LATSOLAN-V/22/Report

Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

Report of the Fifth meeting of the Latin American Soil Laboratory Network (LATSOLAN)

Virtual meeting, 26 - 27 October 2022

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2022

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Introduction

The fifth meeting of the Latin American Soil Laboratory Network (LATSOLAN) was held online on 26 and 27 October 2022. The meeting was attended by about 160 laboratory staff members and managers from 23 countries within Latin America and the Caribbean. The list of participants is available in Annex I.

The meeting was opened by Ms María Cristina Suárez, LATSOLAN Chair, Ms Miriam Ostinelli, Chair of the Global Soil Laboratory Network (GLOSOLAN) and Ms Carolina Olivera Sanchez, facilitator of the Latin America and the Caribbean Soil Partnership (on behalf of Ms Sol Ortiz García – Chair of the Regional Partnership), who recalled the importance of good quality, harmonized data in decision making and the link between GLOSOLAN and global soil mapping activities. The importance of keeping soil laboratories connected and collaborating with the national focal points and the FAO country offices was also stressed.

Ms Suárez ultimately recalled the objectives of the meeting: (i) to inform Latin American and Caribbean soil laboratories on GLOSOLAN progress and the way forward, (ii) to bring soil laboratories issues and challenges to the attention of national governments by bridging the gap between soil laboratories and national focal points to the Global Soil Partnership (GSP), (iii) to discuss the results of the GLOSOLAN proficiency test (PT) 2022, (iv) to identify the standard operating procedures for GLOSOLAN and LATSOLAN to harmonize, and (v) to open the discussion on the interpretation of laboratory results and the provision of recommendations to farmers.

In order to meet these objectives, national focal points to the GSP were invited to attend the first day of the meeting (see agenda in Annex II).

Highlights and conclusions

Ms Lucrezia Caon (GLOSOLAN coordinator) opened the meeting by introducing national focal points to the GSP and new LATSOLAN members to GLOSOLAN, recalling that uncertainty in soil data is currently too large to monitor changes in soil properties, to make scientific conclusions or to pay for ecosystem services. By improving the performance of soil laboratories and reducing uncertainty in the measurement, GLOSOLAN plays a key role in providing better soil data for better soil management and decision-making. At present, GLOSOLAN is composed of almost 1 000 member laboratories organized into Regional Soil Laboratory Networks (RESOLANs). Since 2021, GLOSOLAN supports countries in establishing their National Soil Laboratory Networks (NASOLANs).

Participants commented that GLOSOLAN, LATSOLAN and NASOLANs are very important platforms for exchanging information and ideas, to allow experts to talk freely, and to promote technical and scientific cooperation. Thereafter, the discussion focused on the following topics:

- National Soil Laboratory Networks (NASOLANs)

During the meeting, representatives from Argentina, Chile, and Mexico shared their experience on the establishment of their NASOLANs. Having an international committee supporting the national reference laboratory on the establishment of NASOLAN-Chile (RENALASCH) was of critical importance to the successful implementation of their activity in the country. Argentina represents a special case as they are trying to merge more than one existing national network on soil laboratories in the country. In Mexico, launching NASOLAN-Mexico (MEXOLAN) helped in affirming the national reference laboratory in its role and to adapt GLOSOLAN standard operating procedures (SOPs) to the national context. In order to keep Mexican laboratories active and engaged, regular meetings, conferences, and events are organized.

Mr Gaius Eudoxie from Trinidad and Tobago presented the work that he is leading to establish a sub-regional soil laboratory network of Caribbean Small Island Developing States (SIDS) under the project SOILCARE. Interested countries are: Antigua and Barbuda, Barbados, Belize, Granada, Guyana, Haiti, Jamaica and St. Lucia. The project aims to strengthen Caribbean SIDS with the necessary tools for adopting policies, measures and reforming legal and institutional frameworks to achieve land degradation neutrality and climate resilience. One core activity of the project is the establishment of the Caribbean Soil Laboratory Network (CARSOLAN) for building the capacity of laboratories on soil analysis and data harmonization. In terms of soil laboratory activities, an assessment of soil laboratory capacities was performed, a minimum set of SOPs for harmonization and capacity building was agreed on, benefiting laboratories of the project registered in GLOSOLAN and a training programme was defined. The equipment and consumables to procure are under discussion. Activities on soil laboratories will be implemented hand-in-hand with the development of the soil information system (SIS) software for SOILCARE countries (national systems), the development of the CarSIS platform (regional system) and the development of CarSIS decision support system (CarSIS DSS).

Countries were invited to provide information on the status of establishment of their NASOLAN or their NASOLAN activities to the GLOSOLAN coordinators. Information will be used by the GLOSOLAN coordinators to create or update NASOLAN webpages. The GLOSOLAN coordinators also reminded participants about the Terms of Reference for NASOLANs and the guidelines on how to establish a National Soil Laboratory Network that provide stepwise instructions for developing the national networks and reports interesting study cases.

- Bridging the gap between soil laboratories and national governments

Ms Caon presented the results of the survey on the interaction between national reference laboratories and national focal points to the GSP. The survey was completed by the national reference laboratories for Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Honduras, Jamaica, Nicaragua, and Trinidad and Tobago. When asked about the type of support they receive from the government, the majority of laboratories (forty percent) reported not to receive any type of support from their government. Twenty percent of respondents declared to receive some sort of support as “other”, ten percent to receive support as extra budget, ten percent to receive moral support, importance and visibility at the national level, and ten percent to have a preferential communication channel with the government. A remaining ten percent of them did not answer this question.

The majority of laboratories (sixty percent) do not receive any support from sponsors or donors other than the government. Still, four laboratories that answered the survey reported that they are the main and unique data providers to their government for national soil assessment and mapping activities. Still, another four laboratories reporting acting as main data providers to their government together with other institutions while two laboratories stated not being involved in national soil assessment and mapping activities at all.

During the discussion, participants showed appreciation for the participation of national focal points to the GSP to the meeting because of the role that they play in decision-making and the role that they can play in bringing soil laboratories' needs and priorities to the attention of the central government. National focal points need to know about GLOSOLAN, LATSOLAN and NASOLAN activities and need to support the national reference laboratory for their country. Still, national focal points need to connect soil laboratories to other GSP activities that are not necessarily happening in the laboratory because of the support that laboratories can provide to their implementation. This can be done by organizing country specific meetings aiming at (1) improving the connection between the national reference laboratory and the national focal point, and (2) having more comprehensive discussions that look at the implementation of all GSP activities. The region also stressed the need to develop one platform to bring all laboratory soil data together and to make it public.

The frequent change of national focal points in the region represents an issue. Linking national reference laboratories to the national soil science societies could help coping with this unstable situation. LATSOLAN also agree on the proposal of the European and Eurasian Soil Laboratory Network (EUROSOLAN) to prepare two brochures:

- One flyer/brochure for soil laboratories: this should stress the added value of GLOSOLAN/LATSOLAN in building the capacity of its member laboratories. Therefore, it should focus on equipment, standard operating procedures and the fact that joining the network will give international visibility to member laboratories (e.g. through the GLOSOLAN/FAO website).
- One flyer/brochure for the government: this should focus on data quality for decision making and the role of GLOSOLAN in supporting countries on the reporting on the Sustainable Development Goals.

- Governance on the import of soil samples and guidelines on the management of soil samples in laboratories

Mr Giacomo Rocchegiani (GSP Secretariat) provided an overview of the regulations on soil samples import within and outside the Community of Latin American and Caribbean States (CELAC) area:

- Imports within the CELAC area: soil samples can be easily exchanged between members countries providing the following documents:
    - Phytosanitary Certificate;
    - International Agreement;
    - Safe Conduct (a document issued by the institution sending the samples, indicating the receivers/carrier involved in the shipping).

- Imports from outside the CELAC area: soil samples coming from countries other than CELAC should be shipped together with:
    - Certificate of sterilization;
    - Certificate issued by the shipping institution stating the purpose of the use of that soil (research/inter-laboratory tests).

This information is also available on Soil Import Database (SIMPLE) of GLOSOLAN.

Regarding waste management regulations, almost all countries have them, but the actual implementation is lacking. The lack of such implementation causes numerous negative consequences, ranging from uncertainty with which practitioners behave to the safety of laboratory technicians, and even, paradoxically, to a negative impact on the soil itself in the case of a lack of regulations on waste management in laboratories dealing with these types of samples. Actually, in some cases, this lack of public bodies is compensated for by private bodies or universities. For example, in cases where the States do not provide any guidance on the disposal and handling of soil samples, in these circumstances it is often the laboratories that provide their workers with the necessary guidelines. However, this phenomenon leads to inconsistency within even a single State.

Responding to this vacuum is one of the major responsibilities in the hands of individual State governments. The contradiction inherent in promulgating environmental protection regulations that are not supported in practice by guidelines in the management and especially the disposal of soil samples is evident.

Mr Rocchegiani also introduced participants to SoiLEX, a global database that aims to facilitate access to information on existing legal instruments on soil protection and prevention of soil degradation and, in this way, raise awareness on such a pivotal topic. The platform was created in coordination with FAOLEX, which is to date one of the largest databases of legal frameworks and instruments related to natural resource management, food, and agriculture. The legal and policy instruments can be searched by country profiles or by soil-related keywords. The information provided by the database allows users to have the complete document as well as a detailed summary of its content, focusing mainly on the purpose and specific objectives of the instrument. On SoiLEX, there is also a section for topic-based search method. In addition, there is a map on the website showing those states that have regulations exclusively dedicated to soil protection, the so-called “soil acts”. To date, there are, unfortunately, only 19 countries that have a soil act (just under 10 percent of the 194 members countries of the FAO) and, of these, only 16 have a systematic national regulation.

- LATSOLAN performance in the GLOSOLAN PT 2022

Ms Mercedes Mendez-Millan (IRD, France) presented an overview of the performance of the LATSOLAN members that participated to the GLOSOLAN Proficiency Test (PT) 2022. Fifty-one soil laboratories from 20 Latin American and Caribbean countries received a parcel containing a set of ten soil samples. Each sample contained ten g of homogenized soil material that had been dried, sterilized and packed in double-layered plastic bags. Each sample was labelled in progression using the suffix “GLO-” (i.e. GLO-1, GLO-2, etc.). Laboratories were asked to determine a few basic chemical parameters for each sample, namely: soil carbon, total nitrogen, and soil available phosphorus. While total nitrogen and available phosphorus were

not mandatory parameters to analyze, PT participants were asked to deliver results on carbon as a mandatory condition to join the PT. This condition was decided due to the global need to have precise data on the organic carbon content of the soil, given its role in mitigating climate change.

The PT instructions delivered to each participant specified that the standard operating procedures (SOPs) harmonized by GLOSOLAN should have been used to analyze each soil parameter. These were:

SOPs on carbon:

- Total carbon by Dumas dry combustion method available in English, Spanish and Russian (EN | ES | RU);
- Organic carbon by Walkley and Black method – titration and colorimetric method available in English, Spanish and Russian (EN | ES | RU);
- Organic matter by loss of ignition. Please note that GLOSOLAN does not have a SOP for measuring organic matter by loss of ignition at 450-550 °C yet.

SOPs on phosphorus:

- Soil available phosphorus by Olsen method available in English only (EN);
- Soil available phosphorus by Bray I method available in English only (EN);
- Soil available phosphorus by Bray II method available in English only (EN).

SOPs on nitrogen:

- Soil total nitrogen by Dumas dry combustion method available in English only (EN);
- Soil total nitrogen by Kjeldahl method available in English only (EN).

The low amount of soil needed to carry out the analysis using the methodologies reported above allowed participants to perform more than one procedure for the same parameter.

Each laboratory was provided with a unique pin code to be used to upload the analysis results on an online platform that was developed by GLOSOLAN with the purpose of facilitating the collection of data from PT participants and guarantee anonymity.

The presented results were based on the data that was successfully submitted by 41 laboratories only (out of the 51 which received the samples) and thus used for the statistical analysis. Ten laboratories did not submit the results in time to be included in the analysis and their performance will be not assessed, despite having received the samples for the GLOSOLAN PT. Mr Christian Hartmann (IRD, France) remarked on the importance of ensuring a clear overview of the countries' regulations prior to proceeding in shipping the soil samples. This information should also be made available on the GLOSOLAN's soil import legislation (SIMPLE) database. He also highlighted the great opportunity given to the labs to participate in the exercise for free, as the preparation and delivery of PT samples is a time-consuming and expensive operation.

Ms Mendez-Millan shared some outcomes on the performance of Latin American and Caribbean laboratories for the carbon analysis. The overall results (on both the regional and world scales) will be described in detail in the PT global report, which is under preparation. Moreover, all PT participants received an individual report of their performance.

The analysis of the PT results allowed for insight for the most adopted methodologies. For instance, it seems that most LATSOLAN laboratories use the Walkley and Black method to measure soil organic carbon, as 36 out of the 41 participants of the GLOSOLAN PT submitted results following this procedure. Nevertheless,

the Dumas method was used by 14 laboratories (this was the region where the second highest number of carbon values by Dumas were collected, after Europe), while only seven PT participants from the region submitted results using loss of ignition method. As explained above, laboratories could perform more than one methodology to determine the same parameter (e.g. both Walkley and Black and Dumas), as long as there was sufficient sample quantity.

Results obtained using Walkley and Black method (see figure 1) highlighted that the uncertainty (i.e. dispersion of the results around the consensus values) of the analysis results received from LATSOLAN laboratories participating to the PT was similar to the global one (coefficient of variation around 15 percent). Values for sample F (the one with the highest carbon content), showed higher dispersion. However, the coefficient of variation for such sample was only 17 percent, indicating a similar performance compared to the other samples.

Moreover, Ms Mendez-Millan explained that within the ten-sample set received by laboratories, five samples were actually replicas of the same soil. This was done to test laboratories' precision in blindly measuring the same soil material multiple times. Overall, results suggested that LATSOLAN members determined very similar consensus values. Still, the distribution of results around such consensus values was different among the five replicates, indicating issues with precision for some of the laboratories. Moreover, the boxplots reported in figure 1 highlight that for each sample there are three to four outliers, suggesting additional problems with accuracy.

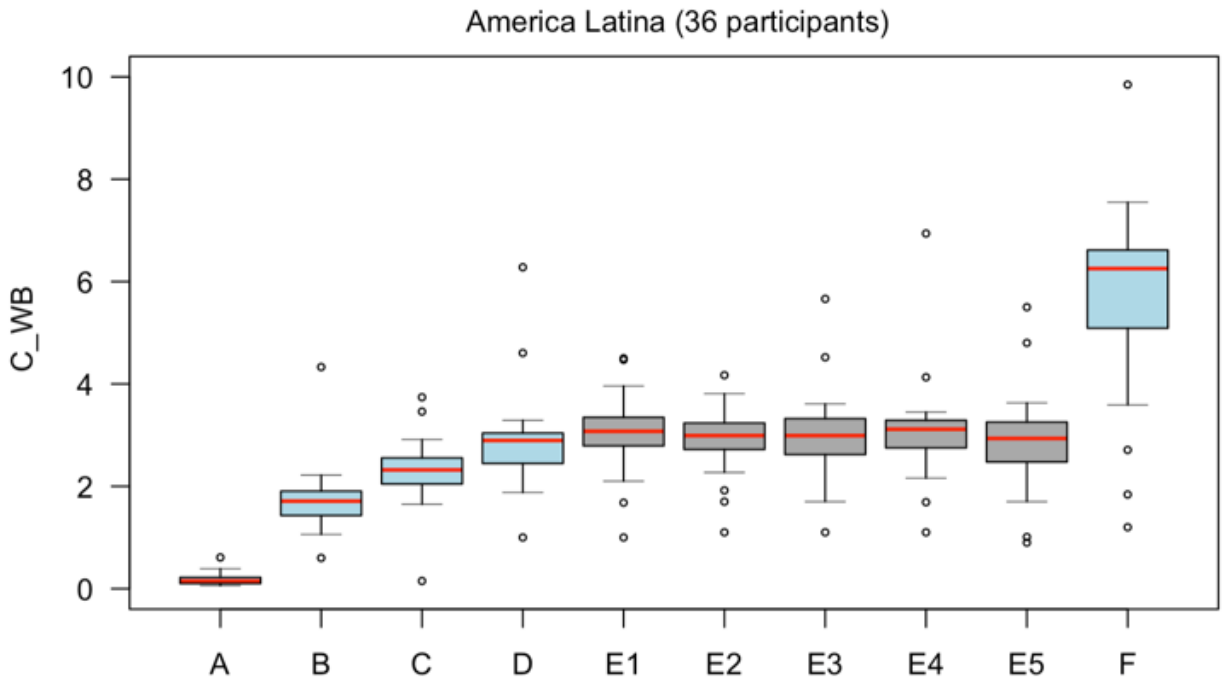

Figure 1 – Boxplots reporting the results collected from the LATSOLAN participants to the GLOSOLAN PT 2022 for soil organic carbon using the GLOSOLAN SOP for Walkley and Black method. Letters A-F correspond to the samples delivered to laboratories

ordered from the lowest to the highest carbon content. Please note that the A-F order does not coincide with the order of samples' labelling (GLO-1, GLO-2, etc.). The y-axis report carbon content (percentage).

Figure 2 reports the data derived from total carbon submissions collected using the Dumas method. The coefficient of variation was much better that the one calculated for Walkley and Black submissions, at around five percent. However, for sample A (the one with the lowest carbon content) the calculated coefficient of variation was 55 percent, while for sample F (highest carbon content) was as low as two percent. The precision in measuring the carbon content for the five replicates was better with Dumas method rather than Walkley and Black, but minor differences could still be observed between replicates. Dumas results revealed a lower number of outliers (generally only two outliers per sample) compared to Walkley and Black, but their presence could be addressed to biases. Considering the overall procedure to measure carbon content following the principle of Dumas method, it would be unlikely that the reported outliers are linked to the apparatus used (analytical machines). Therefore, human errors might still influence the quality of measurement even when a high-technology method is used. In other words, this means that results may be improved by working on laboratory technicians' reporting skills, with marginal expenses.

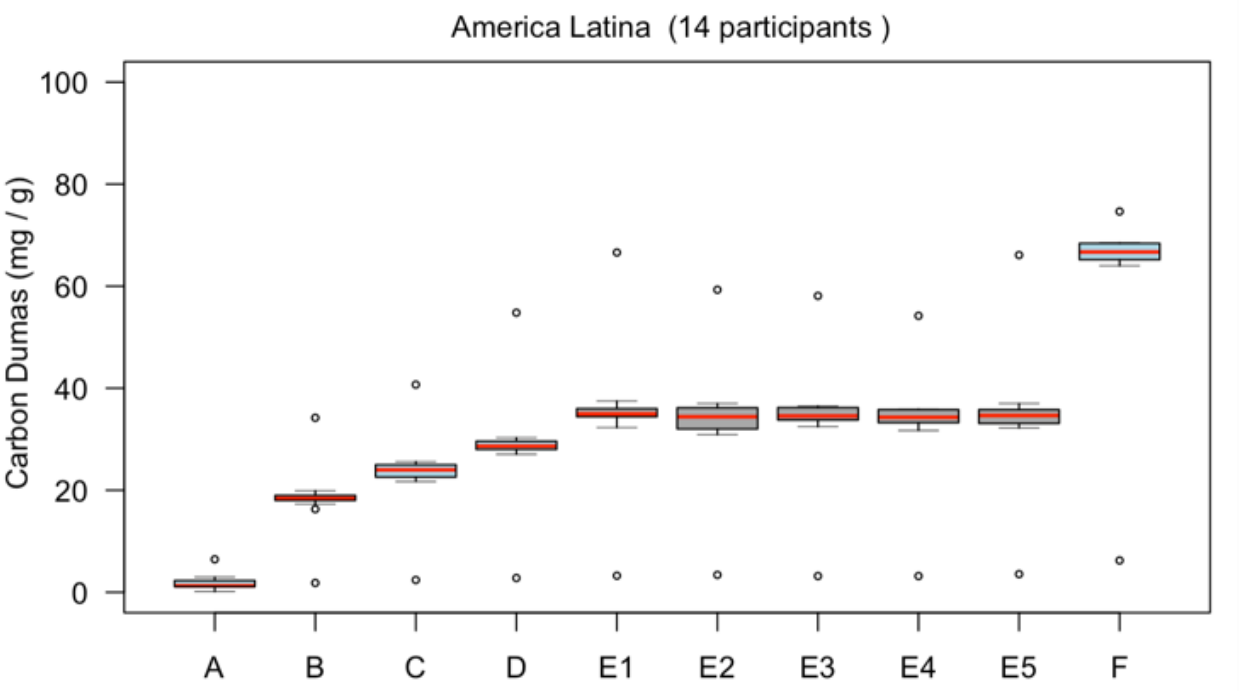

Figure 2 – Boxplots reporting the results collected from the LATSOLAN participants to the GLOSOLAN PT 2022 for soil total carbon using the GLOSOLAN SOP for Dumas method. Letters A-F correspond to the samples delivered to laboratories ordered from the lowest to the highest carbon content. Please note that the A-F order does not coincide with the order of samples' labelling (GLO-1, GLO-2, etc.). The y-axis report carbon content (mg/g).

Ms Mendez-Millan informed participants that the data collected using the loss of ignition method were very low in number (seven submissions only, as mentioned above). For this reason, it was not possible to proceed with a statistical analysis. Consequently, the graph for this method is not included in this report.

During the discussion, participants asked to organize a PT on Mehlich III and other parameters like nitrate and ammonium that are of relevance to the application of fertilizers. The parameters will be selected based on the SOPs already harmonized by GLOSOLAN. Jamaica also pointed out that not all laboratories do a same analysis for similar purposes and that quality is key. Participating to a PT does not mean that the laboratory is accredited and this should be made clear also to farmers.

- Standard operating procedures (SOPs)

Ms Caon recalled how GLOSOLAN SOPs are harmonized, stressing that a modified procedure is followed when there are few experts on a topic in the working groups or when there are only few laboratories using a given method. In this regard, harmonization matrices are used as a reference within the working group and are not sent to the GLOSOLAN network for completion.

In order to open the discussion on the SOPs that LATSOLAN recommends GLOSOLAN to harmonize in 2022, Ms Caon summarized the SOPs that the network harmonized already. See table 1. To note that since GLOSOLAN already harmonized the majority of methods widely used worldwide, in 2023, RESOLANs will focus on harmonizing SOPs of regional relevance.

Table 1. SOPs harmonized by GLOSOLAN in 2019 - 2022

	2019	2020	2021	2022
Chemical	OC Walkley and Black, TC Dumas, Calcium carbonate eq. (titrimetric and volumetric calcimeter methods)	Phosphorus (Bray I, Bray II, Olsen, Mehlich I), pH, electrical conductivity (in water and in saturated paste), nitrogen (Dumas, Kjeldah), carbon (Tyurin)	Particulate organic carbon (physical fractionation), Quasi-total elements (digestion using aqua regia and EPA), Exchangeable bases and CEC (ammonium acetate), available micronutrients (extraction using DTPA), Boron (hot water extraction), Mehlich III for macro and micronutrients (including S and B)	Organic matter (loss of ignition), Available phosphorus (KCl), Exchangeable acidity + Exchangeable Al (KCl), Soil buffer capacity (KOH), Fe and Al oxides (ammonium oxalate)
Physical			Particle size-distribution (hydrometer, pipette), bulk density, moisture content (gravimetric method)	Water retention (pF) curve, Particle density (pycnometer)
Biological			Microbial biomass C and N by chloroform fumigation-extraction, soil respiration	Microbial Enzyme Activities (B-Glucosidase, Arylsulfatase, Dehydrogenase), N Mineralization (incubation method), Nematodes trophic groups (wet extraction), QBSar, ISO-TSBF

Participants decided to ask the LATSOLAN Steering Committee to prepare a survey about the SOPs to harmonize at the regional and global level in 2023. In this regard, no decision on the SOPs to propose for harmonization to GLOSOLAN was made.

- Interpretation of laboratory results and provision of recommendations to farmers

Mr Jorge Etchevers presented about the importance of soil analysis for soil fertility. The most important chemical analysis to soil fertility are of two types:

1. Those that have a **direct interpretation** and do not constitute analysis of essential elements and properties such as aluminum, base saturation, C:N ratio, calcium carbonate, cation exchange

capacity, electrical conductivity, organic carbon, organic matter, pH. The interpretation of this first group is the product of empirical experience, published and agreed among the experts (tables, charts).

2. Value indicators of the potential availability of essential elements to plants. The extension of the root system influences plants absorption of nutrients, which can be grouped into the following fractions:
    a. Soluble, among these are available N (nitrates) and B;
    b. Extractable (ammonium + nitrates), cupper, iron, molybdenum, phosphorus, zinc;
    c. Exchangeable (aluminum, calcium, hydrogen, magnesium, potassium);
    d. Mineralizable (nitrogen, phosphorus, sulfur);
    e. Fixed (P, K).

    Soluble, extractable and exchangeable fractions require methods previously selected (correlation) and calibrated for the results to be useful for fertilizer recommendations to producers. Mineralizable and fixed fractions can also be measured but they do not relate directly to fertility recommendations.

At the moment of sampling the soil, it is important to make the following decisions:

- simple samples or composite samples
- number of simple samples per composite sample
- sampling depth
- time of the year
- tillage system
- sampling method
- sampling equipment
- sample location
- sampling handling

He closed his intervention by recalling the fundamentals of traditional sampling, the mean value of a population, the zig-zag soil sampling method and soil sampling in precision agriculture.

- Capacity building

Mr Filippo Benedetti (GLOSOLAN Alternate Coordinator) introduced participants to the new GLOSOLAN website, inviting LATSOLAN members to consult the network material that is entirely available online (especially under the section on capacity development). Mr Benedetti invited LATSOLAN to participate in the 6th GLOSOLAN meeting from 22 to 24 November 2022. Laboratories were also invited to send video messages wishing happy birthday to GLOSOLAN in their local languages. Videos were displayed at the *Five years of GLOSOLAN* celebration on November 10.

Venue and time of the next meeting

The sixth LATSOLAN meeting will take place online between September and October 2023.

Annex I. List of participants

Ms Lucrezia Caon, Global Soil Partnership Secretariat, FAO HQ

Mr Filippo Benedetti, Global Soil Partnership Secretariat, FAO HQ

Ms Carolina Olivera Sanchez, Global Soil Partnership Secretariat, FAO HQ

Ms Silvia Pioli, Global Soil Partnership Secretariat, FAO HQ

Mr Giacomo Rocchegiani, Global Soil Partnership Secretariat, FAO HQ

Ms Magdeline Vlasimsky, Global Soil Partnership Secretariat, FAO HQ

Country	Full Name	Name of laboratory
Argentina	Alejandra Soledad Vilte	Laboratorio de Suelos, Agua y Fertilizantes. EEA SALTA
Argentina	Argentina Gabriel Escobar	Laboratorio de Suelos INTA Castelar
Argentina	Augusto Exequiel Bellanich	Laboratorio de Suelo y Agua INTA Catamarca
Argentina	Bárbara Iwasita	Laboratorio Suelo, Agua y Vegetal
Argentina	Carolina Alvarez	Lab de suelo y agua Inta Manfredi
Argentina	Cintia Tinture	Argentina
Argentina	Daniel Carreira	LabIS-Laboratorio Instituto de Suelos-INTA
Argentina	David Alvarez	Laboratorio Suelo, Agua y Fertilizante EEA-Cerrillos
Argentina	Fernando Yapura	Laboratorio de suelo y agua Inta
Argentina	Inta Anguil	INTA Anguil
Argentina	Jorge Perez Peña	Laboratorio de Suelo, Agua y Material Vegetal de la EEA Mendoza INTA
Argentina	Juan De Dios Herrero	Laboratorio de suelo y agua. INTA Anguil.
Argentina	Leandro Eduardo Climenti	Observatorio de clima, sequía y erosión en la Patagonia Austral
Argentina	Marcelo Javier Gallac	Laboratorio de Suelo, Agua y Material Vegetal
Argentina	María Florencia Roldan	Laboratorio de suelo y agua INTA EEA Sáenz Peña
Argentina	Mariana Pino	INTA Mendoza
Argentina	Milciades Ramon Ramirez	Laboratorio SAV
Argentina	Miriam Mabel Ostinelli	Laboratorio Instituto de Suelos - INTA
Argentina	Na	Laboratorio instituto Suelos
Argentina	Nanci Kloster	RILSAV-EEA Anguil
Argentina	Nestor Villagran	LANAG INTA EEA CHUBUT
Argentina	Olga Gudelj	Física de Suelos
Argentina	Oscar Guarise	Laboratorio de Suelo, Agua y Material Vegetal de la EEA Mendoza INTA
Argentina	Ramon Medina	Laboratorio SAV, APAF NEA

Argentina	Rolando Aguirre	Laboratorio de suelo, agua y vegetales INTA AIPAF Formosa
Argentina	Rosa De Lima Holzmann	Laboratorio de agua y suelos para la sustentabilidad productiva y ambiental
Argentina	Sergio Quichan	Lasayp
Argentina	Veronica Jara	Laboratorio de suelos E.E.A-CHUBUT
Argentina	Roberto Maldonado	Argentina
Bolivia	Alfredo Cáceres C.	Laboratorio de Suelos y Aguas, Facultad de Ciencias Agrìcolas Pecuarias y Forestales Universidad Mayor de San Simòn - Cochabamba
Bolivia	Pablo Montaño	Laboratorio de Suelos - Facultad de Ciencias Agrícolas y Forestales - Universidad Autónoma Juan Misael Saracho
Bolivia	Pablo Muñoz	Laboratorio de suelos y aguas SEDAG Tarija
Bolivia	Sergio Fernando Mendoza Mendoza	Laboratorio de Suelos y Riegos Facultad Ciencias Agricolas y Forestales Universidad Autonoma Juan Misael Saracho
Bolivia	Wilfredo Benitez Ordoñez	LABORATORIO DE SUELOS FACULTAD DE CIENCIAS AGRICOLAS Y FORESTALES, UNIVERSIDAD AUTONOMA JUAN MISAEL SARACHO
Brazil	Daniel Vidal Perez	LASP/EMBRAPA
Chile	Andrea Alarcón	Andrea Alarcón
Chile	Carmen Lobos Shand	LABORATORIO DE SUELOS Y PLANTAS INIA CENTRO SUR - INIA QUILAMAPU
Chile	Caroline Torres	Irrifer Limitada
Chile	Chile Marlene Mejías Mejías Jeldres	Laboratorio de Agroanálisis
Chile	Cinthia Jara	Centro Tecnológico de Suelos y Cultivos
Chile	Fabio Corradini	Laboratorio de Suelos INIA La Platina
Chile	Humberto Aponte	Laboratorio de Ecología Microbiana y Biogeoquímica de Suelos
Chile	Ingrid Castro	Laboratorio de Suelos de Cooprinsem
Chile	Isabel Ortega	Agriservice
Chile	Leandro Agullo	Leandro Agullo
Chile	Lesly Malpica	Laboratorio de Suelo Cooprinsem
Chile	Liza Jofre	Agroanalisis UC
Chile	Manuel Araya	Estación Experimental Agricola Sidal
Chile	Marcela Torres	Eurofins Testing Chile S.A
Chile	Maria Martinez	Maria Martinez
Chile	Maria Sepúlveda	Laboratorio de Análisis de Suelos UdeC
Chile	Mauricio Adasme Rocha	Laboratorio Agropecuario Las Garzas
Chile	Nancy Oyarzun	Laboratorio Agropecuario COLUN
Chile	Rodolfo Catalán	DICTUC

Chile	Wilbert Hurtado Boada	Wilbert Hurtado Boada
Chile	Yasna Peña	Chile
Chile	Yasna Tapia	Quimica de Suelos y Aguas
Colombia	Camilo Pantoja	Camilo Pantoja
Colombia	Diana Delgado	car DLIA
Colombia	Diana Patricia Jiménez Giraldo	Laboratorio Análisis Químico de Suelos
Colombia	Jennifer Alejandra Ortega Bilbao	Laboratorio Ambiental de Cornare
Colombia	Jennifert Edith Parra Figueroa	Laboratorio Nacional de Suelos - IGAC
Colombia	Juan David Echeverri Ruiz	Laboratorio Ambiental de Cornare
Colombia	Laura Casas	Car
Colombia	Laura Uribe Triana	Laboratorio Tecnianálisis S.A.S.
Colombia	Luis Gabriel Bautista Montealegre	AGOSAVIA
Colombia	Martha Marina Bolaños-Benavides	AGROSAVIA Colombia
Colombia	Myriam Rocío Melgarejo Prieto	Laboratorio GHT
Colombia	Rosalina Gonzalez Forero	La Salle University
Colombia	Willer Mena	Farmer (Colombia)
Costa Rica	Alejandro Ureña Sánchez	Laboratorio de suelos, plantas y aguas INTA
Costa Rica	Carlos Henríquez	Laboratorio de Suelos y Foliares del Centro de Investigaciones Agronómica de la Universidad de Costa Rica
Costa Rica	Floria Bertsch	LATSOLAN
Dominican Republic	Carbel Mejía	Laboratorio de Química de Suelo de la Facultad de Ciencias Agrónomicas y veterinarias UASD
Dominican Republic	Jenifer Polanco	Labosuelo UASD
Dominican Republic	Julio C. Borbon	LABOSUELOS
Dominican Republic	Libia Mateo	LABOSUELOS
Dominican Republic	María Cristina Suárez	Laboratorio de Química de Suelos - LABOSUELO/FCAV-UASD
Dominican Republic	Robinson Antonio Sosa Martínez	Labosuelos
Ecuador	Betty Janet Rivadeneira Moreira	Laboratorio de suelos-Estación Pichilingue - INIAP
Ecuador	Cristina Alexandra Cuichán Guanoluisa	Laboratorio de Suelos, Foliares y Aguas - Agrocalidad
Ecuador	Cristina Cuesta	Laboratorio de Suelos, Foliares y Aguas - Agrocalidad
Ecuador	Edison Vega	Laboratorio de Suelos, Foliares y Aguas - Agrocalidad
Ecuador	Ezequiel Zamora Ledezma	Laboratorio suelos utm

Ecuador	Lizardo Reyna	Laboratorio de suelos - UTM
Ecuador	Manuel Carrillo Zenteno	EET Pichilingue
Ecuador	Maria Amparo Gilces Reyna	Laboratorio suelo y agua UTM
Ecuador	Paulina Llive	Laboratorio de Suelos, Foliares y Aguas - Agrocalidad
El Salvador	Ana Valencia	CENTA
El Salvador	Claudia Lino	CENTA
El Salvador	Flor Mendoza	FUSADES LAB
El Salvador	José Ernesto Vindel Méndez	CENTA
El Salvador	Liza Yanira Estrada De Menjívar	Laboratorio de Suelos CENTA
El Salvador	Nidia De Landaverde	Nidia de Landaverde
France	Christian Hartmann	Institut de recherche pour le développement
France	Mercedes Mendez	Institut de recherche pour le développement-LOCEAN
Guatemala	Margarita Hurtarte	Agrolaboratorio Ceres s.a
Haiti	Donald Joseph	LNS
Honduras	Carlos Irias	Laboratorio Quimico Agricola de FHIA
Honduras	Elizabeth Santacreo	SAG DICTA
Honduras	Eunice Aguilera	Laboratorio de Suelos Zamorano
Honduras	Karem Velásquez	DICTA
Honduras	Mario Hernan Guevara	Mario Hernan Lopez Guevara
Honduras	Ricardo Alexander Peña Venegas	Laboratorio de Suelos Zamorano
Jamaica	Pamella Mckenzie	Soil Health, Plant Tissue and Water Laboratory
Mexico	Alejandro Espinoza	Rinnovo Ingenieria
Mexico	Ana Coria	LADIPA
Mexico	Armando Guerrero-Peña	Laboratorio Agroindustrial, Suelo, Planta y Agua
Mexico	Aurelio Báez-Pérez	Laboratorio Nacional de Fertilidad de Suelos y Nutrición Vegetal
Mexico	Claudia Moreno	Fertilidad de Suelos y Química Ambiental
Mexico	Consuelo Mendez	LABORATORIO DE SUELOS UABCS
Mexico	Dalia Abigail García Flores	Laboratorio Agua-Suelo-Planta
Mexico	Daniel Carbajal	Laboratorio de servicios Innovak
Mexico	Eloy Camacho Díaz	LABORATORIO DE ANALISIS SUELOS FYPA
Mexico	Eva Isabel Martinez	unifrut
Mexico	Galdy Hernández-Zárate	Laboratorio de Agua-Suelo-Plantas (LASP)
Mexico	Gerardo Torres Anguiano	LABORATORIO AGRICOLA DIAGNOSIS S.C.
Mexico	Hector Estrada Medina	LABORATORIO DE ANÁLISIS DE SUELOS, PLANTAS Y AGUA
Mexico	Hilda Rivas	LASA
Mexico	Jorge Etchevers	Laboratorio de Fertilidad de suelos y quimica ambiental
Mexico	Jose Abraham Alvarez García	AGRUMLAB SC
Mexico	José Francisco	Centro de Diagnóstico Agrícola

Mexico	José Manuel Cena Velázquez	LabSueP-FCA
Mexico	Judith Ruiz Luna	LABORATORIO DE DIAGNÓSTICO AMBIENTAL DEL INSTITUTO TECNOLÓGICO DEL VALLE DE OAXACA
Mexico	Juliana Montecillo	Laboratorio de Fertilidad de Suelos y Química Ambiental del Colegio de Postgraduados Campus Montecillo
Mexico	Lorena Hernandez	CIISPALMA
Mexico	Lucy Mora Palomino	Laboratorio de Edafologia Ambiental
Mexico	Manlet Macias Curiel	laboratorio de suelos y aguas de la UABCS
Mexico	Miguel Ángel López Anaya	LABORATORIO DE SUELOS Y PLANTAS
Mexico	Na	MARIELA DEYTA
Mexico	Rosa Martinez	Laboratorio de suelo, agua y planta
Mexico	Sergio Zamora Salgado	Laboratorio de suelos y aguas de la Universidad Autónoma de Baja California Sur
Mexico	Silvia Ramos Hernández	Laboratorio de Ciencias de la Tierra y Medio Ambiente
Mexico	Ulises	LABORATORIO DE SUELOS Y PLANTAS-UJAT
Mexico	Vicente Arturo Velasco Velasco	Laboratorio de Diagnóstico Ambiental del Instituto Tecnológico del Valle de Oaxaca
México	Sandra Rocha	LABSAP
Nicaragua	Pedro Muñoz	Laboratorio de suelos y agua comandante Fidel Castro Ruz
Panama	Alexander B. Polo A	Envirolab
Panama	Jhon Alexander Villalaz Pérez	Laboratorio de Fertilidad de suelos y agua del Idiap
Panama	Jose Villarreal	Laboratorio de Fertilidad de Suelo del Idiap
Paraguay	Higinio Moreno Resquin	Laboratorio de Suelo
Paraguay	Lilian Rossana Fernández Melgarejo	Facultad Nacional de Agronomia FIA-UNE
Peru	Giuliana Shelly Lizana Flores	Microbiología de suelos
Peru	Julio Cesar Castro Lazo	LABORATORIO DE QUIMICA AGRICOLA - VALLE GRANDE
St. Lucia	Kwesi Goddard	National Agricultural Diagnosic facility
Trinidad And Tobago	Deneil Lara	DFP Soils Laboratory, The University of the West Indies
Trinidad And Tobago	Gabrielle De Souza	Soil and Analytical Services Laboratory
Trinidad And Tobago	Gaius Eudoxie	Agro-Environmental Services
Uruguay	Ana Virginia Silbermann	Laboratorio Suelos DGRN - MGAP
Uruguay	Irene Purtscher	Laboratorio de Suelos
Uruguay	María Morel	Laboratorio de Microbiología de Suelos
Venezuela	Luisa Villalba	Laboratorio de Ecología de Agroecosistemas, LEA

Venezuela	Maiella Rangel-Istillarte	Laboratorio de Ecología de Suelos, Ambiente y Agricultura
Venezuela	Marcia Toro	Laboratorio de Ecología de Agroecosistemas

Annex II: Agenda

DAY 1 - NFP and laboratories (2 hours)	
4:00 – 4.15	**Opening, endorsement of the agenda and group picture** *LATSOLAN Chair* *Ms María Cristina Suárez* *GLOSOLAN Chair* *Ms Miriam Ostinelli* *Latin America and the Caribbean Soil Partnership Chair* *Ms Sol Ortiz García*
4:15 - 4:50	**Item 1. Quick updates (global, regional)** - What is GLOSOLAN - Main achievements at global and regional levels - Regional capacities needs - NASOLANs: establishment and activities (stories from the region: Argentina, Chile) *Ms Lucrezia Caon, GSP Secretariat - FAO*
4.50 - 5:50	**Item 2. Soil laboratories and national government: bridging the gap** - NRLs survey outcomes - National Soil Laboratory Networks - SoilCare project and the Caribbean Soil Laboratory Network *Mr Gaius Edoxie, ITPS* - Open discussion on how to strengthen the collaboration and communication between laboratories and national Focal Points (governments) - Resource mobilization - Improvement of national soil legislation systems (soil import, waste management and disposal, drainage system, etc.) *Mr Giacomo Rocchegiani, GSP Secretariat - FAO*

	- Presentation of the projects implemented/under implementation in the region (both by GSP and other organizations) - Discussion on country-specific project proposals *Moderator: Ms Floria Bertsch, LATSOLAN vice-Chair*
5:50 - 6:00	**Item 3. Announcements** - New GLOSOLAN website - GLOSOLAN 5th anniversary celebrations - 6th GLOSOLAN meeting *Mr Filippo Benedetti, GSP Secretariat - FAO*
6:00	**Closure of the meeting**
DAY 2	
4:00 - 4:30	**Item 4. Proficiency testings** - GLOSOLAN proficiency test (PT) 2021: regional outcomes *Mr Christian Hartmann/Ms Mercedes Mendez-Millan, IRD France* - Regional and national PTs - Contribution to GLOSOLAN PT organization and implementation *Moderator: Mr Armando Guerrero, LASPA – National Reference Laboratory of Mexico*
4:30 - 5:00	**Item 5. Standard Operating Procedures (SOPs)** - GLOSOLAN harmonization process (updates, introductory session organization) - Regional harmonization of methods not used worldwide - Prioritize GLOSOLAN documents to be translated *Moderator: Mr Daniel Vidal Perez, LATSOLAN Steering Committee*
5:00 – 5:20	**Item 6. Capacity building** - GLOSOLAN video trainings (need for more subtitles, launch a call for new videos) - GLOSOLAN webinars: call for trainers - Laboratory infrastructure *Mr Filippo Benedetti, GSP Secretariat - FAO*

5:20 – 5.50	**Item 7. Interpretation of laboratory results and provision of recommendations to farmers** - Develop regional-based interpretation guidelines - The experience of an extension agent Moderator: Mr Jorge Etchevers, LATSOLAN Steering Committee
5:50 – 6:00	**Item 8. Closing remarks**
6:00	**Closure of the meeting**