



Food and Agriculture
Organization of the
United Nations

Item 1

GLOSOLAN-Spec

work report in 2020-2021

*By Mr. Yi Peng, GLOSOLAN-Spec Coordinator,
GSP/FAO*

GLOSOLAN
2nd Plenary meeting
on spectroscopy

2 - 4 November 2021



The GLOSOLAN Initiative on Soil Spectroscopy (GLOSOLAN-Spec) was launched in April 2020 at the purpose of building the capacity of soil laboratories on the use of this technology by bringing together institutions and experts from all around the world on the topic

The First Plenary Meeting on Soil Spectroscopy took place on 23-25 September 2020:

- definition of the GLOSOLAN-Spec work plan for the years 2020-2021*
- definition of the objectives of the initiative*
- definition of the governance of the initiative*
- definition of procedures*

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GLOSOLAN-Spec achievements

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An agreement on the role of the Intergovernmental Technical Panel on Soils (ITPS) in GLOSOLAN-Spec was reached. The text below was confirmed in the Terms of Reference of the Initiative

"At least one member of the Intergovernmental Technical Panel on Soils (ITPS) should be part of the working group on soil spectroscopy. In this regard, the identified expert(s) should assist the GLOSOLAN Coordinator in reporting on GLOSOLAN activities to the ITPS. Because GLOSOLAN works on harmonization and GLOSOLAN documents are released after long discussions among laboratories, countries, and implementing partners, documents produced under GLOSOLAN do not require the approval of the ITPS before publication. The opinion and clearance of the ITPS and that of the GSP Plenary Assembly are required only for documents that have political implications, such as the "Resolution for the International Exchange of Soil Samples for Research Purposes under GLOSOLAN" (presented and approved at the Seventh GSP Plenary Assembly in 2019), and for the launch of new initiatives, such as the initiative on soil spectroscopy (presented and approved at the Seventh GSP Plenary Assembly in 2019) and the initiative on soil fertilizer analysis (presented and approved at the Eighth GSP Plenary Assembly in 2020)."

- GLOSOLAN members were asked to inform the GSP Secretariat whether an amendment to the GSP Soil Data Policy was needed to implement the work of GLOSOLAN-Spec.

Conclusion: no need for an amendment!

- Establishment of 3 working groups:
 - General working group
 - Working group on the library
 - Working group on the estimation service

The first meeting of the working groups was organized in December 2020



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Global soil spectroscopy assessment

**Spectral soil data:
needs and capacities**

2020



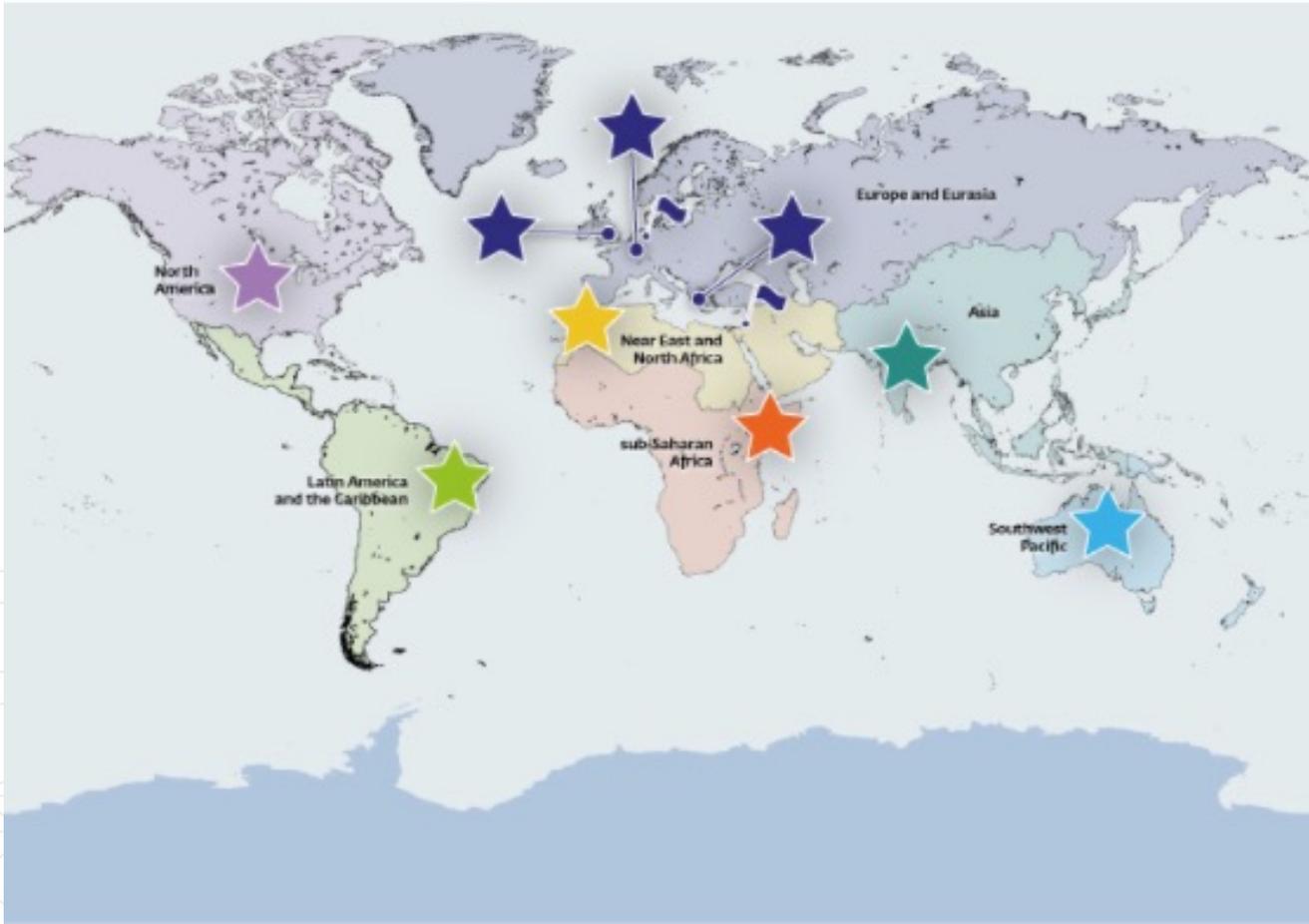
Main conclusions

- Survey was completed by 97 laboratories and experts from 56 different countries
- The assessment provide an overview of the current expertise, capabilities, needs and priority areas for labs that want to start or improve their spectral measurements and modelling,.
- The main issue is the lack of equipment and trainings.
- Building a spectral calibration library, quality checks, sample preparation, and model evaluation, etc.

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Regional Champions on Soil Spectroscopy



11 regional champion laboratories on soil spectroscopy

- EUROPE and the Mediterranean Basin
- AFRICA
- NEAR EAST AND NORTH AFRICA
- LATIN AMERICA AND THE CARIBBEAN
- NORTH AMERICA
- ASIA

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<https://www.fao.org/global-soil-partnership/glosolan/soil-analysis/dry-chemistry-spectroscopy/en/>



Soil spectroscopy webinars

SESSION 1: An Introduction to Soil Spectroscopy

Monday, 6 September 2021 | 15:00 CET



Guest speaker: Bo Stenberg

Biography: Bo Stenberg is an associate professor in soil science from the Swedish University of Agricultural Sciences. He is the research leader at 'Precision Agriculture and Pedometrics', Department of Soil and Environment. His research interests focus on digital soil mapping and variable rate fertilizer application in precision agriculture system, farm soil mapping, proximal soil sensing, diffuse near infrared spectroscopy for soil analysis, three dimensional soil mapping.

Abstract: This webinar will review the basic mechanisms for soil visible–near infrared (vis–NIR) spectroscopy. It will also provide information on applications related to precision agriculture and the use of large regional soil spectral libraries for estimating small scale variations.

[Register here](#) | [Details of the event](#)

SESSION 2: Soil Spectroscopy for accurate measurement of soil physical and chemical soil properties

Thursday, 16 September 2021 | 09:00 CET



Guest speaker: Budiman Minasny

Biography: Budiman Minasny is a professor in soil-landscape modelling at the University of Sydney. He is the theme leader of soil, carbon, and water at Sydney Institute of Agriculture. He is a soil scientist, previously awarded the QEII and the Future Fellowships from the Australian Research Council. He is recognized as a Highly Cited Researcher in 2019 by the Web of Science. He is passionate about the role of soil in managing climate change, food, water, energy security, and maintaining biodiversity.

Abstract: This webinar will present how soil spectroscopy can characterize extensive different soil physical and chemical soil properties.

[Register here](#) | [Details of the event](#)

SESSION 3: A future for soil spectral inference

Thursday, 23 September 2021 | 08:00 CET



Guest speaker: Alex McBratney

Biography: Alex McBratney is a world-leading soil scientist who conceived and developed pedometrics, digital soil mapping and soil security, radically strengthening the knowledge base of soil science. He established new theory and empirical models of soil variation in landscapes and developed their applications. His contributions have revolutionised the availability of soil information and led to improved agricultural practices with reduced environmental impacts and enhanced security of the world's soil.

Abstract: This webinar will present the definition and role of soil spectroscopy for laboratory as well as field measurement and will speculate on possible novel approaches.

[Register here](#) | [Details of the event](#)

- Six online webinars
- A total of 5959 registrations from 142 countries
- A total of 2607 participants joined live session
- Video recordings
- Questions and discussions

SESSION 4: The Brazilian Soil Spectral Library Experience from scientific to society services

Monday, 4 October 2021 | 15:00 CET



Guest speaker: José Alexandre M. Demattê

Biography: Dr. José A. M. Demattê is currently a Full Professor in the Department of Soil Science, Luiz de Queiroz College of Agriculture, University of São Paulo, Brazil. He has basic formation in Pedology with a carrier in Remote Sensing Applied to Soils in last 30 years. He has extensive experience from the research world to practice in the field, agriculture industry, soil management, mapping, precision agriculture, soil tillage, productivity systems and soil laboratories. Thanks to his wide experience he can bridge the real issues with the academic thinking. Currently, he leads the Brazilian Soil Spectral Library, the Brazilian Program on Soil Analysis via Spectroscopy. He is also member of the working group of the Pronasolos Brazilian Soil Mapping and MapBioma Programs.

Abstract: This webinar will present the 25 years' experience on constructing the Brazilian Soil Spectral Library, from scientific research purposes to the development of free estimation online service of soil analysis.

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[Register here](#) | [Details of the event](#)

SESSION 5: Characterization of soil properties using French national Vis-NIR and MIR spectral libraries

Thursday, 14 October 2021 | 14:00 CET



Guest speaker: Cecile Gomez

Biography: Dr Cécile Gomez is involved in research dealing with Vis-NIR-SWIR (400 – 2500 nm) lab, field and remote sensing imagery for soil sciences studies. She has now around 12 year experience in lab and field soil spectroscopy, and in imaging spectroscopy (airborne and satellite supports) for extraction of physico-chemical soil properties. She was and is currently P.I. and Co-P.I. in national research projects and contributes to the definition of the French hyperspectral satellite (HYSP). She is a French Research Scientist at IRD (French Research Institute for Sustainable Development) since 2007. She is currently associated with the Indo-French Cell for Water Sciences at IISc Bangalore (India).

Abstract: This webinar will present the national soil collection provided by the French national soil quality monitoring network. Based on this national database, several researches have been conducted for 10 years to highlight the potentials and issues of such national spectral databases.

[Register here](#) | [Details of the event](#)

SESSION 6: Measuring reflectance of undisturbed soil surface in the field under laboratory quality: A protocol to assess soil properties that are sensitive to the soil sealing phenomenon

Thursday, 28 October 2021 | 15:00 CET



Guest speaker: Eyal Ben-Dor

Biography: Prof. Eyal Ben-Dor is the Head of the Remote Sensing Laboratory at Tel Aviv University (RSL-TAU), the leading group in Israel for imaging spectroscopy (IS), soil spectroscopy and remote sensing applications dedicated to soil mapping and environmental monitoring. The RSL people are experts in field and airborne campaigns at national and international levels and have gained significant experience in many different projects.

Abstract: This webinar will cover a new developed device for measuring surface reflectance in the field to fill the gap between laboratory and field spectral measurements of the soil surface.

[Register here](#) | [Details of the event](#)

If you intend to participate in the webinar(s), please register using the above links. Upon registration, you will receive an automatic reply providing you with personal username and passcode to access the session which you registered for.

Soil spectroscopy training material

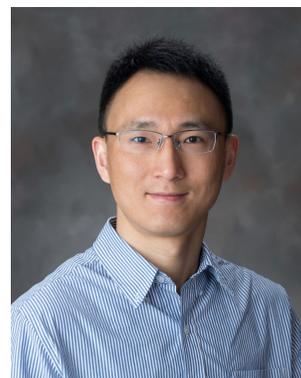
Project: Innovative Digital Tools for Soil Fertility Management in Uzbekistan

Funding: World Bank in cooperation with the Korean Trust Fund for Green Growth (KGGTF)

A primer on soil analysis using visible and near-infrared (vis-NIR) and mid-infrared (MIR) spectroscopy

1. Background

Visible and near infrared (vis-NIR) and mid-infrared (MIR) reflectance spectroscopy has emerged and developed in the past three decades as an important method for quantitative soil analysis in the lab (Baumgardner et al., 1985; Chang et al., 2001; Viscarra Rossel et al., 2006; Reeves III, 2010). Many researchers believe that vis-NIR and MIR can become an alternative to the conventional laboratory-based, wet-chemistry methods for soil analysis (Janik et al., 1998; Nocita et al., 2015). Various modern applications require large amounts for high-resolution (both in space and time), quantitative soil data. One examples is precision agriculture, where soil samples are collected from the field (e.g., in a grid pattern) and analyzed in the lab to generate soil property maps. These soil property maps then become baseline maps to generate management zones or to guide variable rate applications of fertilizers, water



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Prof. Budiman Minasny (University of Sydney)

Prof. José Alexandre M. Demattê (University of São Paulo)

Preface writing:

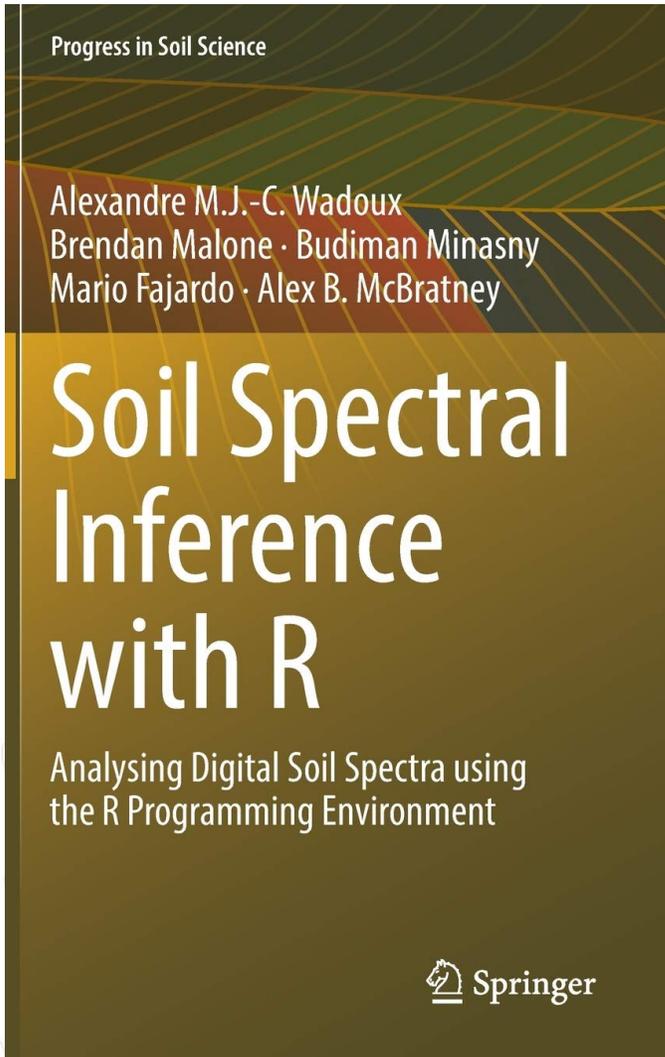
Prof. Alex McBratney (University of Sydney)

Expected to be online beginning of 2022

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Soil spectral modelling video courses



- Six sessions
- Soil spectral modelling in R
- Delay due to COVID lockdown in Sydney
- Expected to be online in 2022
- R codes



Alexandre Wadoux
University of Sydney

Challenges and issues

- Sending soil samples to KSSL
- Issues of publishing SOPs
- Issues of collaboration with IIEEE
- Instruments (Issues of working with private sectors)



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Thank you



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