

GLOSOLAN-I/17/Report



Food and Agriculture
Organization of the
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Report of the launch meeting of the Global Soil Laboratory Network (GLOSOLAN)

Rome, Italy, 1-2 November 2017

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REPORT OF THE LAUNCH MEETING OF THE GLOBAL SOIL LABORATORY NETWORK (GLOSOLAN)

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Rome, 2017

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List of Acronyms

EC	Electrical conductivity
EURLs	European Union Reference Laboratories
GLOSIS	Global Soil Information System
GLOSOLAN	Global Soil Laboratory Network
GSP	Global Soil Partnership
ICP Forests	International Cooperating Program Forests
ICRAF	World Agroforestry Center
INSII	International Network of Soil Information Institutions
ISO	International Organization for Standardization
ISO/TC 190	Technical Committee 190 of the International Organization for Standardization
ITPS	Intergovernmental Technical Panel on Soils
LATSOLAN	Latin-American Soil Laboratory Network
OC	Organic carbon
P5IP	Pillar 5 implementation plan
PA	Plenary Assembly
QA/QC	Quality Assurance and Control
RESOLANs	Regional Soil Laboratory Networks
SEALNET	South-East Asian Soil Laboratory Network
SOPHIE	Integration, Innovation and Standardization of Measuring Soil Hydro-Physics Properties
ToRs	Terms of Reference
TN	Total nitrogen

1. Opening of the meeting and tour de table

The launch meeting of the Global Soil Laboratory Network (GLOSOLAN) was held at the headquarters of the Food and Agriculture Organization of the United Nations (FAO), Rome, Italy from 1st to 2nd November, 2017.

The meeting was opened by Mr. Olcay Unver, Deputy Director of the FAO Land and Water Division, who highlighted the importance of GLOSOLAN to harmonize soil analytical data and provide comparable information between countries and projects. Mr. Olcay emphasized the fact that national governments, international organizations, stakeholders and ultimately users, need of harmonized soil data and information to promote the practice and ensure sustainable soil management. He appreciated the participation to the meeting of representatives from all regions, which are now called to agree on common goals under the umbrella of GLOSOLAN and set up a work plan for joint efforts. On this basis, the GSP Pillar 5 can be successfully implemented.

Mr. Vargas, Secretary of the GSP, invited participants to introduce themselves and the soil laboratory they represented. In total, the meeting was successful in bringing together 44 laboratory experts from 37 countries (see list of participants in Annex I).

Prior to the opening of the meeting, a demonstration on the use of soil spectroscopy as an alternative for soil analytical measurements was presented by SoilCares. The potential and limitations of this tool were discussed with participants and they were provided with information and opportunities for using such techniques at national level.

2. Purpose of the establishment GLOSOLAN within the context of GSP, ITPS and Pillar 5

Ms. Viridiana Alcántara (GSP Secretariat) provided an overview of the functioning and governance of the GSP as well as its five Pillars of Action. She reported that in June 2017, the 5th GSP Plenary Assembly (PA) endorsed the Pillar 5 Implementation Plan (P5IP) and called for its immediate execution, starting with the establishment of a global soil laboratory network (GLOSOLAN). All partners were invited to nominate their reference laboratory to join GLOSOLAN. GLOSOLAN is a very much needed network in the GSP because it would serve to:

- Make soil information across laboratories, countries and regions comparable and interpretable;
- Build a set of agreed harmonization principles;
- Improve quality assurance and control (QA/QC) of soil analyses; and
- Promote information and experience exchange to develop capacities wherever needed.

To conclude, Ms. Alcántara presented briefly the agenda of the meeting (see Annex II) and stressed that by the end of this meeting a Roadmap for Action should be developed, tasks and responsibilities should be clarified, the way to address comparability should be reviewed and the interaction between GLOSOLAN and existing networks, in particular those related to the establishment of the Regional Soil Laboratory Networks (RESOLANs), discussed.

Mr. Rainer Baritz, Pillar 5 Chair for, highlighted that the core objectives of the P5IP are (i) the development of an over-arching system for harmonized soil characterization, enabling data

exchange using a variety of data sources, and (ii) the development of/agreement on target standards. In this context, Pillar 5 envisage to harmonize Soil Description and Classification, Soil Mapping Methods, Soil Analysis, Data exchange standards, Indicators and Evaluation/Interpretation. The selection of these areas of harmonization is related to their importance for the well-functioning of the Global Soil Information System (GLOSIS) and the successful achievement of the goals for Pillar 1, 2 and 3.

Global activities in the P5IP were elaborated on regional needs expressed by the GSP Regional Soil Partnerships in their Regional Implementation Plans. These included harmonization activities in inventorying facilities, capacities and methodologies, establishing laboratory networks for information and experience exchange as well as monitoring and improving the quality of soil analyses. Additionally, global activities in the P5IP are the review of existing practices for field sampling, sample preparation and measurement as well as the development of specifications and guidelines for harmonized approaches to the determination of the main functional properties of soils.

It is proposed to start the work of GLOSOLAN by focusing on harmonizing soil analysis on pH, carbonate content, gypsum and salt content, electrical conductivity (EC), organic C (OC), total N (TN) and nitrate, phosphorus, potassium, CEC, exchangeable Aluminium, Iron and Manganese, exchangeable bases, particle size distribution, bulk density and coarse fragments. Mr. Baritz however emphasized that this is non-exhaustive and that it will be important to consider also soil micronutrients and soil biological parameters in the future. The role of establishing Reference Soil Laboratories in supporting the broad application of recommended methods, conducting interlaboratory comparisons/ring tests and trainings was stressed. Criteria for the selection of Reference Soil Laboratories at country level should be agreed within GLOSOLAN.

Mr. Baritz closed his presentation specifying the pathway for GLOSOLAN to become an operational network, which requires prioritization, defining detailed tasks, electing a Chair and developing a Roadmap and presenting the planned activities to the GSP Plenary Assembly in June 2018. Remarks and considerations from the participants to the proposed way forward of GLOSOLAN are herewith summarized:

- The establishment and use of control samples and reference materials should be addressed;
- Need to evaluate the required resources to ensure quality assessment;
- Since harmonization and selection of single methods at the global-scale might be difficult to achieve, the network should develop pedotransfer functions to facilitate the comparison of soil analyses from different methods. There were contrary opinions regarding the definition of single methods for each parameter due to the large diversity between countries regarding resources and capacity and the limited applicability of any methods to analyse every soil type;
- Importance of building on national networks and combining bottom-up with top-down approaches;
- Care should be taken when recommending accreditation as conflicts of interest might arise because different organizations perform accreditation; and
- Regarding the parameters to focus on, nutrient fractions and fractionation schemes and the soil enzymatic activity should be addressed.

At the end of this session, Mr. Luca Montanarella, Chair of the Intergovernmental Technical Panel on Soils (ITPS), accentuated that several ITPS members were participating in the meeting and would thereafter provide recommendations for GLOSOLAN. He stressed that it

was important to clearly define the added value of GLOSOLAN taking into consideration that many networks already work in the field of soil analysis standardization and harmonization.

3. Experiences in developing Soil Quality standards

Mr. Frank Lamé, Chairman of the Technical Committee 190 of the International Standardization Organization (ISO/TC 190), gave a presentation on the standards developed by ISO, which cover areas relevant to soil analysis such as soil description, digital-exchange of soil-related data, soil sampling, chemical methods, biological methods, geochemical modelling of leaching, bioavailability and site remediation. He highlighted that ISO/TC 190 provides a well-established professional platform for international cooperation in standards development and stressed that consequently applying ISO Standards provides a solid basis for obtaining reliable and comparable results. However, harmonization can only be achieved when standards are applied overall.

According to Mr. Lamé's experience, harmonization is a major challenge if it is planned to occur on a voluntary basis. On the contrary, mechanisms that majorly support harmonization are a clear economic driver or prescription by international institutions and legislation. Mr. Lamé stated that ISO/TC 190 is a responsive group open to develop specific standards when there is a need. He sees an important potential role of GLOSOLAN in identifying these needs and in identifying experts who can participate in the development of standards. Formally, participation needs to be arranged through the National Standards Bodies through which a formal liaison can be established to ensure information exchange.

During the subsequent discussion, it was noted that a major barrier to the use of ISO standard is their high costs. Mr. Lamé expressed his personal pursuit to make ISO standards freely available in the future. He also stressed that in research, ISO standards are not always applied because it is not the focus. Referring to his presentation, Mr. Lamé stated that the existence and application of ISO standards should not hamper innovation and he concluded by reminding that spectroscopy standards are also available within the ISO framework.

4. Experiences of existing regional and national laboratory networks

The session chaired by Mr. Lalljee, Chair of Pillar 5 within ITPS, provided perspectives from existing and planned networks of soil laboratories and harmonization in different regions:

- Ms. Nopmanee Suvannang from the Land Development Department of Thailand shared experiences from the South-East Asian Soil Laboratory Network (SEALNET), which was established in 1995 with the purpose of facilitating the sharing of experience among lab managers. Within SEALNET, inter-laboratory comparisons were conducted and trainings on the application of Good Laboratory Practices were provided in Thailand, Vietnam and Laos PDR. After the inclusion of SEALNET in the Asian Soil Partnership (ASP) implementation plan, its activities are expanding to all ASP member countries. To this end, laboratory managers from national reference laboratories are going to meet in Bogor, Indonesia from 20 to 24 November 2017. The goal of the meeting is that of launching SEALNET as the RESOLAN for Asia and set up the roadmap for the network, which should be developed around SEALNET objectives: (i) standardize and harmonize soil testing procedures and practices in laboratories in the

ASEAN and wider Asian regions in the context of the ASP, and (ii) set up a regional inter-laboratory proficiency program to implement QA/QC procedures and processes.

- Ms. Floria Bertsch from Costa Rica shared the harmonization work performed in Latin-America between 2009 and 2012 when two-round laboratory ring tests for the parameters were performed. Since the establishment of the Central America, Caribbean and Mexico Soil Partnership, new activities were agreed for harmonization and QA/QC including an inventory of soil laboratories, organization of regional workshops toward procedure standardization and performance of further inter-laboratory tests.

Ms. Rosa Cuevas from Mexico presented the experience from REDLABS, the Mexican National Network of Laboratories for Analysis, Use, Conservation and Soil Management, where a standardized consensual manual for analytical soil carbon and other physicochemical methods was generated. Uncertainty was reduced through the successful implementation of the Inter-comparison Program for Plant and Soil Analysis.

Building on these experiences, it is being proposed to formally establish the Latin-American Soil Laboratory Network (LATLABS). The short-term planned activities are the organization of a regional workshop of harmonization and standardization for training and capacity building, the compilation of the methodologies of sampling and analysis and the establishment of a QA/QC program. Over the long-term, these progress of LATLABS should strengthen and update the Latin-American and Caribbean Soil Information System SISLAC with quality information.

- Mr. Luca Montanarella in his function as Senior Expert from the European Commission – Joint Research Center reported on the existing European Union Reference Laboratories (EURLs) in the area of food and feed related issues, which provide reference methods, reference materials, proficiency testing schemes and training to laboratory staff. He listed the main soil related harmonization activities, which are ICP-Forest and Biosoil in the field of forest regulation, EUROSIL and LUCAS-Soil. Mr. Montanarella stressed the importance of harmonizing soil sampling to obtain comparable results and that they followed the strategy of concentrating the analyses of one campaign into one single laboratory, which is designated following an open tender.
- Mr. Erick Towett from the World Agroforestry Center (ICRAF) presented the harmonization work within the African Soil Information System, which is focused on soil-plant spectroscopy (MIR and pXRF) for improving fertilizer recommendations. He highlighted that MIR is better capable of capturing complex interactions between mineral and organic soil components compared to wet chemistry soil tests. He also mentioned that the dry soil-plant spectroscopy can combine soil and plant testing cost-effectively (approximate cost 1.5 USD per sample and less than 1mg of soil is required for the analysis). An important part of harmonization of spectroscopic methods is the inter-instrument reproducibility. Mr. Towett stated that ICRAF holds a Spectral Laboratory Network among several national institutions, NGOs, private sector and international research institutions.

After these presentations, diverse issues were pointed out, including the need to define the area of harmonization (soil fertility assessments and fertilizer application recommendation or

indicators for soil classification), the importance of allowing RESOLANs to be autonomous and to identify the needs for global coordination as well as the challenge of comparing results for one parameter obtained through different methods.

5. Quality assurance, correction and conversions: experiences from existing harmonization programs

Mr. Nils Koenig from the Northwest German Forest Research Institute presented the Quality Assurance Program and Interlaboratory Comparisons within the UN/ECE International Cooperating Program Forests (ICP Forests) Expert Panel on Soil and Soil Solution. The background of this program was to monitor the forest condition in Europe to detect changes in forest ecosystems over decades and across countries. Over 50 laboratories have been involved in ICP Forests from nearly 30 European countries, which perform soil solution analyses, mineral soil and humus layer analyses as well as soil physics analyses.

The program operates based on 4 pillars: the use of harmonized, well-defined and documented analytical methods, an internal quality control program within each laboratory, an external QC program with interlaboratory comparisons coordinated by the monitoring program organizers and permanent exchange of analytical knowledge via ICP Forests website, the Working Group QA/QC in Labs and the Meeting of the heads of the labs. Mr. Koenig stressed the great effectivity of ring tests to identify problems and sources of error, such as faulty calibration or deficient humidity control, in order to continuously achieve a higher inter-comparability of results. Also, he highlighted that good performing laboratories can play a big role in helping other laboratories to improve their performance. Finally, Mr. Koenig underlined the importance of a manual of methods to provide specific guidance to laboratories and enable the comparison of results.

During a question/answer session, the problem of obsolete and malfunctioning laboratory equipment was discussed. Mr. Koenig stressed that inter-laboratory comparisons can help identify which equipment needs to be replaced and promote experience and knowledge exchange in procurement of new equipment. This was identified as a chance to justify the need for funding. Ms. Laurinda Nobela noted that GLOSOLAN can therefore become a channel to find funding to improve the laboratory equipment. In this context, Mr. Koenig reminded that inter-comparability can also be reached with different types of equipment and that this is also allowed when applying ISO standards. Mr. Chude pointed out that a big problem for laboratories in Africa is the discontinuous energy supply. It was also clarified that for analyses based on extraction, two-step ring tests have been performed.

Ms. Winnie van Mark presented the work of proficiency testing within WEPAL at Wageningen University, which introduced the first ring test on soil in 1988 and currently counts with over 700 participants from different regions of the world. The WEPAL proficiency tests serve to evaluate and maintain the performance of existing laboratories (accredited or not), to validate standard methods (e.g. those developed by ISO/TC 190) as well as to set-up and train new laboratories.

Ms. Van Mark highlighted the need for a truly homogenous sample material when conducting inter-laboratory comparisons, which becomes increasingly challenging with increasing number of participating laboratories. Also, she mentioned that sample distribution is often a major challenge due to the different border control and customs declaration regulations in different countries. This is one of the reasons for which inter-laboratory comparisons require a large amount of time.

The following soil parameters are assessed within WEPAL and could be applied within GLOSOLAN: pH_{water} , pH_{KCl} , EC, OC, TN, available K, available P, CEC, exchangeable Ca, exchangeable Mg, exchangeable K, exchangeable Na, exchangeable acidity and texture. Ms. Van Mark also mentioned that ring tests for water retention curves for undisturbed sampled have also been performed. However, sample distribution is very difficult and therefore a new initiative from Wageningen University titled Integration, Innovation and Standardization of Measuring Soil Hydro-Physics Properties (SOPHIE) will be launched on the 5th December (World Soil Day) at the IGBE in Brussels.

Ms. van Mark suggested that WEPAL could play a role within GLOSOLAN in organizing proficiency tests for participating laboratories. WEPAL can provide reports and datasets for specific groups, has the capacity of preparing reference materials for daily routine, which enables the comparison of laboratory results. The participation in the WEPAL tests has a cost of approximately 600 EUR per laboratory and is lower for WEPAL members. For GLOSOLAN harmonization purposes, a lower price could be negotiated, especially because many laboratories of the network are also WEPAL members.

6. Setting of GLOSOLAN goals and tasks

Mr. Baritz provided a summary of the main points, which were subsequently discussed and defined in order to decide upon a Roadmap for GLOSOLAN. The main points are hereby summarized:

- Communication and experience exchange between laboratory networks
The main focus of GSP Pillar 5 as envisaged in the P5IP are the regional soil laboratory networks (RESOLANs). GLOSOLAN is needed for coordination at the global level. Because many networks already exist, it is important to take stock of this information. It was agreed to include questions about membership in existing networks in the online survey to be distributed through at the national level, also through the GSP focal points.
- Laboratory quality
The improvement of the quality of laboratory results is the main operation target for GLOSOLAN/RESOLAN because data exchanged for GLOSIS should be comparable and have high quality. At the same time analysis should be well described, in particular when it comes to using legacy data. The focus on laboratory quality will have to include the development of QA protocols and conducting ring tests. It will have to be defined if the ring tests will be performed at global, regional or national level. This question will be included when developing a concept note for this activity (see GLOSOLAN Roadmap, Annex III).
- Laboratory equipment
The precarious situation of many laboratories was mentioned many times during the meeting. The survey to be distributed and the planned ring tests (see GLOSOLAN Roadmap, Annex III) will serve to identify the status and needs in this regard. Ideally, GLOSOLAN will become a vehicle for resource mobilization towards modernization of laboratory equipment.
- Definition of parameters for harmonization
The main parameters envisaged in P5IP were related to GLOSIS and the basic characterization on soils. Mr. Baritz stressed the importance of starting the harmonization with a few parameters and expand to more gradually. Chemical

parameters are more feasible to begin with due to the high costs of performing ring tests for physical properties. Mr. Chaudhari emphasized that dynamic parameters should be considered in order to provide recommendations for land users and policy makers. For the ring tests, mandatory and optional parameters could be defined.

- Laboratory questionnaire

The meeting participants agreed that taking up the GLOSOLAN activities needs to take stock of the situation of the soil laboratories. It was clarified that the questionnaire's objective was not to evaluate laboratories in terms of good or bad, but to identify the needs of certain laboratories and identify those who can support others to improve their performance. Mr. Koenig suggested to take the questionnaire results as a basis for concentrating on the most used methods.

As SEALNET is using this questionnaire to take stock of their laboratory situations, the following suggestions for adding additional questions were raised: age and model of equipment, staff qualification and performance (e.g. average number of samples analyzed per day), challenges of the laboratory situation (e.g. heating or air conditioning), changing the units for available P to be volume based instead of mass based, provide the possibility of adding another method and not only selecting among a listing.

The final version to be distributed as an online survey within GLOSOLAN will be finalized following the milestones defined in the Roadmap (Annex III).

- Focus on single methods for each parameter

It was agreed that harmonization is more feasible when concentrating on single method for each parameter. However, it was many times pointed out that due to soil heterogeneity and diversity among countries' capacities, resources and facilities, it will not be feasible to agree upon a single method at global level.

- Promotion of the use of standards

Although in principle, the use of ISO standards would be desirable, the cost factor is a barrier for wide-scale utilization. Ms. Yakimenko also pointed out that in Russia, there exist national standards. The planned survey (see GLOSOLAN Roadmap, Annex III) will also help to identify the different situations in which standards are used and the reasons for not using them.

- Reference Laboratories

It was discussed that it will be difficult to designate reference soil laboratories in each country. On the other hand, certain countries might have more than one reference laboratory. It was agreed upon that there should be no restrictions in that regard. However, for operability reasons, a single contact laboratory needs to be defined to keep the communication with GLOSOLAN and the GSP Secretariat. This laboratory should then be responsible for the communication and activities at national level. Ms. Bertsch pointed out that it should be ensured that the quality of this contact laboratory should be high. The different roles are clearly defined in the GLOSOLAN Terms of Reference (ToRs), which can be found in Annex V.

- Capacity development

GLOSOLAN is expected to become a driver for capacity development towards improving quality of laboratory analysis through exchange between the different labs.

The planned survey (see GLOSOLAN Roadmap, Annex III) is expected to provide information on the capacity needs.

- Innovation

Even if it is not envisaged as the main focus, GLOSOLAN should remain open and aware of innovative methods including spectroscopic techniques, analyses of soil physical properties and soil biota assessments.

7. GLOSOLAN Roadmap

The meeting participants agreed upon a Roadmap for GLOSOLAN for the coming year. Specific milestones are defined in Annex III.

8. Election of the GLOSOLAN Chair

The ToRs of the GLOSOLAN Chair were discussed and endorsed after slight modifications. The endorsed version can be found in Annex IV.

Ms. Nopmanee Suvannang from the Land Development Department of Thailand was nominated as GLOSOLAN Chair due to her vast experience within SEALNET. The nomination was supported by Mr. Chude, Mr. Koenig and further participants. Ms. Olga Yakimenko from Lomonosov Moscow State University of Russia was also nominated to take up the role as GLOSOLAN Chair by Mr. Jobe from Gambia.

As both participants needed to confirm the support from their government, the election was left open and to be confirmed within few weeks. If both nominees are supported by their governments, Ms. Yakimenko suggested to act as future Chair, following the model of IUSS, in order to increase continuity and gradually start taking up the responsibility. At the same time, Ms. Suvannang's experience could serve as a good basis for immediate take-up of the activities. Between the meeting and the finalization of the present report, Ms. Suvannang confirmed accepting her appointment as Chair of GLOSOLAN.

Dr. Bhanooduth Lalljee from the University of Mauritius and Chair of Pillar 5 within the ITPS was appointed as Vice-Chair.

9. GLOSOLAN Terms of Reference

The draft GLOSOLAN ToRs distributed prior to the meeting among the participants were discussed and modified. The final and endorsed version can be found in Annex V.

10. Way forward

Mr. Vargas closed the meeting by thanking all participants for joining the meeting and positively highlighting the fact that a concrete Roadmap was set-up and ToRs for GLOSOLAN and its Chair were agreed upon. He ensured the support from the GSP Secretariat in all activities and at the same time appealed on the participants to get involved and be active because the success of all GSP activities depends on them.

Annex I: List of Participants

Surname	Name	Institution	Country
Akgul	Suat	Soil Fertilizer and Water Resources Central Research Institute	Turkey
Alcántara	Viridiana	FAO / GSP Secretariat	
Amanullah		ITPS	Pakistan
Andriamananjara	Andry	Laboratoire des Radioisotopes	Madagascar
Arán	Miquel	Spanish Soil Science Society	Spain
Baptista	Isaurinda	ITPS	Cape Verde
Baritz	Rainer	EEA	Denmark
Bertsch	Floria	Soil Science Society Costa Rica	Costa Rica
Brajendra		ITPS	India
Caon	Lucrezia	FAO / GSP Secretariat	
Chaudhari	Suresh Kumar	Indian Council of Agricultural Research	India
Chude	Victor	National Programme for Food Security, Federal Ministry of Agriculture and Rural Development	Nigeria
Comerma	Juan	ITPS	Venezuela
Coutinho Mendes	João Filipe	UTAD	Portugal
Cruz	Carlos	INEGI	Mexico
Cuevas	Rosa	REDLABS	Mexico
Dooshin	Tuul	Institute of Plant and Agricultural Sciences	Mongolia
Farias	Gonzalo	Brazilian Soil Science Society	Brazil
Garcia-Prechac	Fernando	ITPS	Uruguay
Givovich	Arturo	Analisis Ambientales S.A.	Chile
Hacuatau	Siosia	ITPS	Fiji
Heidkamp	Arne	Thuenen Institute of Climate-Smart Agriculture	Germany
Horn	Rainer	ITPS	Germany
Jeleapov	Ana	Institute of Pedology, Agrochemistry and Soil Protection "N. Dimo"	Moldava

Surname	Name	Institution	Country
Jobe	Abdou Rahman	Soil and Waater Management Unit, Ministry of Agriculture	Gambia
Keay	Caroline	Cranfield University	USA
Khamis	Nuha Abdalla Mohamed	Land and Water Research Centre, ARC	Sudan
Koenig	Nils	Northwest German Forest Research Institute	Germany
Krasilnikov	Pavel	ITPS	Russia
Lallje	Bhanooduth	ITPS	Mauritius
Lame	Frank	ISO	Netherlands
Lindbo	David	USDA-NRCS	USA
Maksym	Solokha	NSC Institute	Ukraine
Montanarella	Luca	European Commission / ITPS	Italy
Muhaimeed	Ahmad	Bagdad University	Iraq
Muscolo	Adele	Mediterranean University	Italy
Neto	Antónia	Centro de Investigação Agronómica e Tecnológica	São Tomé and Príncipe
Nkongolo	Nsalambi	ITPS	South Africa
Nobela	Laurinda	IIAM- Agrarian Research Institute	Mozambique
Perez	Daniel	Embrapa	Brazil
Pierzynski	Gary	Kansas State University	USA
Proix	Nicolas	INRA	France
Rousseva	Svetla	Institute of Soil Science "N. Poushkarov"	Bulgaria
Rozloga	Iurii	Institute of Pedology, Agrochemistry and Soil Protection "N. Dimo"	Moldova
Rulle	Skaidrīte	State Plant Protection Service of Latvia	Latvia
Suvannang	Nopmanee	Land Development Department	Thailand
Towett	Erick	ICRAF	Kenya
Valule	Santa	State Plant Protection Service	Latvia
van Beek	Christy	SoilCares	Netherlands
van erp	Peter	SoilCares Research	Netherlands

Surname	Name	Institution	Country
van Vark	Winnie	Wageningen University-WEPAAL	Netherlands
Velikonja-Bolta	Špela	Agricultural Institute of Slovenia	Slovenia
Venegas	Carlos	Analisis Ambientales S.A.	Chile
Yagi	Kaz	National Agriculture and Food Research Organisation	Japan
Yakimenko	Olga	Moscow State University	Russia
Yang	Liping	Institute of Agricultural Resources and Regional Planning, Chinese Academy Of Agricultural Sciences	China
Yemefack	Martin	ITPS (IITA & ASSS)	Cameroon
Zhang	Ganlin	ITPS (Institute of Soil Science)	China

Annex II: Agenda of the launch meeting of GLOSOLAN

Wednesday, 1 November 2017 – Philippines Room (C277/281)

12:30 – 13:30 Developments in soil spectroscopy - a practical demonstration by SoilCares		
13:30 – 13:40	Opening	Olcay Unver (Deputy Director CBL, FAO)
Needs for global harmonization of soil analysis (session chair: Ronald Vargas)		
13:40 – 13:50	Harmonized soil analysis in the context of the Global Soil Information System and GSP	Viridiana Alcantara (FAO/GSP)
13:50 – 14:25	Introduction of participants: country situation, challenges, ongoing activities, expectations	All
14:25 – 14:45	Goals and Implementation Plan of Pillar 5 – Purpose and concept of GLOSOLAN	Rainer Baritz (EEA, Chair GSP Pillar 5)
14:45 – 15:00	Expectations on GLOSOLAN from ITPS	Luca Montanarella (Chair of the ITPS)
15:00 – 15:15	Experiences of ISO/TC190 Soil Quality – challenges in standards development and harmonization	Frank Lamé (ISO TC190)
15:15 – 15:45 Coffee break		
Experiences of existing and planned regional networks (session chair: V. B. Lalljee)		
15:45 – 16:00	Experiences from SEALNET	Nopmanee Suvannang (LDD, Bangkok)
16:00 – 16:15	Examples of national soil laboratory networks and planned regional Latin American soil laboratory network	Floria Bertsch (University of Costa Rica) and Rosa Cuevas (REDLABS)
16:15 – 16:30	European Union Reference Laboratories and associated networks of national reference laboratories	Luca Montanarella (JRC)
16:30 – 16:45	Africa Soil Spectroscopy Laboratory Network	Erick Towett (ICRAF)
16:45 – 17:00	Wrap up Day 1	All

Thursday, 2 November 2017 – Philippines Room (C277/281), FAO HQ

Quality assurance, correction and conversions: experiences from existing harmonization programmes (session chair: Nopmanee Suvannang)		
09:00 – 09:15	<i>Welcome – Summary Day 1</i>	All
09:15 – 09:45	Quality assurance program and interlaboratory comparisons within the UN/ECE ICP Forests Expert Panel on Soil and Soil Solution	Nils Koenig (NW German Forest Research Institute)
09:45 – 10:15	Proficiency testing – implementing QA/QC standards in laboratory networks; experiences from the WEPAL network	Winnie van Mark (Wageningen University)
10:15 – 10:30	<i>Discussion: Feasibility of harmonization and goal setting</i>	All
10:30 – 11:00	Coffee break	
GLOSOLAN challenges and tasks (session chair: Rainer Baritz)		
11:00 – 11:30	Roadmap for GLOSOLAN; Introduction and key questions for group discussions <i>Guidance for discussion prepared by presenters</i>	All
11:30 – 12:30	Topic 1: Method selection for a global soil measurement programme (agriculture/ forest/ organic soils; minimum parameters)? Which guidance material is needed? Topic 2: Requirements and priorities for ring tests; needs for enabling good lab performance	All
12:30 – 13:30	Lunch break	
13:30 – 14:30	<i>Topic 1 and Topic 2</i>	
14:30 – 15:00	Terms of Reference for GLOSOLAN Chairperson – discussion, decision and election of a Chairperson	to be elected
15:00 – 15:30	Coffee break	
GLOSOLAN roadmap (elected chair GLOSOLAN)		
15:30 – 16:00	<i>Results from group discussions: GLOSOLAN roadmap; tasks for GLOSOLAN members</i>	All
16:00 – 16:30	Summary Terms of Reference for GLOSOLAN – discussion and decision	All
16:30 – 16:45	Meeting summary and conclusions	Chair GLOSOLAN
16:45 – 17:00	Way forward and closure	Ronald Vargas (FAO/GSP Secretary)

Annex III: Roadmap for GLOSOLAN

1. GSP Secretariat to finalize the list of reference labs in all countries by the end of December 2017 the latest.
2. The GSP Secretariat will compile inputs and feedback on the questionnaire received during the GLOSOLAN meeting by 15 November 2017. In this regard, they will expand the questionnaire by including a section on networking activities and challenges. Thereafter, the questionnaire will be sent to participants in GLOSOLAN and their networks for a final check. Feedback to finalize the questionnaire are expected by 30 November.
3. The revised version of the questionnaire will be converted into an Online Survey by the GSP Secretariat, who will launch it on 15 January 2018 through GSP Focal Points and launch meeting participants. The Online Survey is addressed to participants to the GLOSOLAN meeting, laboratories in their networks and all laboratories interested in this activity but not directly related to laboratories participating to the first GLOSOLAN meeting. Online Survey open until 19 March 2018.
4. Questionnaire evaluation in form of a report by Chair, Co-Chair and GSP Secretariat, supported by an ad-hoc Working Group (Maksym Solokha – Ukraine, Nicolas Proix – France, Rosa Cuevas - Mexico and Floria Bertsch – Costa Rica, open to further members) by end of April 2018. Evaluation to be communicated back to GLOSOLAN members, Pillar 5 Working Group and Chairs of the Regional Soil Partnerships.
5. Support the establishment of RESOLANs where needed by using the results of the questionnaire and the identified gaps. Start intensive communication between RESOLAN Chairs and GLOSOLAN Chair and Co-Chair.
6. Based on the questionnaire results, the Working Group (see Point 4) should prepare a Concept Note for a first ring test with guidance from WEPAL (explore possibility of Letter of Agreement) to present to the GSP Plenary Assembly in May 2018.
7. On that basis, compile a document for GSP Plenary Assembly. GLOSOLAN Chair to present this report at the 6th Plenary Assembly in June 2018, especially advocating for financial resources.
8. Prepare a Concept Note for a best practice manual between June and October 2018.
9. Develop an agenda for a second meeting with an operational focus in October/November 2018.

Annex IV: Terms of Reference of the GLOSOLAN Chair

Terms of Reference for the Chair of the Global Soil Laboratory Network (GLOSOLAN)

The Chairperson of the Global Soil Laboratory Network (GLOSOLAN) will:

- i) ensure that the Pillar 5 Implementation Plan, Section “Soil Sampling and Analysis”, is executed and the GLOSOLAN is established;
- ii) chair the GLOSOLAN meetings, and oversee the respective section of the Pillar 5 Implementation Plan, thus ensure its work objectives and deliverables are met in time, and update it when necessary;
- iii) maintain active communication between GLOSOLAN and the GSP Secretariat and the Pillar 5 Working Group, in relation to the execution of the GLOSOLAN activities as documented in the Roadmap agreed upon at the launch of the GLOSOLAN;
- iv) participate in the Pillar 5 Working Group at global level (see ToR for the Pillar 5 WG in the Pillar 5 Implementation Plan);
- v) oversee progress and link between GLOSOLAN and Regional Soil Laboratory Networks (RESOLAN), including maintaining active communication;
- vi) report (jointly with the GSP Secretariat and ITPS Chair) to the GSP Plenary Assembly about the GLOSOLAN progress;
- vii) advocate for the mobilization of resources to execute the GLOSOLAN activities as foreseen in the Pillar 5 Implementation Plan and GLOSOLAN Roadmap.

The appointment of the Chair of the GLOSOLAN will take place during the annual meeting of GLOSOLAN. The term for the Chairperson is two years after election, extendable via GLOSOLAN decision to a second term. The Chair is, whenever possible, supported by a Co-Chair in all its activities and tasks.

Annex V: Terms of Reference of GLOSOLAN

Terms of Reference of the Global Soil Laboratory Network (GLOSOLAN)

The Global Soil Laboratory Network (GLOSOLAN) will be composed of representatives from national soil laboratories from all Regional Soil Partnerships. GLOSOLAN is one of the implementing networks for GSP Pillar 5. During the 5th Plenary Assembly of the GSP in June 2017, the establishment of the Global Soil Laboratory Network (GLOSOLAN) as well as regional soil laboratory networks were endorsed as part of the Pillar 5 Implementation Plan. The agreed version of this ToR will update the Pillar 5 Implementation Plan.

In order to build the necessary capacity and quality in soil analysis, capacity building and partnering is considered most effective at regional level, where language barriers are reduced, travel is easier, and thus partnering between institutions is more effective (e.g. trainings, ring tests). Regional Networks of Soil Laboratories (RESOLANs) will be formed wherever this is pursued by the respective Regional Soil Partnership. Ideally, each country in the respective region allows its soil laboratories to participate and cooperate in the regional RESOLAN.

The GLOSOLAN will:

- i) contribute to the execution of the Pillar 5 Implementation Plan by serving as a strategic decision making and implementation body;
- ii) exchange information and experiences from laboratory operations;
- iii) organize and coordinate ring tests and calibration exercises, and accompany the quality assessments for GSP Pillar 4 related datasets (soil profiles, soil monitoring);
- iv) support the mandated national soil laboratories to be able to transfer knowledge and share experiences in form of capacity building as well as production and sharing of reference materials in the framework of organizing and evaluating inter-laboratory comparisons;
- v) identify, promote and, if needed, develop standards/recommended procedures;
- vi) promote the establishment of Reference Soil Laboratories;
- vii) coordinate activities among the RESOLANs supported by the GSP Secretariat in order to ensure harmonization at a global level;
- viii) convene an annual meeting to monitor progress on Pillar 5 Implementation Plan in respect to soil analysis;
- ix) appoint a Chair for a period of 2 years, extendable via GLOSOLAN decision to a second term;

GLOSOLAN will be composed of designated national soil laboratories (nominated by GSP national focal points), and any interested soil laboratory and/or member of a regional soil laboratory network.

Pillar 5 Reference Soil Laboratories

The proper implementation of Pillar 5, harmonization of soil analysis, requires that well-experienced and equipped laboratories take initiative for action, within a Regional Soil Partnership (through RESOLANs), and certainly at global level (through GLOSOLAN). The

Pillar 5 Implementation Plan foresees reference soil laboratories to play such a key role. A first draft of criteria for the performance of such laboratories are mentioned below:

- i) dispose of qualified, trained, and experienced staff
- ii) dispose of appropriately calibrated and maintained equipment
- iii) regularly apply adequate quality assurance and quality control procedures
- iv) use appropriate (sub-)sampling practices
- v) dispose of sound testing and/or inspection procedures
- vi) accurately record and report obtained data
- vii) dispose of an appropriate testing environment
- viii) apply standards for safety and disposal of hazardous wastes
- ix) if possible, be accredited or certified after ISO 17025