# THE IMPORTANCE OF SOIL INFORMATION SYSTEM (SIS) AND THE WAYS TO IMPROVE ARMENIAN SIS

***Voskanyan Gohar Vazgen,*** *Ph.D. in economics, Scientific researcher, assistant,*
*M. Kotanyan Institute of Economics of the NAS RA, Armenian National Agrarian University, Yerevan, Republic of Armenia*

***DOI: https://doi.org/10.31435/rsglobal_conf/30032021/7481***

***Abstract.*** *Humans use soil as a holding facility for solid waste, filter for wastewater, and foundation for our cities and towns. Finally, soil is the basis of our nation's agroecosystems which provide us with feed, fiber, food and fuel. Soil information is very important for making decisions at micro, macro and global levels. Modern digital technologies enable the development of national and global soil information systems. Armenia has had its soil information system since 2020. The article presented the importance of soil information systems, the work carried out in this diraction, as well as a number of proposals for the improvement of Armenian soil information system.*
***Keywords:*** *information system, soil, partnership, GlOSIS, ArmSIS*

**Introduction.** Soil is an essential resource and a vital part of the natural environment from which most of the global food is produced. At the same time, soil provides living space for humans, as well as essential ecosystem services which are important for water regulation and supply, climate regulation, biodiversity conservation, carbon sequestration and cultural services. But soils are under pressure from increases in population, higher demands for food and competing land uses. Approximately 33% of our global soils are degraded and policy makers around the world are exploring opportunities to embrace sustainable development via the sustainable development goals. Although the importance of soils seems clear, in the past it has not received due attention in terms of its use and management, since soils were often considered an infinite resource that will always be able to provide us with its ecosystem services. However, this is not the case and there is an urgent need to raise awareness on the importance of soil, especially the need to protect soils and use them sustainably [1].

**Purpose of the research.** Soil map delineates the boundaries of different kinds of soils whose characteristics are markedly different due to the various factors affecting soil formation. These factors include climate, parent material, topography, vegetation, and length of time for the soil formation. Detailed knowledge of soil characteristics is important in soil resources use and conservation.

Information systems are the software and hardware systems that support data-intensive applications. A geographic information system (GIS) is used to integrate, store, edit, analyze, share, and display georeferenced information. GIS plays essential roles in integrating a variety of data layers to express a real world. The usefulness of an information system will depend on its ability to provide decision makers with the right data at the right time in the proper manner [2].

**Methodology.** The basic requirement to develop a soil information system (SIS) is to have large datasets. Such datasets are not generally available for all countries. The geographic information system (GIS) has been an important tool for geo-referencing the soil information system (GeoSIS). Various countries have developed their own SIS. The most widely used system is the Soil and Terrain Digital Database (SOTER; 1 : 1 m). It provides data for improved mapping, modelling and monitoring of changes of world soil and terrain resources. The SOTER methodology allows mapping and characterization of areas of land with a distinctive, often repetitive pattern of landform, lithology, surface form, slope, parent material and soils. The approach resembles physiographic or land systems mapping. The collated materials are stored in a SOTER database linked to the GIS, permitting a wide range of environmental applications. The SOTER method used for studies on carbon stocks and their changes in the Indo-Gangetic Plains (IGP), led to the following, viz. (i) linkage between soil profile data and spatial component of a SOTER map for environmental applications requires generalizations of measured soil (profile) data by soil unit and depth zone, (ii) the set of soil parameter estimates for the IGP should be seen as best estimates, based on the currently available selection of profile data held in IGP–SOTER and World Inventory of Soil Emission Potential (WISE), and (iii) the primary and secondary datasets for IGP will be useful for agroecological zoning, land evaluation and modelling of carbon stocks and changes at a scale of 1 : 1 M. Soil series provide first-hand information on soil resources of the state in terms of

morphological, physical, chemical and mineralogical properties. Such information helps understand the nature and extent of a particular soil under different categories of acidity, physiographic position and land use. This soil information can be systematically arranged according to the users' demand [3].

The role of soils in maintaining ecosystem and climate regulation is increasingly gaining recognition. This demands relevant and useful information on soils throughout the world. The need for relevant and pertinent datasets to develop a SIS at the country, state, and farm level is a dynamic process. This is more so since the soil has many dynamic parameters which control its health affecting crop performance. Digital soil maps have been useful in providing information on dynamic soil properties. Linking datasets of natural resources for web-based solutions requires team-work. With the changing global scenario at present we need expertise with sufficient knowledge on agriculture and allied sciences. Such experts would find GeoSIS and the proposed a decision support system (DSS) useful to analyse issues like land degradation, soil diversity, agricultural land-use planning, and change in soil and land quality parameters as influenced by land-use and/or climate change [4].

**Research results.** Global Soil Information System (GLOSIS) aims to develop a spatial data infrastructure that brings together soil information collected by national institutions. GLOSIS is envisioned as a federation of soil information systems, which share interoperable soil data sets via web services. This approach will empower countries to develop their soil information systems as reference centres for national soil information [5]. Global soil information system has three primary functions:

1. Answering critical questions at the global scale (e.g. is there enough arable land with suitable soil to feed the world?)
2. Providing the global context for more local decisions (e.g. transnational aspects of food security and degradation of natural resources)
3. Supplying fundamental soil data for understanding Earth-system processes to enable management of the major natural resource issues facing the world (e.g. climate change, food security, biodiversity loss). These data need to be comparable with other fundamental data sets including those for weather, climate, net primary productivity, biodiversity, land cover and geology [6].

The Global Soil Partnership was established in December 2012 as a mechanism to develop a strong interactive partnership and enhanced collaboration and synergy of efforts between all stakeholders. From land users through to policy makers, one of the key objectives of the GSP is to improve the governance and promote sustainable management of soils. Since its creation, the GSP has become an important partnership where global soil issues are discussed and addressed by multiple stakeholders. Key outputs demonstrate that the partnership was needed to fill an existing gap in the promotion of sustainable soil management [1]. Regional Soil Partnerships (RSPs) were established among interested and active stakeholders of the same regions [7]. The Eurasian Soil Partnership (EASP) was established in November 2013, as a sub-regional soil partnership within the ESP, to address the specificities of the eastern European and Eurasian GSP members. The main goal for the EASP is the implementation of sustainable soil management practices at a wider scale, especially in areas affected by soil salinity, as reflected in the EASP implementation plan, which is reviewed and updated at the yearly EASP plenary meetings [8]. Armenia is a member-country of EASP. The mandate of the GSP is to improve governance of the limited soil resources of the planet in order to guarantee agriculturally productive soils for a food secure world, as well as support other essential ecosystem services, in accordance with the sovereign right of each State over its natural resources. In order to achieve its mandate, the GSP addresses five pillars of action to be implemented in collaboration with its regional soil partnerships. The 5 pillars of action are:

1. Promote sustainable management of soil resources for soil protection, conservation and sustainable productivity
2. Encourage investment, technical cooperation, policy, education awareness and extension in soil
3. Promote targeted soil research and development focusing on identified gaps and priorities and synergies with related productive, environmental and social development actions
4. Enhance the quantity and quality of soil data and information: data collection (generation), analysis, validation, reporting, monitoring and integration with other disciplines
5. Harmonization of methods, measurements and indicators for the sustainable management and protection of soil resources [9].

In the framework of the Global Soil Information System (GloSIS), the Armenian Soil Information System (ArmSIS) was launched on 5 December 2020 during the World Soil Day official celebration. The

development of ArmSIS represents a stepping stone in the assessment of soil resources to guide effective and knowledge-based policymaking to combat soil degradation. At the request of the Ministry of Economy of Armenia, ArmSIS was established through a joint collaboration between FAO, the Global Soil Partnership, the Armenian National Agrarian University, the Centre of the Agricultural Services (SNCO) and the Institute of Geological Sciences. ArmSIS is financially supported by the Ministry of Finance of the Russian Federation. The new and fully functional Armenian Soil Information System was populated by digitizing legacy soil data and compiling fresh soil data that originated from Armenia's soil agrochemical sampling campaigns, which occur every 5 years. Soil property maps were created and/or updated using state-of-the-art Digital Soil Mapping (DSM) techniques. The process was supported through a DSM training provided by the GSP. ArmSIS was designed and developed in the framework of GloSIS, using the open-source GeoNetwork catalog application. ArmSIS represents not only a great achievement for Armenia, but also serves as an example for other countries that want to leverage the full potential of soil information. Its launch constitutes a step closer towards the realization of GloSIS, the first-ever nationally federated and globally harmonized Global Soil Information System [10].

**Conclusions.** Studies show that soil information systems are important for making rational decisions at both the global and local levels. The Republic of Armenia is an integral part of the Global Soil Information System, which has already developed Armenian soil information system (ArmSIS). In order to increase the usefulness and usability of the ArmSIS, it is proposed to create an Armenian version of the system to be useful to Armenian users. To increase the efficiency of the system, it is necessary to add other maps and information, such as soil theme maps and crop suitability maps, fertilizer recommendation. In the future the pedometrics concept for soil mapping and predicting soil and environment properties and remote sensing for the estimation of soil properties also can be added.

## REFERENCES

1. Retrieved from http://www.fao.org/global-soil-partnership/about/why-the-partnership/en/
2. S. Young Hong and others, Development of soil information system and its application in Korea, p. 1-5
3. T. Bhattacharyya, and others, Soil information system for resource management – Tripura as a case study, Current Science-November 2010, p.1210-1212
4. Tapas Bhattacharyya and others, Soil Information System: Web-Based Solution for Agricultural Land-use Planning, Current Science-January 2016, 245
5. Retrieved from http://www.fao.org/global-soil-partnership/areas-of-work/soil-information-and-data/en/
6. Retrieved from http://www.fao.org/global-soil-partnership/pillars-action/4-information-data/en/
7. Retrieved from http://www.fao.org/global-soil-partnership/regional-partnerships/en/
8. Retrieved from http://www.fao.org/global-soil-partnership/regional-partnerships/europe/eurasia/en/
9. Retrieved from http://www.fao.org/global-soil-partnership/pillars-action/en/
10. Retrieved from http://www.fao.org/global-soil-partnership/resources/highlights/detail/en/c/1371495/