to build the UNSIS in collaboration with the concerned ICAR, national organizations like NRSC, SLUSI, SAUs and state agricultural departments. He also provided a glimpse of the dedicated BHOOMI Geo-portal on the soil theme, its accessibility, metadata formats, and functionalities.

- Shri Prashant Kumar, Dy. Surveyor General, SOI outlined the objectives of the NGP-2022, including the redefinition of the National Geodetic Framework and the implementation of high-accuracy geo-identification. He informed that SOI will provide base information on administrative units up to village level, DEM at 10m resolution services of CORS network to improve the accuracy in survey activities, and other cartographic features to all the stakeholders to build a UNSIS (Action: SOI).

- Dr. Gahlot, SLUSI in his presentation provided updates on watershed delineation, soil degradation assessment, and the National One Soil Program. The land degradation datasets and soil database on a 1:50,000 scale were mapped and compiled in collaboration with NRSC. He assured that the watershed atlas database upto the micro-watershed level available with SLUSI can be shared with UNSIS to use it uniformly across the stakeholders (Action: SLUSI).
- Dr. G. Sujata, Head, SLRA Division, NRSC highlighted the collaboration with SLUSI and mapping land degradation by using LISS-3 temporal data. She also informed that mapping of soils at the state level on 1:50,000 has been completed in collaboration with SLUSI and compilation in the final stage. The land degradation datasets and soil database on a 1:50,000 scale can be contributed to UNSIS (Action: NRSC).
- Dr. S.K. Behara, Pr. Scientist & Head, Division of Soil Chemistry and Fertility, ICAR-Indian Institute of Soil Science (ICAR-IISS), Bhopal made a presentation on soil fertility datasets and informed the house that soil fertility datasets for 615 districts were developed. He informed that available soil fertility information at the district level developed under AICRP can be shared in building the UNSIS (Action: ICAR-IISS).
- Dr. Priyabatra Santra, Pr. Scientist & Head, Division of Natural Resources, ICAR-Central Arid Zone Research Institute (ICAR-CAZRI), Jodhpur made a presentation on soil datasets of hot arid ecosystems compiled at the institute and he informed that datasets on soil profiles and land degradation can be made available for UNSIS (Action: ICAR-CAZRI).
- Dr. Pushpanjali, Sr. Scientist, Division of Resources Management, ICAR-Central Research Institute on Dryland Agriculture (ICAR-CRIDA), Hyderabad made a presentation on district-level contingency plans developed at the institute and soil organic status developed for 440 NICRA villages. She informed that district-level contingency plan datasets can be made available for UNSIS (Action: ICAR-CRIDA).
- Dr. DV Singh Pr. Scientist & Head (I/c), SSA, ICAR-Indian Institute of Soil and Water Conservation (ICAR-IISWC), Dehradun discussed about soil erosion assessment and soil erodibility and DPR preparation. He assured that datasets available on soil erodability at the institute level can be made available in building the UNSIS (Action: ICAR-IISWC).
- Dr. Rajgopal, Scientist, ICAR-National Institute of Abiotic Stress Management (ICAR-NIASAM), Baramati joined online and briefed the house about the abiotic stress mapping and datasets used. The surface soil samples collected under different projects can be leveraged in building UNSIS (Action: ICAR-NIASM).
- Dr. Amresh Choudhary, Scientist, ICAR-Central Soil Salinity Research Institute (ICAR-CSSRI), Karnal briefed the house about the soil salinity mapping collaboration with various institutes and datasets available. The soil samples collected by the institute under various projects can be leveraged in building UNSIS (Action: ICAR-CSSRI).
- Dr. R.N. Katkar, Professor, Department of Agricultural Chemistry and Soil Science, College of Agriculture, Nagpur highlighted the importance of soil sample collection and assessment of soil health. He informed that soil profiles studied and samples collected at the district level for soil fertility analysis under PDKV jurisdiction can be shared in building the UNSIS (Action: PDKV).
- Dr. P.H Vaidya, Head, Dept. of Soil Science & Agril. Chemistry, VN Marathwada Agril. University, Parbhani emphasized soil sample collection, soil health card development, and the preparation of soil suitability maps. He informed that soil profiles studied and samples collected for soil fertility analysis under VNMAU jurisdiction can be shared in building the UNSIS (Action: VNMAU).

- Dr. S.D. Gorantiwar, Director of Research & Head, Dept. of Agril. Engineering, MPKV, Rahuri informed that MPKV working on soil spectroscopy and soil spectra development. He informed that soil samples collected for soil fertility assessment under MPKV jurisdiction can be shared in building the UNSIS (Action: VNMAU).
- Dr. N. J. Jadav, Professor and Head, Department of Agril. Chemistry and Soil Science, Anand Agricultural University, Anand informed that soil samples collected for soil fertility assessment under AAU jurisdiction can be shared in building the UNSIS (Action: AAU).
- Dr. H.D. Rank, Professor and Head, Department of Soil and Water Conservation Engineering, College of Agricultural Engineering & Technology, Junagadh Agricultural University highlighted the activities of soil fertility assessment under JAU jurisdiction and he mentioned that the available soil datasets can be shared in building the UNSIS (Action: JAU).
- Dr. K. G. Patel, Professor & Head, NMCA, Navsari in his presentation informed that the available soil data collected by faculty/students under different projects for soil fertility assessment under NAU jurisdiction and he informed that this information can be shared in building the UNSIS (Action: NAU).
- Dr. S.K. Shah, S.D. Agricultural University Sardarkrushinagar, Dantiwada, District Banaskantha, Gujarat informed that the available soil data collected under different projects for soil fertility assessment under SDAU jurisdiction and can be shared in building the UNSIS (Action: SDAU).
- Dr. Rakesh Banwasi, Associate Professor, SSAC, CoA, IGKV, Raipur informed that the available soil data collected under different projects for soil fertility assessment under IGKV jurisdiction and can be shared in building the UNSIS (Action: IGKV).
- Dr. Satish Ayyappa, Professor, UAS, Bengaluru informed that the UAS Bangalore generated soil data under Sujala-III and Reward Projects and available soil data under these projects can be shared in building the UNSIS (Action: UAS, Bangalore).
- Dr.V.B. Kuligod, Professor, COA, Dharwad informed that the UAS Bangalore generated soil data under Sujala-III and Reward Projects and available soil data under these projects can be shared in building the UNSIS. (Action: UAS, Dharwad).
- Dr. S. Pazhanivelan, Director, Centre for Water and Geospatial Studies, TNAU, Coimbatore informed that the TNAU developed soil map of Tamil Nadu on a 1:50,000 scale and working on digital soil mapping at 30m resolution. He informed the available soil information can be leveraged in building the UNSIS. (Action: TANU Coimbatore)
- Dr. A. Madhavi, Pr. Scientist & Head, Institute of Soil Health Management, AICRP-STCR, PJTSAU, Agricultural Research Institute, Rajendranagar, Hyderabad informed the available information on soil properties at PJTSAU can be leveraged in building the UNSIS (Action: PJTSAU, Hyderabad).
- Sh. Dinesh Pal Singh, Tech Lead- Digital Transformation Office, Cisco Systems India Pvt Ltd., New Delhi highlighted the necessity of data convergence, avoiding the duplication in data assimilation, and the requirement of IT infrastructure and cyber security to visualize the UNSIS.
- Satyendra Gupta, Co-founder & CEO, Neoperk Technologies Pvt. Ltd, Mumbai highlighted the need of soil spectroscopy and collaboration efforts with ICAR-NBSS&LUP. He informed that soil spectroscopy significantly helps in building soil fertility datasets in INSISI.

To discuss in detail, three domain expert teams were formed on the development of standards and assimilation of soil data on Geoportal, compilation of soil fertility data, and compilation of soil spectral datasets. The following points emerged in the discussion.

Development of standards and assimilation of soil data on Geoportal

- Base layer datasets of SOI administrative boundaries (National to Village level), DEM Datasets (10m for plain 20m for hilly areas), CORS to be used for survey activities and Other cartographic features datasets like waterbodies, settlements, rivers to be used. The hydrological units and watersheds datasets of SLUSI are to be used.
- To ensure standards in soil profile data collection, ICAR-NBSS&LUP Standard soil profile format is to be used. Assimilation and harmonization of legacy data (point and polygon) are to be done on priority.
- Appropriate resolution of satellite data to be used in soil resource mapping. The standard methodology adopted by NBSS/SLUSI in soil resource mapping can be followed uniformly.
- Geoportal and IT Infrastructure Strengthen the existing geoportal platforms to harmonize and pool the legacy data- NBSS and partners. Develop data dissemination strategies using Al and ICT tools

Compilation of soil fertility data

- Information from different ICAR, SAU & others to be obtained dealing with soil health parameters including chemical, Physical & Biological.
- Sampling strategy needs to be indicated such as, scale of sampling, method of sampling, method of analysis and time of sampling.
- Organization should inform the availability of geospatial data pertaining to soil health parameters in different formats i.e. map, and excel map.
- There is a need to assess the requirement of soil health data by different stakeholders.
- Acknowledgement mechanism for soil health data sharing to be prepared.

Compilation of soil spectral datasets

- Before uploading datasets in UNSIS, aspects like SoP for data collection, soil sampling, soil processing, analysis, spectra acquisition, data ownership, copyright and sharing policy to be addressed.
- Metadata on spectra, instrument specification, detectors, and spectral region (350-2500 nm) to be developed. Spectral resolution (10 nm), soil analysis procedures are to be assessed.
- Geotagged datasets are essential to develop soil spectra. Protocols for visualization of soil spectra, soil properties and authentication of the user for data sharing especially for point data and spectra to be developed.

The two-day meeting ended with a formal vote of thanks.