Report of the Third Plenary Meeting of the Global Soil Laboratory Network's Spectroscopy Initiative (GLOSOLAN Spec)

Zoom, 31 November- 1 December 2022

GLOSOLAN Spectroscopy-I/22/Report

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Food and Agriculture Organization of the United Nations

Rome, 2023

Contents

1. Introduction

The third plenary meeting of the Global Soil Laboratory Network Initiative on Soil Spectroscopy (GLOSOLAN-Spec) was virtually organized by the Global Soil Partnership (GSP) on 31 November and 1 December 2022 on the online platform Zoom (See agenda in Annex I). The meeting was attended by approximately 80 participants from 40 countries (see list of participants in Annex II) and was opened by Mr Ronald Vargas, GSP Secretary. Mr Vargas announced that the importance of soil spectroscopy is more apparent than ever as many countries have reached out for support. Mr Vargas concluded by remarking on the importance of continuing to invest in an inclusive process to implement the work plan of the GLOSOLAN-Spec, and reiterating to participants the importance of discussing the best way to promote data-sharing and capacity building for interested countries within GLOSOLAN Spec.

2. Report on the work performed by the initiative in 2022-2023

Mr Eyam Ben Dor, the GLOSOLAN Spec Steering Committee Chair presented the main achievements of the GLOSOLAN-Spec Initiative in 2021 – 2022. These include:

- Five online webinars on the topic of soil spectroscopy were organized and attended live by a total of 2 607 participants from 142 countries. All video recordings are available online on the GLOSOLAN website;

- Training material for the beginner level on spectroscopy was developed in collaboration with a World Bank's project in Uzbekistan and translated into Russian, Chinese, and French; and

- A video course consisting of six sessions on the topic of soil spectral modelling was published thanks to the collaboration established with the University of Sydney. Since their release, the videos have been watched more than 800 times.

Mr Ben Dor presented and led the discussion on the main challenges faced by the initiative in 2021 – 2022:

- The discussion on a potential collaboration on a NIR standard operating protocol (SOP) between GLOSOLAN and the Institute of Electrical and Electronics Engineers (IEEE) was halted because of conflict over making the standard operating protocol (SOP) on NIR open source; and

- Legal discussion on the transfer of the soil estimation platform, for open access data analysis for soil spectra to organic carbon information, from Curtin University have taken more time than expected.

Comments on the work plan included further discussion on data sharing and on the need for a clearer forum for discussion.

3. Capacity building

The first day of plenary meeting focused on capacity building activities.

Ms Cécile Gomez presented on the past success and future direction of the GLOSOLAN-Spec webinar series. GLOSOLAN-Spec successfully organized five webinars in English in 2022. Building on this success, more webinars in different languages will be organized in 2023, prioritizing languages which have been requested and those for which translators are available. Moving towards a few series of more specific topics was the suggestion since the basics of spectroscopy have been covered in the previous webinars. Specific examples that were given include collaborating with experts from INSOP (International Network on Soil Pollution) and a series of presentations related to state-of-the-art papers on relevant topics, and a series of webinars with manufacturers on equipment upkeep.

Secondly, Mr Ben Dor presented on the structure and benefits of a summer school programme he will be teaching on spectroscopy. The programme will be hosted for master's students at Tel Aviv University, Israel, in the summer 2023 and will cover critical aspects of spectroscopy and remote sensing. The summer school was suggested to be shared within networks and any interested were suggested to reach out the GLOSOLAN-Spec coordinator. Mr Ben Dor went on to suggest that according to a similar format, summer schools for countries interested in building spectral capacity and for GLOSOLAN-Spec experts to develop near infrared spectroscopy (NIR) SOPs would be possible.

Mr Filippo Benedetti presented the new GLOSOLAN webpage and demonstrated where to find the GLOSOLAN Spec information.

4. Global Proficiency Testing (PT) on Soil Spectroscopy

Mr Elvis Weullow and Ms Zampela Pittaki, World Agroforestry Centre (ICRAF), presented their roadmap for the development of a GLOSOLAN proficiency test (PT) for mid-infrared spectroscopy (MIR). They discussed the benefits and goals of establishing the PT, and the short- and long- term steps required to implement it. They identified the need for SOP's to be developed and reviewed as one of the first steps.

Then, Mr Ben Dor presented in greater detail the way forward for a near-infrared spectroscopy (NIR) proficiency trial (PT), as well as his experience with the P4005 (IEEE's spectroscopy focused working group) spectroscopy PT, as the first ring share trial has been progressing with IEEE. He identified shipping as one of the biggest limitations in the progression and the inclusivity of the PT.

Finally, Mr Jose Lucas Safanelli, Woodwell Climate Center, presented on the North American section of the ring trial. While the analysis is ongoing, initial results show the importance of more research on calibration transfer.

The discussion covered the frequency and demand for a GLOSOLAN PT. Focusing on publishing SOPs this year and preparing for the PT to take place in 2024 was widely suggested and thus decided on as the best course of action. Inclusion of additional countries that were not able to participate in the IEEE ring trial, due to customs and shipping issues, was also a priority. Additionally, GLOSOLAN needs to find available soil samples for PT.

5. Soil estimation platforms

Ms Magdeline Vlasimsky, GLOSOLAN Spec coordinator, spoke on the progress on the transfer of the soil property estimation platform on carbon (GlobalSpeC) from Curtin University to the GSP/FAO. The legal progress has been more complex than expected but the transfer is expected in beginning 2023.

Mr Jonathan Sanderman from Soil Spectroscopy for the Global Good, then presented on their soil estimation service and its challenges. During the following discussion, it was suggested to publish a list of all available soil spectral libraries and their licensing as well as a guide to the different soil estimation platforms and when to use which. Encouraging countries to have open licenses for their soil spectral libraries was also suggested.

6. Conclusions

The vote on the International Capacity Development Group on Soil Spectroscopy (SoilSpecNet) was for. The work plan was approved, with the additions of guides to the available open-source resources on spectroscopy, the creation of a forum of discussion and encouragement for institutions to make their data publically accessible. The global PT with be considered for 2024 in order to incorporate experiences from the ongoing external PTs, and in the meantime emphasis will be put on the development of the SOPs.

7. GLOSOLAN-Spec work plan 2022-2023

The below workplan and assigned tasks were endorsed by GLOSOLAN-Spec.

Activity	Responsible party	Deadline
General assignments		
Inform GLOSOLAN members and working group members on the outcomes of the second plenary meeting on spectroscopy and move forward with the shift to the Soil Spectral Network.	GLOSOLAN Coordinator	February 2023
Capacity development		
Organization of a series of webinars on the topic of spectroscopy equipment, together with the use of protocols, soil spectral library, spectral modelling, open-source data analysis training, etc. Diversify languages webinars are offered in.	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WG, Manufacturers	February to December 2023 - 4-6 sessions are expected for the first series of webinars 2023 - The first session is expected to start from February - Schedules should be online by January

Expand training material:
 	
- Translate existing material into additional languages
 	
   • For written publications
 	
   • For the video trainings, subtitles in all FAO languages plus others depending on demand and availability of translators
	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WG, Partners.	Throughout 2023

Implement training programme on the topic of spectral measurement, spectral data management, spectral modelling, etc. - Online courses - Short intensive training programmes which can be hosted by different institutes. - Cost Action plan for funding support	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WGs	February to December 2023

Gathering advanced institutes/ research groups on soil spectroscopy for national capacity development under GLOSOLAN-Spec initiative
 	
    Finalizing and publishing information in GLOSOLAN website
 	
- Informing countries about this information and encouraging countries actively looking for collaborators from this database
 	
   - Share application amongst the working group and to all interested.
 	
   - Collect applications and discuss selection amongst steering committee.
 	
Follow up actions will be taken with those willing to work with the GLOSOLAN
	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WGs	Started right after 2nd plenary meeting, all information is expected to be online before March 2023

- information in GLOSOLAN website
 	
- Informing countries about this information and encouraging countries actively looking for collaborators from this database
 	
    - Share application amongst the working group and to all interested.
 	
    - Collect applications and discuss selection amongst steering committee.		

Sending a questionnaire, to collect more detailed information about what specific technical support each lab needs for the development of soil spectroscopy. GLOSOLAN's activities can be more target	GLOSOLAN Coordinator, GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WG	May 2023

orientated based on the results back from this. questionnaire		
Organize and execute summer school for NIR protocol	GLOSOLAN Coordinator, GLOSOLAN-Spec Coordinator, Chair, Steering Committee	September 2023
Create and moderate a forum for discussion either integrated into the GLOSOLAN-Spec. website or linked to it.	GLOSOLAN Spec-Coordinator, Chair, Steering Committee WG	Late January 2023
Proficiency Test (PT) on Soil Spectroscopy		

Call for labs to join PT on soil spectroscopy - Confirmation on their interests to join PT - Confirmation on their instrumental and lab capacities - call for soil samples All information will be organized in a database to be used by the working groups. Follow up actions will be taken with those willing to work with GLOSOLAN	GLOSOLAN Coordinator, GLOSOLAN-Spec Coordinator, GLOSOLANLabs - The first round of PT can start with the previously recognized regional champion labs and those from SSN recommended by the Steering Committee - GLOSOLAN will be looking for soil samples and sendingsoil samples	2023
Continue work on Spectroscopy PT - Follow Road Map for MIR, developed by ICRAF - Continue discussions with IEEE on NIR	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WGs, GLOSOLAN Members	Throughout 2023, Exact timing of PT dependent on feedback from labs
Global Soil Spectral library & Estimation Service		

Continuing establishing free estimation platforms - Engage with estimation platform developers for hosting estimation platform - Communicating with FAO IT&LEGA department for technical and legal procedures - Inviting few users for testing estimation platform - Detecting and fixing technical issues of platform - Open the platform to public as a free service	GLOSOLAN-Spec Coordinator, Chair, Steering Committee, WG members	2023 It depends on how the process moves forward in FAO LEGA

Contacting countries or labs who have existing soil spectral libraries, and who are building or interested to build a spectral library: - Looking for responsible individuals from the Steering Committee for each region, to support communication with labs - Encourage lab's willingness to make publicly available part of their spectral library Summarize information of all confirmed labs (e.g.:contact information,data type, timeline, etc.)	GLOSOLAN Coordinator, Chair, Steering Committee,WG members	June 2023

Create and publish guidelines on the focus and suitability of the difference Estimation Services for different situations.	GLOSOLAN Spec. Coordinator, Steering Committee, WG	April 2023
Projects and Publications		
Writing project proposals and concept note to cover the following costs: - The implementation of the National Capacity Development, including training, the program, instrument procurement, etc. - Organization of PT among regional champion laboratories - Development of the global spectral library and the global SOC estimation service	GLOSOLAN Coordinator,Chair, Steering Committee	Through all the year 2023

- Development of the national soil spectral labs, national soil spectral libraryand estimation service		
Publish a scientific publication to report GLOSOLAN-Spec initiative	GLOSOLAN Coordinator, Chair, Steering Committee,WG members	Submit by end of 2023

7. Venue and Time of the Next Meeting

The fourth plenary meeting on soil spectroscopy will take place virtually or in hybrid format, depending on

feasibility, between September and November 2023.

Annex I. Agenda

Third Plenary Meeting on Spectroscopy

30th November- 1st December 2022

From 11 AM to 1 PM CET

Online meeting – Zoom platform

Day 1		
11:00 - 11:10AM CET	Opening	Mr Ronald Vargas, Secretary of the Global Soil Partnership
11:10 – 11:15 AM CET	Endorsement of the Agenda and group picture	Ms Magdeline Vlasimsky, GLOSOLAN Spec. coordinator, FAO
11:15 – 11:35 AM CET	Item 1. Report on the work performed by the Initiative in 2021-2022	Dr Eyal Ben-Dor, GLOSOLAN Spectroscopy Chair, Tel Aviv University
11:35- 11:45AM CET	Discussion of the report	Dr Eyal Ben-Dor, GLOSOLAN Spectroscopy Chair
CAPACITY BUILDING		
11:45AM – 11:50PM CET	Item 2: Presentation and Discussion on Soil Spectral Network (for decision)	Ms Magdeline Vlasimsky, GLOSOLAN Spec Coordinator
11:50 – 12:20PM CET	Item 3: GLOSOLAN Spec. webinars: updates and way forward	Dr Cécile Gomez, Institut de recherche pour le développement (IRD)
12:20-12:50PM CET	Item 4: Discussion of summer schools on spectroscopy (standard and protocol, the tau COURSE IN June)	Dr Eyal Ben-Dor, GLOSOLAN Spectroscopy Chair, Tel Aviv University
12:50-1:00PM CET	Item 5: GLOSOLAN spec webpage presentation and updates	Moderated by Mr Filippo Benedetti, GLOSOLAN Alternate Coordinator

Day 2		
GLOSOLAN SPEC PROFICIENCY TESTING (PT)		
11:00AM – 11:15AM CET	Item 7: Progress on organization of PT MIR	International Council for Research in Agroforestry (ICRAF)
11:15 – 11:30PM CET	Item 8: Progress on organization of PT NIR	Dr Eyal Ben-Dor, GLOSOLAN Spectroscopy Chair, Tel Aviv University
11:30-11:45	Item 10: Presentations from other organizations who have run PT and discussion	Dr José Lucas Safanelli, Woodwell Climate Research Center

11:45-12:30 PM CET	Item 9: Soil Spectral Estimation Service	Dr Raphael Viscarra Rossel, Curtin University Dr Jonathan Sanderman, Woodwell Climate Research Center
12:30-12:50PM CET	Item 10: Open discussion	Moderated by Dr Yufeng Ge, University of Nebraska-Lincoln
12:50PM CET	Item 11: Review of the work plan 2022-2023 and closure of the meeting	Moderated by Ms Magdeline Vlasimsky, GLOSOLAN Spec Coordinator

Annex II. List of participants

From the GSP Secretariat, FAO:

- Ms Lucrezia Caon, GLOSOLAN Coordinator

- Ms Magdeline Vlasimsky, GLOSOLAN-Spec Coordinator

- Mr Filippo Benedetti, GLOSOLAN Alternate Coordinator

- Mr Ronald Vargas, GSP/FAO

Name	Country	Affiliation
Mohamed Egueh Walieh	Djibouti	Lanoratoire de Pedologie
Nishant K Sinha	Liberia	University of Liberia, Fendell Lab
Chiara Cassinari	Italy	M.C.M Ecosistemi S.R.L
Demba N A Trawally	Gambia	Soil and Plant Laboratory
Soma Jayaraman	India	Indian Council of Agricultural Research
Zampela Pittaki	Kenya	Soil-Plant Spectral Diagnostics Laboratory
Simphiwe Madonsela	Eswatini	Triomf Eswatini Holdings Agriculture Laboratory
Angus McElnea	Australia	Depart of Environment and Science, Queensland
Dalel MELKI	Tunisia	Technical Center of Organic Agriculture
Elvis Weullow	Kenya	Soil-Plant Spectral Diagnostics Laboratory
Sreenivas Chilamkurthi	Nepal	Soil, Plant, and Water Analysis Laboratory
Lamine B Konate		

Nghi Tong Quoc	Viet Nam	Center for Agricultural Analysis and Services
Franck Albinet	France	International Atomic Energy Agency
Jean Novias	Brazil	University of Brasília
Maria Heiling	Austria	International Atomic Energy Agency
June Mark		
Veronica Migo	Philippines	Environment and Bioprocessing Engineering Lab
Eyal Ben Dor	Israel	Tel Aviv University
Jose Lucas Safanelli	Brazil	Woodwell Climate Institute
Penelope Nagel	United States of America	Persistence Data Mining, Inc.
Fenny van Egmond	Netherlands (Kingdom of the)	Wageningen University Soil Labs
Rosa Martinez	Mexico	Laboratorio de suelo, agua, y planta
David Hoover	United States of America	United States Department of Agriculture
Ranjeet Chaudhary	India	Indian Institute of Soil Science
Branislav Jović	Serbia	Laboratory for IR Spectroscopy
Ioannis Varvaris	United States of America	University of Wisconsin–Madison
Maria Knadel	Denmark	Aarhus University
Khalid Omar Ali	Somalia	CSET Agriculture Research and Development
Jean Robertson	United Kingdom Of Great Britain and Northern Ireland	The James Hutton Institute
Yufeng Ge	United States of America	The University of Nebraska-Lincoln

Suleiman Garba	Nigeria	Phosphorus Lab
Clémence Mariage	Belgium	Axe Exchanges Eau-Sol-Plantes, GxABT
Keith Shepherd	United States of America	Innovative Solutions for Decision Agriculture
Gelboikai Keita	Ghana	University of Ghana
Charity Akao		
Elh Moustapha Abdourahaman	Niger	Centre Regional de la Recherche Agronomique
Sanjay	India	Common Research Facility Centre
Hla Win Htay	Myanmar	Land Use Laboratory
Viktorija Ilieva	North Macedonia	University of SS. Cyril and Methodius
Felipe Yunta	Spain	European Commission
Rich Ferguson	United States of America	United States Department of Agriculture
Rabindra Adhikari	Nepal	Laboratory of Soil Science and Geology
Juan Manuel Martin Jimenez	Spain	European Commission
Thomas Terhoeven-Urselmans	Germany	Chief Data Scientist at Crop Nutrition Laboratory Services
Esra Güneri	Türkiye	Ankara University
Rolf Mabicka Obame	Gabon	Laboratory d'Analyse des Sols et Environment
Miriam Ostinelli	Argentina	Laboratorio del Instituto de Suelos CIRN-CNIA-INTA
Andrew Sila	Kenya	The Alliance of Bioversity International and CIAT
Monika Zovko	Croatia	University of Zagreb
Wajira Balasooriya	Sri Lanka	Wayamba University

Daniel Carreira	Argentina	Laboratorio del Instituto de Suelos CIRN-CNIA-INTA
Yasna Pena Plaza	Chile	Pontificia Universidad Catolica de Valparaiso
Aissatou Diouf	Senegal	Laboratoire National de Recherches sur les productions Vegetales
Luciana Silva	Brazil	University Center of Lavras
Muhammad Abbas Aziz	Pakistan	University of Agriculture
Hashim Abba Yakasai	Nigeria	Bayero University Kano
Valmire Havolli	Kosovo	Kosovo Institute of Agriculture
Lewis Kingori	Kenya	KALRO-KABETE
Francis Rubianes	Philippines	International Rice Research Institute
Sevinc Madenoglu	Türkiye	Ministry of Food Agriculture, and Livestock
Yuri Gelsleichter	Brazil	ISRIC
Rose Ndango	Cameroon	Soil, Water, Plant and Fertilizer Analytical Services Laboratory
Joseph Uponi	Nigeria	IITA Analytical Service Laboratory
Ondoua Oyono J. Sadrac	Cameroon	Institute of Agricultural Research for Development
Souleymane DAMBE	Mali	Laboratoire de physico-chimie des matériaux : LPCM-FST/USTTB- Bamako
Tõnu Tõnutare	Estonia	Estonian University of Life Sciences, Tartu
Ingrid Castro	Chile	Laboratorio Analisis De Suelo Cooprinsem
Martin Luft	Germany	Bruker

	India	Indian Institute of Soil Science
Pradip Dey		
Nazar Elnesairi	The Sudan	Soil Laboratory
Leo Ramirez Lopez	Switzerland	BÜCHI Labortechnik AG

Annex III. Decision Document GLO/I/2023

Decision document GLO/I/2023: Review of the capacity building strategy of the GLOSOLAN-Spec Initiative

To be discussed on 30th of November 2022.

Background

Following the launch of the GLOSOLAN Initiative on Soil Spectroscopy (GLOSOLAN-Spec) in 2020, nine regional champion laboratories were identified to serve as regional hubs for training. Thus, to support GLOSOLAN in the implementation of its capacity development programme on soil spectroscopy. However, during the second GLOSOLAN-Spec plenary meeting in 2021, the objectives of GLOSOLAN-Spec were revised to address the need for supporting countries in establishing their own soil spectral laboratories and national soil spectral libraries. To achieve this objective, GLOSOLAN will be using a country-driven approach and invest in capacity building activities at the national or regional level. Additionally, participants in the meeting asked GLOSOLAN to collect and publish detailed information of advanced soil spectroscopy institutions/laboratories in relation to their capacities, research interests, etc.

In this regard, GLOSOLAN-Spec perceived the need to support countries and laboratories not only through the nine regional champion laboratories but through a more extensive network of institutions. This will allow regional and country requests to be addressed by a larger pool of experts and institutions located in different countries worldwide. For example, a request of support from an Asian country will not be only addressed by the regional champion laboratory for Asia but also by other institutions recommended by GLOSOLAN.

Proposal

The proposal is to establish an International Capacity Development Group on Soil Spectroscopy (SoilSpecNet) aiming to:

1. Develop the capacities of at least one soil spectroscopy institution/laboratory per country that will thereafter join SoilSpecNet; and

2. Under the auspices of GLOSOLAN, support the development of the Global Soil Information System (GloSIS) and the National Soil Information Systems by providing estimated soil property data to the International Network of Soil Information Institutions (INSII) for soil mapping and modelling purposes.

SoilSpecNet will be composed of:

- The nine regional champion laboratories or institutions identified in 2020;

- Internationally recognized soil spectroscopy institutions and laboratories; and

- Private sectors (e.g., manufacturers and private laboratories) specialized in soil spectroscopy that prove not to have any conflict of interest with GLOSOLAN and GLOSOLAN-Spec.

Please note that SoilSpecNet does not include individuals because it is not meant to work on individual capacities but on institutional capacities. In this regard, members of SoilSpecNet are tasked to:

- Provide information such as their capacities and interests on the development of soil spectroscopy as needed.

- Attend the in person or virtual annual meetings of SoilSpecNet and contribute to global decision making;

- Support GLOSOLAN-Spec on the development of national capacities by (for example) acting as trainers in webinars, participate to the writing of manuals, guidelines, project applications, etc. on soil spectroscopy, respond to country specific requests for support by sharing their knowledge and other as needed;

- Actively communicate with other SoilSpecNet members and support each other in the implementation of the GLOSOLAN-Spec Initiative;

- Closely cooperate with national INSII focal point and support the development of national soil information systems;

- Get in touch with their National Reference Laboratory in GLOSOLAN to explore ways of collaboration on wet chemistry and spectroscopy at the national level;

- Spread the voice on SoilSpecNet, motivating other laboratories, institutions and private actors in their country and region to join the network;

- Advocate for the mobilization of financial resources to execute the GLOSOLAN-Spec workplan on capacity development;

- Share national and institutional soil spectral libraries (SSLs) to GLOSOLAN to support a global open-access library, and;

- Allow individuals to attend GLOSOLAN summer school on SSL.

All public and private laboratories and institutions, and the private sectors specialized in soil spectroscopy are welcomed to apply and join SoilSpecNet by completing and sending a dedicated registration form to the GLOSOLAN-Spec Coordinator (magdeline.vlasimsky@fao.org) and the GSP Secretariat (GSP-

Secretariat@fao.org). All applications will be reviewed by the GLOSOLAN-Spec Chair and Steering Committee. New members of the SoilSpecNet will be announced at the annual GLOSOLAN-Spec meeting. All information on SoilSpecNet members will be published on the GLOSOLAN-Spec webpage.

SoilSpecNet is led by the GLOSOLAN-Spec Chair with the support of the GLOSOLAN-Spec Steering Committee. The GLOSOLAN-Spec coordinator will act as SoilSpecNet facilitator.

Decision to make at the 3rd Plenary Meeting on Soil Spectroscopy

GLOSOLAN is kindly asking participants to the 3rd Plenary Meeting on Soil Spectroscopy to endorse the establishment of International Capacity Development Group on Soil Spectroscopy (SoilSpecNet).