INFA-I/20/Report

Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

Report of the First Meeting of the International Network on Fertilizer Analysis (INFA)

Virtual meeting, 8-9 December 2020

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2020

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1. Introduction

Due to the COVID-19 pandemic, the launch meeting of the International Network on Fertilizer Analysis (INFA) was organized virtually using the Zoom Video Communications© platform. The meeting lasted two and a half hours per day on 8 and 9 December 2020 (see agenda in Annex I) and was attended by 330 participants from 89 countries (see list of participants in Annex II). The meeting had the objectives of launching the network and defining its main areas of work.

Ms. Rosa Poch (Chair of the Intergovernmental Technical Panel on Soils) opened the meeting by recalling that fertilizer quality has major implications on soil quality and that laboratory analysis is the first step to assess the quality of fertilizers and amendments. INFA will operate under the Global Soil Laboratory Network (GLOSOLAN). In this regard, Ms. Poch informed the participants that the achievements of GLOSOLAN over time have been so remarkable that countries and partners have asked GLOSOLAN to also look into the harmonization of methods for fertilizer analysis. In response to these requests, and in relation to the implementation of the International Code of Conduct for the Sustainable Use and Management of Fertilizers, the Global Soil Partnership decided to establish INFA. Ms. Poch concluded by thanking the participants, GLOSOLAN members and potential INFA partners for providing information on national fertilizer regulations and responding to the online survey on fertilizer quality assessment. These inputs were greatly appreciated and were used to build the discussion at the launch meeting of INFA.

1.1. Results of the online survey on fertilizer quality assessment

Mr. Ronald Vargas, GSP Secretary presented the main results of the online survey on fertilizer quality assessment, which aimed to collect information on how fertilizer quality is assessed worldwide to support the discussion at the launch meeting of INFA.

- About 22 percent of respondents said that fertilizer quality is not assessed at all in their country;
- About 26 percent of respondents said that fertilizer quality assessment is not regulated by law in their country;
- About 53 percent of respondents said that fertilizer quality is assessed against nationally developed standards, while about 20 percent of respondents declared to trust the label and therefore rely on industry standards;
- About 82 percent of respondents declared not to be a member of any regional or international association working or discussing fertilizer quality assessment;
- About 98 percent of respondents believe that global standards on fertilizer quality assessment are needed, but that they should be taken as a reference. In this regard, about 52 percent of respondents think that regional standards would work better because:
    - Soil fertility conditions, constraints and priorities are different – regional standards tend to align with local context;
    - Each region has specific issues and conditions that global standards may not cover (e.g. the use and composition of non-synthetic fertilizers and amendments would vary);
    - Especially for organic or recycling fertilizers that are locally produced – it is not useful to set global standards for these fertilizers;
    - There is a significant gap between developing and first world countries in terms of technology and quality control;
    - Regional standards are easier to implement and take into consideration socio-economic and financial conditions.

- About 93 percent of respondents declared their readiness to adopt global standards on fertilizer quality assessment if they were made available for free. Those opposed to their adoption justified this as follows:
    - It depends on the government;
    - It depends on the decision of the national standard office;
    - It depends on whether the method/standard is well investigated – we need to test it first;
    - The method/standard needs to be adapted to national conditions;
    - Regional standards already exist;
    - It is not a question of having a standard, but of having the equipment and trained staff to carry out the analysis;
    - National standards are preferable.
- The main limitation to the adoption of global or regional standards at the national level is that national legislations should be revised to reflect these new standards. Additionally, laboratories working on fertilizer quality control will show little interest in changing their laboratory procedures.
- The most common types of fertilizers quality control are mineral fertilizers, followed by organic fertilizers and amendments/improvers like manure, slurry, substrate, sapropel and compost, liquid fertilizers, foliar fertilizers and bio-fertilizers.
- About 92 percent of respondents believe that the capacity to assess the quality of fertilizers needs to be improved in their country. Ideas on how this can be achieved are herewith reported:
    - Provision of training and equipment
    - Raise awareness on the topic
    - Increase controls on fertilizers quality / laboratory inspections followed by the provision of recommendations and plant-tissue testing
    - More efficient value chain / marketing chains
    - Harmonization of standard operating procedures with specific mention to some regional requirement
    - Development of fast, simple but accurate test methods
    - Improve legislative frameworks
    - Proficiency test
    - By allowing local laboratories to test fertilizers (official governmental laboratories should not be the only ones with this mandate). This would allow verification of whether fertilizer quality has changed during transportation and distribution.

  Those who did not felt the need to improve the capability to assess the quality of fertilizers in their country declared that this was under the responsibility of regional bodies or that national capacities are sufficient.

The survey was available online from April to December 2020. In total, the Global Soil Partnership Secretariat received 170 replies from 65 countries (Argentina, Belgium, Brazil, Burundi, Cambodia, Cameroun, China, Colombia, Costa Rica, Cuba, Cyprus, Ecuador, El Salvador, Eritrea, Eswatini, Fiji, Gabon, Ghana, Grenada, Haiti, India, Indonesia, Iraq, Kenya, Kosovo, Kuwait, Latvia, Lebanon, Lesotho, Macedonia, Malawi, Mauritius, Mexico, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Paraguay, Perú, Philippines, Russia, Rwanda, Samoa, Sao Tome and Principe, Senegal, Serbia, Sri Lanka, Switzerland, Syria, Thailand, Togo, Trinidad and Tobago, Turkey, Uganda, Ukraine, Uruguay, Vietnam, Yemen, Zambia, Zimbabwe). A report on the survey results will be prepare and published by the Global Soil Partnership as soon as possible.

1.2. International Code of Conduct for the Sustainable Use and Management of Fertilizers

Ms. Vinisa Saynes Santillán (GSP Secretariat) introduced participants to the International Code of Conduct for the Sustainable Use and Management of Fertilizers (Fertilizer Code), a document written in response to the large increase in fertilizer production and use over the last century. Indeed, despite their benefits, fertilizers are often associated with greenhouse gas emissions, nutrient excess, heavy metals and contaminants, economic loss, water contamination, air pollution, soil degradation and low yields.

The Fertilizer Code aims to be a tool to address soil degradation issues (e.g. nutrient imbalance, contamination and acidification) related to the misuse of fertilizers in agriculture. In this regard, it is a vehicle for the implementation of the Voluntary Guidelines for Sustainable Soil Management. More specifically, the Fertilizer Code aims to promote the responsible and judicious use of fertilizers to prevent inappropriate use, underuse and overuse. Still, it aims to assist countries in designing policies and regulatory frameworks for the sustainable use of fertilizers. This involves setting out the roles, responsibilities and actions of governments, the fertilizer and nutrient recycling industry, agricultural extension and advisory services, research and academia, farmers and other end-users. The Fertilizer Code applies to synthetic and mineral fertilizers, organic fertilizers, and reused and recycled nutrients in terms of production, trade, policy regulation and use.

Article 6 in the Fertilizer Code is about "composition, limits and testing":

6.1. Ensuring that fertilizers and sources of recycled nutrients are compliant with quality and safety standards;

6.2. Sampling is a government task in collaboration with the fertilizer industry. Harmonization of fertilizer sampling and testing procedures.

6.3. International standards and best practices:

6.3.1. Be responsible for regulating the composition and quality of fertilizers in terms of nutrient content, heavy metals linked to the production process and source of raw material, harmful microbes, other dangerous or toxic materials, and additives such as sand, ground rocks and other materials used to dilute the original product

6.3.2. Set and regulate evidence-based safety standards, limits and guidelines on harmful content of fertilizer products.

6.4. Specify relevant methods to analyze fertilizer nutrient content and bioavailability for crops.

6.5. Through their NARS and rural AEAS, supported by international research centres, other research organizations, universities and the fertilizer industry, governments should take care of:

- health and safety aspects related to fertilizer composition;
- Oversee and support the field-testing of fertilizers for their efficacy;
- Conduct appropriate testing of recycled nutrient sources and products;

- Educate stakeholders and fertilizer users on the use of information pertaining to the safety and efficiency, composition, quality, and purity of fertilizers offered for sale, and on means to remain compliant with relevant regulations and guidelines.

Thus, the scope of INFA is perfectly aligned and contributes to the implementation of the code.

The Fertilizer Code is a living document and will be reviewed and updated on a regular basis, with updates every 5 to 10 years, or when deemed appropriate. Its implementation covers a current global gas as it assists countries with (i) the registration and regulation system for fertilizers, (ii) the availability of quality fertilizers in underserved areas, (iii) fertilizer quality control, (iv) policy formulation, and (v) capacity development.

An example on how the code will be implemented in Latin America is herewith reported:

1. Identify institutional stakeholders in the different countries with the assistance of the respective focal points;
2. Generation of a map of possible stakeholders and build a working group;
3. Conduct an informative webinar on the Code for Latin America;
4. Hold a regional workshop to address specific questions and priority issues of the different countries;
5. Examples: markets for organic fertilizers, legal framework in the different countries, quality analysis of fertilizers;
6. Interaction with the International Network on Fertilizer Analysis (INFA);
7. Implementation of the Global Soil Doctors Programme

Relevance of INFA and the Code in a "perfect storm" scenario:

- Countries need fertilizers;
- Need them but import them. Most countries do not produce the fertilizer they need;
- Do not have food security;
- Greenhouse gas emissions are increasing. Agricultural sector activities are the second cause of national GHG emissions after energy;
- Low efficiency in the use of fertilizers. Excessive fertilizer additions lead to low incomes, underground water and atmospheric pollution, biodiversity loss and global warming.

1.3. Global Soil Laboratory Network (GLOSOLAN)

Ms. Lucrezia Caon, GLOSOLAN coordinator, introduced participants to the Global Soil Laboratory Network (GLOSOLAN) on behalf of Ms. Nopmanee Suvannang, GLOSOLAN Chair. GLOSOLAN was established in November 2017 to build and strengthen the capacity of laboratories in soil analysis and to respond to the need for harmonizing soil analytical data. At present, the work of GLOSOLAN is focused on wet and dry chemistry, harmonization of standard operating procedures and training in quality assurance and quality control, use and maintenance of laboratory equipment, and health and safety.

Investing in more efficient labs and harmonized data has national, regional and global implications. GLOSOLAN is an efficient and effective way to:

• Provide reliable evidence to support better decision-making at both field and policy level;
• Support countries in reporting progress towards the Sustainable Development Goals (SDGs);
• Contribute to the development of international standards and indicators;
• Contribute to the assessment, monitoring and sustainable management of soil and provide quality data to support the establishment of National Soil Information Systems that can feed into the Global Soil Information System (GLOSIS);
• Assist companies manufacturing laboratory equipment to improve their products;
• Identify research gaps and increase investments in research.

At present, over 600 laboratories are registered in GLOSOLAN and many initiatives and organizations support and contribute to GLOSOLAN's work. Indeed, GLOSOLAN does not aim to re-invent the wheel but to be a catalyzer.

GLOSOLAN operates through Regional and National Soil Laboratory Networks. National Soil Laboratory Networks (NASOLANs) are particularly needed to support the implementation of GLOSOLAN activities at the local level, to bring local challenges to the attention of GLOSOLAN who will develop strategies to address them, and to reach and support a larger number of laboratories. The main tasks of NASOLANs are:

- To facilitate the implementation of GLOSOLAN activities;
- To advertise GLOSOLAN activities and events (e.g. online or in person training and meetings like those of the Regional Soil Laboratory Network), motivating national laboratories to take part in them;
- To organize national training and meetings in order to:
    - Transfer the knowledge and skills acquired in GLOSOLAN/RESOLANs to other laboratories;
    - Discuss common challenges and needs;
    - Explore financial resources mobilization opportunities.
- To organize national proficiency testing exercises.

Since its establishment, GLOSOLAN's main achievements have been:

- The establishment of the Regional Soil Laboratory Networks for Asia (SEALNET in 2017), Latin America (LATSOLAN in 2018), Africa (AFRILAB in 2019), Europe and Eurasia (EUROSOLAN in 2019), the Pacific (ASPAC in 2019), and the Near East and North Africa (NENALAB in 2020)
- The organization of annual regional trainings on:
    - Internal and external quality control
    - Health and safety
    - Procurement of laboratory equipment
    - Use and maintenance of laboratory equipment
- The organization of regional and global proficiency tests (PT):
    - 2018: SEALNET and LATSOLAN PTs
    - 2019: GLOSOLAN PT
    - 2020: GLOSOLAN PT cancelled because of COVID-19
- The purchasing of equipment for 20 laboratories in 20 different countries. The beneficiary laboratories were selected based on the results of the GLOSOLAN PT 2019;

- The "Resolution on the international exchange of soil samples for research purposes under the Global Soil Laboratory Network (GLOSOLAN)" was approved by the 27th Committee on Agriculture in 2020 (COAG 27);
- The launch of the first ever-global customs control procedure database SIMPLE - Soil IMPort Legislation;
- The launch of the GLOSOLAN programme on soil spectroscopy in April 2020 and the organization of the first plenary meeting on soil spectroscopy in September 2020;
- The publication of five Standard Operating Procedures (SOPs) on soil carbon analysis in 2019 and the preparation of other 11 SOPs in 2020
- The publication of training and awareness raising material and the translation of the GLOSOLAN website and all GLOSOLAN material in (at least) the 6 UN languages

The appreciation of the work done by GLOSOLAN since its establishment has been such that GLOSOLAN members and partners have asked the network to also look into the analysis of fertilizer quality. Thereafter, the idea of establishing the International Network on Fertilizer Analysis (INFA) was launched. INFA will operate under the umbrella of GLOSOLAN and will stand to GLOSOLAN principles:

- Everybody matters: All INFA members matter and should be put in the conditions to play an active role in the network.
- Together we are stronger: When possible, it is important to develop common strategies and work plans at different scales. This will make it easier to help each other.
- Create a tendency: The main goal of INFA activities should be to strengthen the capacities of all its member laboratories.

2. Panel discussion on the importance of harmonizing fertilizers' analysis

Mr. Vargas moderated this session which counted on the participation of:

- **Ms. Theodora Nikolakopoulou**, European Commission - DG GROW (D.2 Unit – Chemicals and Plastics Industries). Ms. Nikolakopoulou works on the implementation of the new regulation on fertilising products and also follows the work of CEN related to the development of new harmonised ENs in support of new products.

  Ms. Nikolakopoulou was invited to answer the following questions:
  - Could you please tell us what are the latest regulations on fertilizers that the European Commission is currently working on? What are the major issues the Commission is facing on this topic?
  - What about the new regulation on bio-fertilizers as quality requirements and health impact?

***Answer*:** the European Commission (EC) is actively working to regulate many fertilizing products which are currently on the European market but are not covered by harmonized rules. A new regulation was adopted in 2019, covering many different types of fertilizing products. For each product category there are safety and quality requirements that should be complied. The main challenges are related to the development of test methods that may be used to verify the compliance of products with the legal requirements. For this reason, the EC has mandated the European Committee for Standardization to

develop standards that may be used when assessing the compliance of fertilizing products with the quality and safety requirements of the regulation. For the implementation of this new regulation, the EC is working with a range of partners, such as representatives of Member States competent authorities, experts in the field of fertilizing products, NGOs and industry associations.

- **Mr. Job Fugice,** Research Scientist, International Fertilizer Development Center (IFDC). The International Fertilizer Development Center (known as IFDC) is a science-based public international organization working to alleviate global hunger by introducing improved agricultural practices and fertilizer technologies to farmers and by linking farmers to markets.
  Because of internet connection issues, Mr. Fugice was unable to answer to the following questions live:

  1. Could you please tell us how the IFDC works, especially in terms of interactions with governments and farmers?
  2. What is your strategy to convince governments and farmers to use specific type of fertilizers and their crop/site-specific recommendations?
  3. How to bring producers closer to innovations and new technologies that increase the efficiency of fertilizer use?

  However, his replies are herewith reported:

***Answer 1*:** IFDC's partnerships with governments, both at national, supra and sub-national levels, are critical to harmonize fertilizer policies and strategies between countries in a region, to inform public and private stakeholders along the fertilizer and food value chains with and to increase farmers' profits and productivity. Linkages with governing bodies are essential to reach impact at scale. Several projects have been launched by IFDC to provide guidance on government subsidies and to promote accessibility to products and technologies through capacity building activities. This goes for our projects like in Bangladesh where IFDC together with the government reached almost 2 million farmers with a technology that reduced fertilizer use by a third while increasing rice yields by 15%. In several countries like Nigeria and Burundi, IFDC has improved the effectiveness of the subsidy system to reach the targeted farmers using electronic vouchers for instance. IFDC, through the EnGRAIS program, is advising and guiding various countries in Western Africa to harmonize their fertilizer policies and introduce regulatory measures to benefit from economies of scale and to enhance the effectiveness of the chain by developing well-functioning private sector-led fertilizer markets in order to reach smallholder farmer. IFDC is also catalyzing Multi-stakeholder Fertilizer Platforms, such as in Kenya and Ghana, for stakeholders to collectively resolve the challenges in the value chain that go beyond the capability of individual actors and enhance value chain effectiveness. Do note that IFDC also works beyond fertilizers on e.g. improving the seed sector and on increasing market access to farmers. IFDC further supports business entrepreneurs in the food chain to professionalize their business, smoothen their sourcing and developing novel markets, such as to reach (poor) Base of the Pyramid consumers. By linking governments and farmers, the Supporting Agricultural Activity in Burundi (PAPAB) program, for instance, led by IFDC sustainably increased agricultural productivity, strengthened resilience, and raised incomes for nearly 1 million farming households. The project was funded by the Embassy of the Kingdom of the Netherlands. These and other programs demonstrate the strategic approach pursued by IFDC to maximize the impact of its endeavors by engaging with governments, but also with private sector, research and other CSO's.

Answer 2: The use efficiency of fertilizers, especially on the African continent, is too low to entice farmers to use fertilizers as the return on investments may not work out well. Increasing that use efficiency calls for crop- and site-specific fertilization. The continent is beset with blanket recommendations while the soils and crops characteristics call for specificity. Proven impact on yield through local testing and demonstrations of emerging technologies under smallholder conditions to increase farm productivity, profitability, and sustainability with the support of local partners and the private sector are some of the ingredients to reach out to governments and draw their attention and willingness to support such practices. But, again, note that IFDC embraces in its efforts both the improvement of the input side of farm production AND the output marketing, because farmers are unlikely to invest in inputs if output markers are not secured.

Answer 3: In addition to the above remarks, one of IFDC's strategic approaches is the continuous work to narrow the gaps between research and technology adoption. IFDC's Soil Mapping, Recommendations Development, and Transfer to Farmers (Soil SMaRT) framework, for instance, guides how we collaborate with private and public partners to get the right soil nutrient technologies and practices to farmers.

Within the framework under INFA, IFDC has been working in several projects that overlay with the goals of INFA. In the field, IFDC has been conducting national fertilizer quality assessments in countries like Nigeria, Ghana, Senegal, Myanmar, and others. Delivery of poor-quality fertilizers with poor yield effect are detrimental to farmers willingness to adopt fertilizers to increase their productivity.
At the national and local levels, IFDC pursues a comprehensive approach, apart from specific emphasis on the fertilizer sector, because adoption of innovations and new technologies must come with improved marketing of the produce.
At the international level, IFDC has also involved in several committees related with fertilizer analysis methods like IFA, ISO, AAPFCO, and Magruder, to ensure proper quality fertilizers and to emphasize the need for the development of novel and innovative fertilizers that are better tuned to the needs of smallholder farmers.

- **Engr. Tunde Bello,** Director of Farm Input Support Services, Federal Ministry of Agriculture, Nigeria. The Department of Farm Input Support Services, Federal Ministry of Agriculture and Rural Development, in collaboration with the Nigeria Institute of Soil Science, is jointly responsible for Fertilizer Quality Control.

  Mr. Bello was invited to answer the following questions:
  - Could you please tell us what type of work the Department of Farm Input Support Services does? For example, does it participate in national policy development? Does it analyze imported fertilizers? Does it play a role in assessing the quality of locally produced fertilizers? And how to promote local fertilizer production with the raw materials available in the country?

***Answer*:** Many efforts have been made in Nigeria to guarantee that fertilizers meet the quality standards set by the National Fertilizer Technical Committee. Very recently, the National Fertilizer Quality Control Act was signed to ensure and support farmers on the right quantity and quality to be used. The characteristics of fertilizers are also tested by multi-laboratory tests in all agro-zones of the country and by field trials on a pilot basis, in collaboration with research institutes. The latter also play a role in the analysis of fertilizers produced locally in the country.

- **Ms. Linca Anggria and Ms. Lenita Herawati,** Indonesian Soil Research Institute, Indonesia. The Soil Laboratory, under the Indonesian Soil Research Institute, Indonesia, has a mandate to analyze the nutrient content of fertilizers, including "alternative fertilizers"; newly produced or prototype fertilizers paving the way for market.

  Ms. Anggria and Ms. Herawati were invited to answer the following questions:

- Could you indicate the standards and methods you use to carry out the analysis (e.g. ISO, IFA)?
- One of the issues with fertilizer quality is that the nutrient content can change over time. How does Indonesia deal with this issue? Do you have a quality control chain from your laboratory to the final user?

***Answer*:** In Indonesia national standards developed by the Ministry of Agriculture are used to assess the quality of organic, inorganic and biological fertilizers. Subsidized fertilizers are tested by a certified officer who is in charge of sampling and laboratory analysis. Non-subsidized fertilizers are analyzed in the laboratory under the supervision of the Minister Authority, before distribution to farmers.

- **Ms. Aleksandra Bereza-Stachowiak,** Baltic Control A/S. Baltic Control A/S is the one of the leading providers of fertilizer quality assessment services for FAO fertilizer procurement across the world. We rely on your fertilizer quality assessment for fertilizers procured for FAO projects from sampling to laboratory analysis.

  Ms. Bereza-Stachowiak was invited to answer the following questions:

- What are the standard methods you use for fertilizer analysis?
- How could chemical analysis be de-centralized and carried out locally and meet international standards?

***Answer*:** Baltic Control A/S is responsible for the inspection of fertilizer quality for FAO around the world. In its preliminary stage, the analysis is predominantly visual and focuses on the appearance of the cargo, the logo, the labelling, the origin, the quantity, the color, the smell and the condition of the package. At the pre-shipment inspection stage, samples are collected and sent to the laboratory for analysis to verify compliance with FAO specifications. Parameters analyzed include moisture, particles size and chemical properties. Then, loading supervision takes place to ensure that the transport conditions are appropriate for the subject cargo. Ms. Bereza-Stachowiak also highlighted the importance of the decentralization process, as it can facilitate the analysis of fertilizers once they arrive at their destination, which is currently a very lengthy process.

- **Mr. Alexander Sharabaiko**, Deputy CEO, PhosAgro. PhosAgro is a vertically integrated Russian company and one of the world's leading producers of phosphate-based fertilizers.

  Mr. Sharabaiko was invited to answer the following questions:

- What methods/standards does PhosAgro use to assess fertilizer quality?

- Would PhosAgro support the work of INFA on developing harmonized methods for assessing fertilizer quality and would it also implement these methods?

***Answer*:** PhosAgro, as the world's fourth largest phosphate producer, sets quality control procedures at every stage of production, storage, transportation and sale. The company's Quality Control Service is in charge of guaranteeing the usability of the fertilizers through continuous monitoring. Inspections of raw materials are followed by controls at the production facilities and in the warehouse. In addition, samples of shipped fertilizers are tested in laboratory. Mr. Sharabaiko mentioned the accreditation with international certification bodies (such as ISO, IFA OHSAS and GMP+), which are provided to customers on the basis of quality standards. In addition, the quality of PhosAgro products was also reported, highlighting the efforts made to reduce environmental impact. In this regard, the importance of producing fertilizers in a more sustainable way was stressed, as well as the role of fertilizer manufacturers in the FAO mandate and the Sustainable Development Goals (SDGs). To conclude, Mr. Sharabaiko stated that PhosAgro is willing to support the establishment of INFA and the implementation of the network's activities.

- **Mr. Hugh Rodrigues,** Thorton Laboratories, United States of America. Representative of the Method Harmonization working group, International Fertilizer Association (IFA). The International Fertilizer Association promotes the efficient and responsible production, distribution, and use of plant nutrients. Mr. Rodrigues is also a member of the IFA working group for the harmonization of methods and works on the development of standard operating procedures.

  Mr. Rodrigues was invited to answer the following questions:

- Could you briefly describe how these standard operating procedures for fertilizer quality analysis are developed at IFA?
- Are there harmonized operating procedures for the analysis of organic fertilizers from bio-waste fermentation and composting?

***Answer*:** IFA-MHC, on behalf of its membership, looks at fertilizer methods that are currently used in global trade and makes a recommendation(s) as to its applicability/suitability. This is achieved through collaborative studies to determine if a particular method is superior or failing. The purpose is to ensure fairness in commercial trade. For instance, a recommendation was recently published regarding 'total phosphorous', highlighting that there is no significant difference in any of the methods – AOAC, EN, ISO, GOST, etc. Currently IFA has not undertaken any harmonization of methods for organic fertilizers either from compost or bio-waste. Still, Mr. Rodrigues listed all the IFA guidelines available for free.

3. INFA's mission and objectives

Ms. Caon recalled the missions and objectives of GLOSOLAN which served as a reference to define those of INFA. Ultimately, participants agreed that the **mission of INFA** should be to improve the quality of fertilizer laboratory data to support decision making at field and policy level, in support of the overarching goals of eradicating hunger through the achievement of food security and improved nutrition, and to ensure environmental quality. In this context, the work of GLOSOLAN is connected to the GSP Pillars of Action.

In terms of **vision**, proficiency for technical competencies in laboratory fertilizer analysis is not a priority for all laboratories. In this regard, INFA can avoid working on certification. INFA can solely aim to improve the quality of the analysis.

In terms of **objectives**, the following were endorsed:

1. To standardize the methods and protocols for the analysis of fertilizers. This is linked to the harmonization of fertilizer quality data.
2. To strengthen the performance of fertilizer laboratories through the use of standardized methods and protocols.
3. To harmonize fertilizer quality standards (classification and definitions) to ensure that fertilizer information is comparable and interpretable by laboratories, countries and regions.

However, INFA's objectives will be endorsed by email after consultation with manufacturers, retailers and policy actors.

Following the example of GLOSOLAN, **foreseen impacts and indicators of performance** should be identified for INFA. Due to time constraints, it was decided that the GSP Secretariat will draft foreseen impacts and performance indicators. These will be shared with participants of the launch meeting of INFA and INFA members for review and endorsement by email.

4. INFA's work plan

Due to the complexity of the topic, interactions between the different actors playing a role in fertilizer quality and fertilizer analysis were identified (see Figure 1).

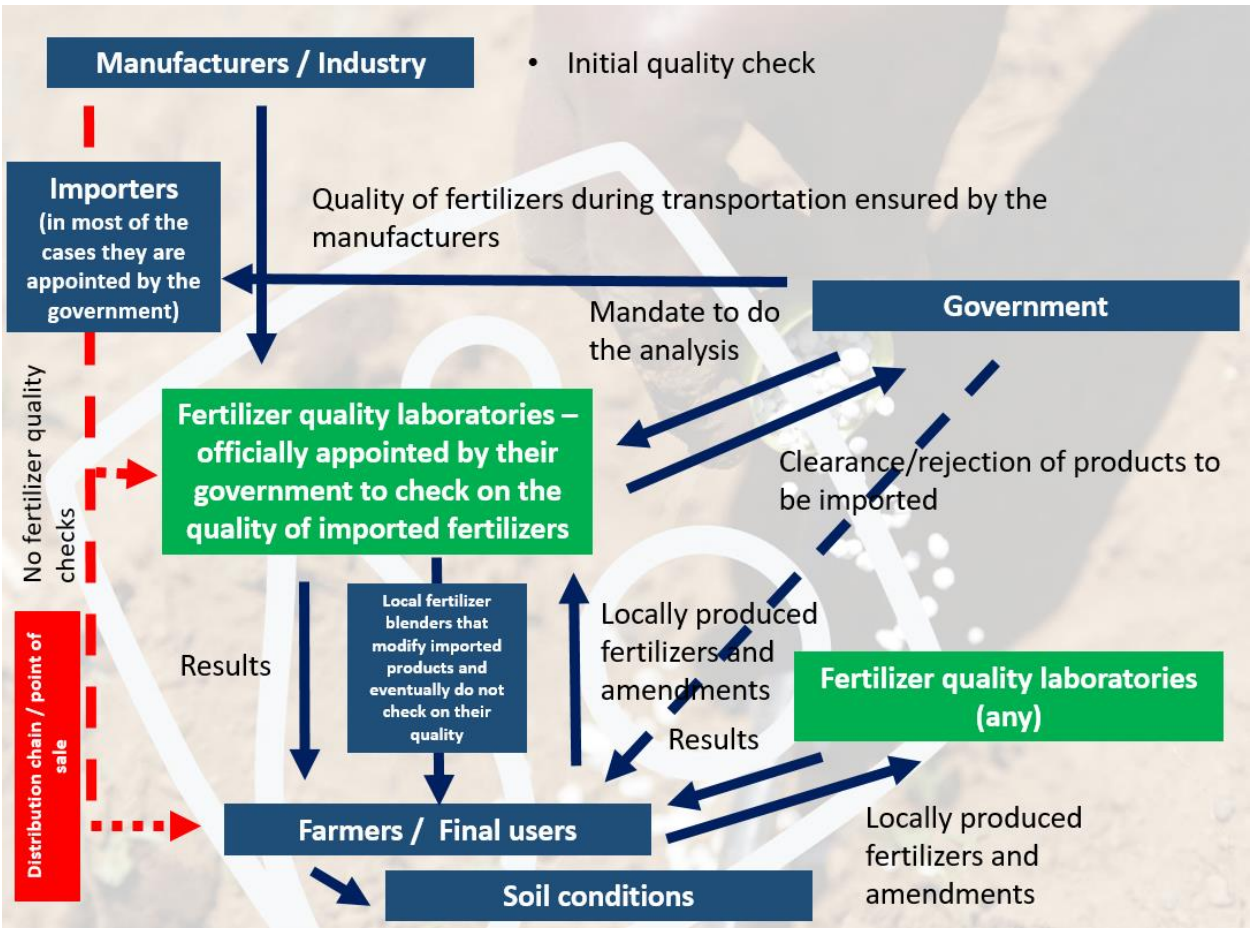

Figure 1. Interactions between actors playing a role in fertilizer quality and fertilizer analysis

Thereafter, the different interactions were analyzed, making a distinction between actions that can be implemented under INFA and those that need to be implemented by other GSP programmes such as the Fertilizer Code and the Global Soil Doctors.

- **International manufacturers / industry & fertilizer quality laboratories (officially appointed by their government to check on the quality of imported fertilizers)**

  Although the quality of fertilizers during transportation is ensured by the manufacturers, secondary stops can have an impact on the ultimate quality of fertilizers. To note that problems start when imported products are modified, blended, cut, etc. by local actors.
  INFA's main areas of work at this level of interaction are reported in Table 1.

Table 1. INFA's main areas of work on the interaction between international manufacturers / industry and fertilizer quality laboratories (officially appointed by their government to check on the quality of imported fertilizers)

MAIN AREAS OF WORK	
INFA	Fertilizer Code and/or other GSP programmes

Ask industry to use INFA's Standard Operating Procedures (SOPs). If not possible, the SOPs used by industry should be compared with INFA SOPs.	
Harmonization of sampling protocols (IFA already published a SOP on this)	

Notes:

- Ms. Saynes will check whether quality guidelines for the industry already exist at this level;
- Industry methods are based on AOAC, ISO, EN/EU standards which are recognized validated methods.

- **Local fertilizer blenders that modify imported products and eventually do not check on their quality & farmers / final users**

  INFA's main areas of work at this level of interaction are reported in Table 2.

Table 2. INFA's main areas of work on the interaction between local fertilizer blenders that modify imported products and eventually do not check on their quality & farmers / final users

MAIN AREAS OF WORK	
INFA	**Fertilizer Code and/or other GSP programmes**
Harmonization of **sampling protocols** (IFA already published a SOP on this)	Develop a **standard procedure on fertilizer packaging**. Packaging affects fertilizer quality (link with moisture)
Train local blenders on sampling	Train local blenders on fertilizer packaging
Train local blenders on SOPs implementation and QA/QC	Train farmers in fertilizer application and quality control (there are some easy techniques to use – contact Pradip Dey from IISS) and in reading labels (link to the Global Soil Doctors Programme).
	Provide guidelines on fertilizer storage (Ms. Saynes will retrieve information on the guidelines already available)
	Ensure that products released by local blenders have an informative label. Including the minimum guaranteed nutrient content

- **Farmers / final users & soil conditions**

  INFA's main areas of work at this level of interaction are reported in Table 3.

Table 3. INFA's main areas of work on the interaction between farmers / final users & soil conditions

MAIN AREAS OF WORK	
INFA	**Fertilizer Code and / or other GSP programmes**
1. Soil conditions and climate can change the assimilation conditions of fertilizer **(FOR THE FUTURE)**	
Activity: improve labelling. Labels can mention that a specific fertilizer applied to a specific soil type can result in different assimilation conditions **Fertilizer Code** to work on labelling **INFA** will work on soil-fertilizer interaction analysis. This is not an easy task, there is the incubation time to be taken into consideration. The response should be assessed in the field. How can the industry provide these information? The industry conducts **agronomy field trials** before commercializing fertilizers. It would be important to have access to these information.	
2. Environmental impacts of fertilizers should be highlighted on labels	

- **Government & local stakeholders and importers**

  INFA's main areas of work at this level of interactions are reported in Table 4.

Table 4. INFA's main areas of work on the interaction between government & local stakeholders and importers

MAIN AREAS OF WORK	
INFA	**Fertilizer Code and / or other GSP programmes**
	Quality standard regulations. This refer to the work of laboratories
Set up a fertilizer quality monitoring system: - Visual assessment - Packaging - Transportation - Labelling - minimum guaranteed content of the nutrients - Storage - Training of stakeholders along the value chain	
Create a database on national regulations on fertilizers like SIMPLE. Work with SoiLEX	

- **Final users / farmers & fertilizer quality laboratories (officially appointed by their government to check on the quality of imported fertilizers + any other fertilizer quality laboratory)**

INFA's main areas of work at this level of interactions are reported in Table 5.

Table 5. INFA's main areas of work on the interaction between final users / farmers & fertilizer quality laboratories (officially appointed by their government to check on the quality of imported fertilizers + any other fertilizer quality laboratory)

MAIN AREAS OF WORK	
INFA	**Fertilizer Code and/or other GSP programmes**
Harmonization of Standard Operating Procedure at the global and regional levels	
Training (QA/QC, health and safety, equipment use and maintenance)	
Procurement of equipment	
Proficiency testing	
Setting up new laboratories as needed	
Defining reference values or classes for environmental (pollution) risk and other (see sustainability matrix of GLOSOLAN)	Work on permissible limits with national governments. We cannot generalize.

In terms of SOP harmonization, participants agreed to give priority to the harmonization of analysis methods for (in order of priority):

- Mineral fertilizers (PRIORITY 1)
- Organic fertilizers and amendments/improvers like manure, slurry, substrate, sapropel and compost (PRIORITY 2). SOPs should consider the microbial/microbiological component of this fertilizer type
- Liquid fertilizers
- Foliar fertilizers
- Bio-fertilizers
- Nano-fertilizer (suggestion from the chat). Commercial phrase and not a class of fertilizers. They have health security concerns.

However, a note on the fact that most fertilizer analytical methods are common to both mineral and organic fertilizers was made.

The need to have a draft definition for each class of fertilizer before the 2nd INFA meeting was stressed. As the definitions of fertilizers (classes of fertilizers) are well defined in ISO 8157, the GSP Secretariat will enquire whether it is possible for INFA to refer to ISO.

- **Manufacturers / industry & final users / farmers. Passing through the <u>distribution chain</u>**

  It should be noted that at this level of interaction, no fertilizer quality checks are performed.

  INFA's main areas of work at this level of interactions are reported in Table 6.

Table 6. INFA's main areas of work on the interaction between manufacturers / industry & final users / farmers. Passing through the distribution chain

MAIN AREAS OF WORK	
INFA	**Fertilizer Code and/or other GSP programmes**
Set up a fertilizer quality monitoring system: - Visual assessment - Packaging - Transportation - Labelling - minimum guaranteed content of the nutrients - Storage - Training of stakeholders along the value chain - Quality should be ensured at the **point of sale**	Work with national governments on heavy metal content regulations. It is not possible to generalize.

5. INFA's governance

Participants at the meeting decided to keep the governance of INFA as simple as possible (at least in the beginning). In this regard, they agreed to identify an INFA Chair and vice-Chair. Like GLOSOLAN, INFA will be organized in Regional Fertilizer Laboratory Networks led by a Chair and vice-Chair. The GSP Secretariat will draft the Terms of Reference for these positions, which will be sent to participants and INFA members for review by email. The endorsement of the Terms of Reference and the election of the INFA Chair and vice-Chair will take place at the 2nd INFA meeting in June 2021.

Working groups will be established as required from June 2021, when a more detailed and technical work plan will be developed. In that occasion, the establishment of an Advisory Board to work on the regulations and a Technical Working Group will also be discussed.

Membership

Participants agreed to welcome any laboratory doing or interested in doing fertilizer analysis in INFA. A laboratory, officially appointed by its government to ensure the quality of imported products, will also be identified. This laboratory will serve as a contact between INFA and the central government.

Collaboration opportunities

INFA will continue to seek partners such as IFA and the IFDC to join efforts and avoid duplication. As per GLOSOLAN, partners will be acknowledged on the INFA webpage.

Internal procedures and decision making

Participants agreed that INFA would operate as reported in Figure 2. Regional Fertilizer Laboratory Networks will be established to address regional specificities. Their opinions, progresses and proposals will be brought to the attention of INFA at its annual meetings. In this regard, the annual INFA meetings are the highest decision-making events of the network. The INFA Chair and vice-Chair will report on INFA progresses at the annual GLOSOLAN meetings.

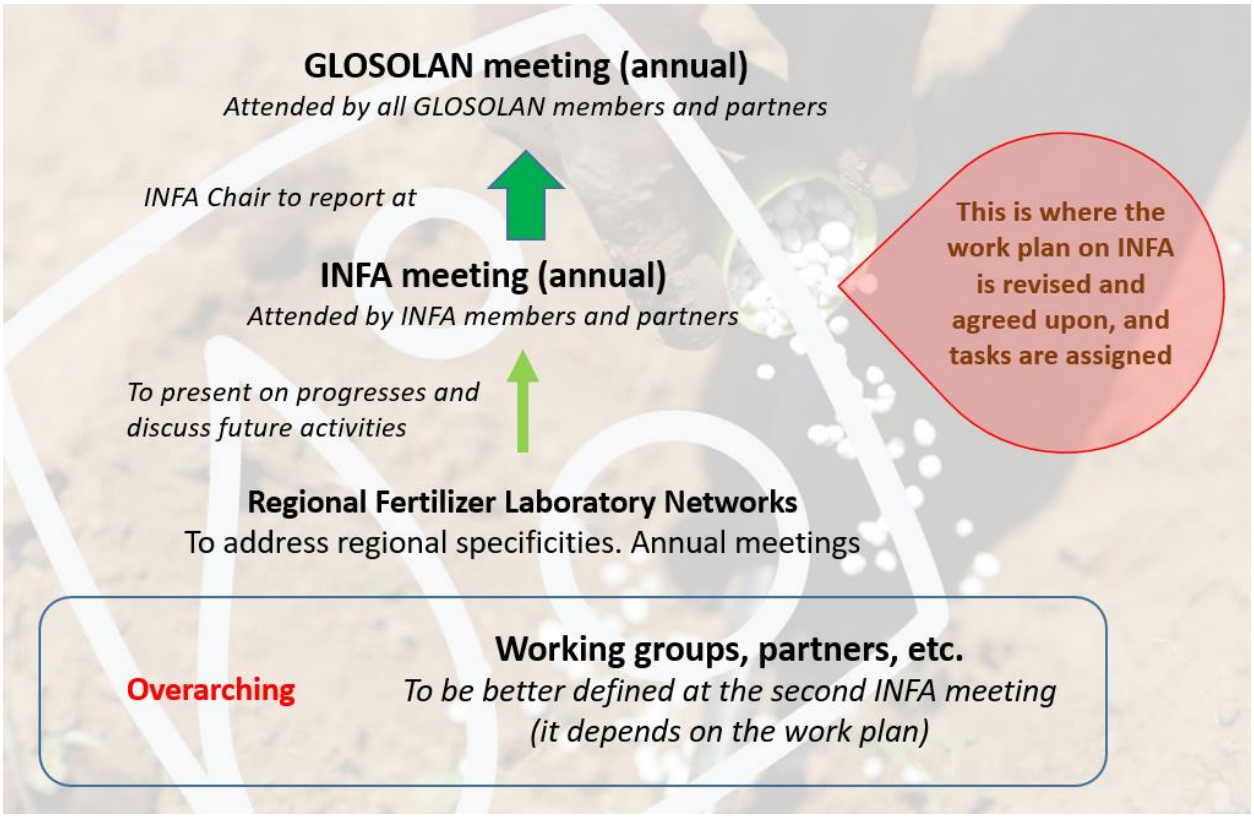

Figure 2. INFA's internal procedures and decision making

6. INFA work plan for January-June 2021

The INFA work plan for January-June 2021 is reported in Table 7.

Table 7. INFA work plan for January-June 2021

Activity	Responsible party	Deadline
Finalization of the **INFA objectives**. Contact manufacturers, retailers and policy actors. As soon as an improved draft is available, INFA objectives will be sent to INFA members for endorsement before being published.	GSP Secretariat and INFA members	March 2021

Draft **INFA's foreseen impacts and indicators of performance** using those of GLOSOLAN as a reference. The draft will be sent to INFA members for endorsement before publishing.	GSP Secretariat and INFA members	February 2021
Identification of laboratories officially appointed by their governments to carry out fertilizer quality analysis. *Finalization of the preliminary list compiled by the GSP Secretariat in 2020, clearance from the countries, publication of the information on the INFA website*	GSP Secretariat and country representatives	May 2021
Identification of laboratories performing or interested to perform fertilizer analysis in GLOSOLAN. Compilation of a list to be included in the INFA database. Publication of information on the INFA website.	GSP Secretariat and GLOSOLAN members	June 2021 (continuous activity)
Identification of manufacturers, industries, associations, etc. interested in working with INFA. *These should be invited to the second INFA meeting.*	GSP Secretariat and implementing partners (e.g. fertilizer associations)	June 2021 (continuous activity)
Cooperation opportunities: Identification of partners that can help in the implementation of different activities (e.g. fertilizer associations). Compilation of already available information and material on the topic.	GSP Secretariat and INFA partners	June 2021 (continuous activity)
Writing and publication of the report on the results of the **survey on fertilizer quality assessment**	GSP Secretariat	April 2021
Contact ISO to ask if INFA can rely on the fertilizer definitions reported in ISO 8157. At least draft definitions for each class of	GSP Secretariat	June 2021

fertilizers should be available before the 2nd INFA meeting.		
Development of the **INFA webpage** http://www.fao.org/global-soil-partnership/glosolan/fertilizers-analysis/en/	GSP Secretariat	June 2021 (continuous activity)
Governance: Draft the Terms of Reference for the following positions: - INFA Chair - INFA vice-Chair - Chair and vice-Chair of the Regional Fertilizer Laboratory Networks The ToRs will be sent to participants to the meeting and INFA members for review.	GSP Secretariat and INFA members	March 2021
Organization of the **second INFA meeting**. Objectives: - Endorsement of the ToRs and elections (INFA's governance) - Development of a detailed annual work plan	GSP Secretariat	June 2021

9. Venue and time of the next meeting

The 2nd INFA meeting will take place in June 2021.

Annex I: Agenda

Food and Agriculture Organization of the United Nations

GLOBAL SOIL PARTNERSHIP

Launch meeting of the International Network on Fertilizers Analysis (INFA)

INFA
International Network on Fertilizers Analysis

8-9 December 2020

From 11AM to 1:30PM CET (Rome time)

Online platform: Zoom

8 December 2020

11:00 – 11:10 CET **| Opening, endorsement of the agenda and group picture**

Mrs. Rosa Poch, ITPS Chair

11:10 – 11:25 CET **| Item 1: Introduction to the International Network on Fertilizers Analysis (INFA)**

Mr. Ronald Vargas, GSP Secretary

11:25 - 11:40 CET **| Item 2: Introduction to the International Code of Conduct for the Use and Management of Fertilizers (Fertilizer Code)**

Ms. Vinisa Saynes Santillan, GSP Secretary

11:40 - 11:55 CET **| Item 3: Introduction to the Global Soil Laboratory Network (GLOSOLAN)**

Ms. Nopmanee Suvannang, GLOSOLAN Chair

11:55 - 12:35 CET **| Item 4: The importance of harmonizing fertilizers' analysis - Panel session**

- Ms. Theodora Nikolakopoulou
  European Commission - DG GROW (D.2 Unit – Chemicals and Plastics Industries)
- Mr. Job Fugice
  Research Scientist, International Fertilizer Development Center (IFDC)
- Engr. Bello
  Director of Farm Input Support Services, Federal Ministry of Agriculture, Nigeria
- Ms. Linca Anggria and Ms. Lenita Herawati
  Indonesian Soil Research Institute, Indonesia
- Ms. Aleksandra Bereza-Stachowiak
  Senior Project Coordinator, Baltic Control
- Mr Alexander Sharabaiko
  Deputy CEO, PhosAgro
- Mr. Hugh Rodrigues
  Thorton Laboratories, United States of America. Representative of the Method Harmonization working group, International Fertilizer Association (IFA)

Moderator: Mr. Ronald Vargas, GSP Secretary

12:35 – 13:00 CET **| Item 5: General discussion**

- **Participants' reflections and experience sharing**
- **Identification of main issues in fertilizer quality assurance**

Moderator: Mr. Haekoo Kim, FAO

13:00 – 13:30 CET **| Item 6: Mission and objectives of the International Network on Fertilizers Analysis (INFA)**

Ms. Lucrezia Caon, GLOSOLAN Coordinator

13:30 CET **| Closure of the day**

9 December 2020

11:00 – 12:00 CET **| Item 7: INFA's governance**

- **Membership**
- **Governance**
- **Internal procedures and decision making**

Moderator: Ms. Lucrezia Caon, GLOSOLAN Coordinator

12:00 – 13:30 CET **| Item 8: INFA's work plan**

- **Main areas of work. Tentative:**
  - **Standard Operating Procedures**
  - **inter-laboratory comparison**
  - **establishment of regional centers of excellence**
  - **equipment**

- **Collaboration opportunities**

Moderator: Ms. Lucrezia Caon, GLOSOLAN Coordinator

13:00 CET **| Closure of the meeting**

Annex II. List of participants

Country	Full name	Organization
Afghanistan	Hameedullah Ahmadzai	Soil Research Directorate
Afghanistan	Mohammad Rafi Salihzada	Ministry of Agriculture/ soil research Directorate
Argentina	Agustín Devia	INTA OLIVEROS
Argentina	Cecilia Rivara	SENASA
Argentina	Esteban Kehoe	INTA/CONICET
Argentina	Marisa Bumaguin	SENASA Servicio Nacional de Sanidad y Calidad Agroalimentaria
Argentina	Miriam Mabel Ostinelli	LabIS - Instituto de Suelos - RILSAV - INTA
Armenia	Stepan Davtyan	Centre of the Agricultural Services, SNCO
Australia	Alice Kirk	Dual Chelate Fertilizer
Australia	Jay Raj Shetty	Plant Needs
Australia	Rob De Hayr	GLOSOLAN Vice-Chair
Azerbaijan	Qosqar	Agrarian Services Agency
Azerbaijan	Şahnaz Şəmizadə	Agrarian Services Agency
Bangladesh	Mohammad Mofizur Jahangir	Bangladesh Agricultural University
Belgium	Fabian Janssens	
Belgium	Fleur Van Ooststroom-Brummel	European Commission
Belgium	Julie Bogaert	Federal Agency for Safety of the Food Chain
Belgium	Kristof Tirez	VITO
Belgium	Theodora Nikolakopoulou	European Commission - DG GROW
Bhutan	Jamyang	Soil and Plant Analytical Laboratory, National Soil Centre
Brazil	Bruna Maier	Terra Brasileira Laboratórios Agronômicos LDTA
Brazil	Carlos Fornasari	Agronómico S.A.
Brazil	Claudia Siqueira	Federal Agriculture Laboratory
Brazil	Eduardo Ribeiro Santos Filho	NOVA GÊNESE
Brazil	Eliezer Augusto Baeta de Oliveira	
Brazil	Flavia Consolini	Laboratório Federal de Defesa Agropecuária em São Paulo- LFDA/SP
Brazil	Lindomario Barros de Oliveira	Ministério da Agricultura
Brazil	Marciana Cristina Da Silva	Laboratório Agroambiental - Unitins
Cabo Verde	Jacques Tavares	INIDA-MAA

Cambodia	Chhin Phy	Department of Agricultural Land Resources Management, GDA, MAFF
Cameroon	Amina Aboubakar	Institut de Recherche Agricole pour le Développement (IRAD)
Cameroon	Bertrand Zing Zing	Laboratoire d'analyses des Sols, Plantes, Eaux et Engrais de l'IRAD
Cameroon	Edouard Nya	Ministry of Agriculture and rural development
Cameroon	Nzeket Aline Beatrice	Institut de Recherche Agricole pour le Developpement (IRAD)
Cameroon	Patrice Kuitekam Dongo	
Cameroon	Rose Ndango	International Institute of Tropical Agriculture
China	Hong Wang	CAAS
Colombia	Gerardo Ojeda	Universidad Nacional Abierta y a Distancia UNAD
Colombia	Laura Uribe	Laboratorio Tecnianálisis S.A.S.
Colombia	Rosalina Gonzalez	La Salle University
Costa Rica	Denis Víquez	Servicio Fitosanitario del Estado, Ministerio de Agricultura y Ganadería
Costa Rica	Jeanette Cárdenas Chacón	CATIE
Costa Rica	Roberto González-Rojas	ICAFE
Côte d'Ivoire	Guy Fernand Yao	Centre National de Recherche Agronomique (CNRA) / Laboratoire Central Sols, Eaux et Plantes (LCSEP)
Croatia	Sanja Slunjski	University of Zagreb Faculty of Agriculture
Czechia	Jiří Zbíral	Central Institute for Supervising and Testing in Agriculture (UKZUZ)
Denmark	Aleksandra Bereza – Stachowiak	Baltic Control A/S
Denmark	Omar Daraghmeh	KU
Ecuador	Ivana Rea	Agrocalidad
Ecuador	Luis Cacuango	Agencia de Regulación y Control Fito y Zoosanitario
Ecuador	Steven Gómez	Agencia de Regulación y Control Fito y Zoosanitario
Ecuador	Yamil Cartagena	INIAP
El Salvador	Grecia Lídice Henríquez de Chávez	CENTRO NACIONAL DE TECNOLOGÍA AGROPECUARIA Y FORESTAL - CENTA
Eritrea	Samuel Bereket	Ministry of Agriculture
Estonia	Egon Hirvesoo	Agricultural Research Centre (ARC)
Estonia	Rainer Pukk	
Estonia	Ülle Tali	Agrochemical Laboratory of the Agricultural Research Centre (AKL)
Eswatini	Senzo Ntshakala	Soil Testing Unit, Ministry of Agriculture
Fiji	Bale Sai	Sugar Research Ins
Fiji	Deeksha Krishna	FNU
Fiji	Doreen Pillay	SUGAR RESEARCH INSTITUTE OF FIJI

Fiji	Vincent Lal	University of the South Pacfic, Institute of Applied Sciences
France	Lucia Castillo	IFA
Gabon	Rolf Mabicka Obame	Laboratoire d'analyse des Sols et Environnement
Ghana	Adams Sadick	CSIR-Soil Research Institute
Ghana	Awudu Abubakari	Kwame Nkrumah University Of Science And Technology, Knust, Kumasi.
Haiti	Donald Joseph	Ministry of Agriculture, Natural Resources and Rural Development
Hungary	Ágnes Nagy	Food Chain Safety Centre Non-profit Ltd. Soil Conservatory Laboratory, Velence
Hungary	Katinka Bátky	SYNLAB
Iceland	María Svavarsdóttir	Agricultural University of Iceland
India	Ashok Patra	ICAR-Indian Institute of Soil Science
India	Monoranjan Mohanty	ICAR-Indian Institute of Soil Science, Bhopal
India	Greenlink Laboratory	Greenlink Analytical and Research Laboratory (India) Pvt Lyd
India	Kuntal Hati	ICAR-Indian Institute of Soil Science, Bhopal, India
India	Milind Kamble	Department of Agriculture, Maharashtra
India	Pradip Dey	ICAR-Indian Institute of Soil Science
Indonesia	Gusnidar Gusnidar	UNIVERSITAS ANDALAS
Indonesia	Lenita Herawaty	Indonesian Soil Research Institute
Indonesia	Linca Anggria	Indonesian Soil Research Institute
Iran	Karim Shahbazi	Soil and Water Research Institute
Iraq	Alaa Ati	University of Baghdad /College of Agriculture
Iraq	Bassam Abdul Jabbar	Office of Agricultural Research -MoA
Iraq	Iman Sahib	Ministry of agriculture
Iraq	Nooruldeen Ali	University of Baghdad
Iraq	Osama Abdul Rahman	Ministry of Agriculture
Iraq	Saadi Mahdi Al-Ghrairi	Ministry of Sci. and Technology3
Iraq	Sadeq J. H. Dwenee	Soil and Water Resources Center. Directorate of agricultural research, Ministry of science and Technology
Israel	Eyal Barnea	ICL
Israel	Hana Chayat	ICL-ISRAEL
Israel	Nirit Bernstein	Volcani Center
Israel	Uri Yermiyahu	ARO Volcani Center
Italy	Gerold Bödeker	FAO
Jamaica	Kellie-Ann Carrington-Clue	Agricultural Land Management Division
Japan	Jun Murase	
Jordan	Nabeel Bani Hani	National Agricultural Research Cenetr
Kenya	Njeru Gachini	Kenya Agricultural Research Organization

Kenya	Stephen Ahenda	Kenya Plant Health Inspectorate Service
Kuwait	Shabbir Ahmad Shahid	Soil Chemistry Laboratory, Soil Physics Laboratory
Lebanon	Dany Romanos	LARI
Lebanon	Fatima Beydoun	ministry of agriculture
Mali	Souleymane Dambe	Laboratoire Sol-Eau-Plante
Mexico	Agustín García	Fertilidad de Suelos S. de R.L. (Fertilab)
Mexico	Armando Guerrero-Peña	Programa de Calidad e Intercomparación de Análisis de Suelos y Planta
Mexico	Aurelio Báez Pérez	INIFAP
Mexico	Coralia Mora Uzeta	Laboratorio de Analisis Industriales
Mexico	Galdy Hernández Zárate	Colegio de Postgraduados Campus Veracruz
Mexico	Gildardo Perez	Colegio De Postgraduados
Mexico	Jorge Etchevers	Laboratorio de Fertilidad de Suelos y Química Ambiental
Mexico	José Francisco Preciado Guzmán	Centro de Diagnóstico e Innovación Agrícola
Mexico	Juan Manuel Alemán Gastelum	Quimialab
Mexico	Juan Pedro Flores Margez	Universidad Autonoma de Ciudad Juarez
Mexico	Juliana Padilla Cuevas	Colegio de Postgraduados
Mexico	Mario García Reynoso	Casa Cuervo
Mexico	Pedro Figueroa-Lopez	TEPEYAC
Mexico	Rosa Martínez	Laboratorio de Suelo, Agua y Planta
Mexico	Sergio de los Santos Villallobos	ITSON
Mongolia	Bayasgalan Baast	Researcher of Soil- Agrochemistry laboratory of the Institute of Plant and Agriculture Sciences
Mongolia	Dulamsuren Byambasuren	the Soil Laboratory of Specialized inspection in Selenge Aimag
Mongolia	Enkhtuya Bazarradnaa	Institute of Plant and Agriculture Sciences, MULS
Mongolia	G. Altantuya	Soil, agro-chemistry lab. IPAS
Mongolia	Ganzorig Khurelbaatar	Gatsuurt LLC
Mongolia	Ikhbayar Damba	Institute of Geography and Geoecology, Mongolian Academy of Sciences
Mongolia	Lkhagvadulam Byambajav	Department of Environmental Engineering, School of Civil Engineering and Architecture, MUST
Mongolia	Monkhtsetseg Togtoch	Agroecology & Business school of Institute of Plant and Agricultural sciences

Mongolia	Munkhbat Batjargal	Researcher of Soil- Agrochemistry laboratory of the Institute of Plant and Agriculture Sciences
Mongolia	Zandraagombo Dovchin	Head of Soil- Agrochemistry laboratory of the Institute of Plant and Agriculture Sciences
Mongolia	Zoljargal Khavtgai	Institute og Geography and Geoecology Mongolian Academy of Sciences
Morocco	Abdelmjid Zouahri	INRA
Morocco	Laila Tajeddine	CESEFRA
Morocco	Rachid Moussadek	Lab. des Analyses des Sols, Eaux et Plantes (Lab-URECRN)
Myanmar	Aung Kyaw Thu	Soil Science, Water Utilization and Agricultural Engineering Division in DAR
Myanmar	Sandar Toe	Department of Agricultural Research (DAR), Ministry of Agriculture, Livestock and Irrigation (MoALI)
Nepal	Dinesh Khadka	Soil Science Division
Nepal	Sunil Pandey	Soil and Fertilizer Testing Laboratory, Pokhara
Netherlands	Andries Bosma	ISRIC - World Soil Information
Netherlands	Piet Derikx	Wageningen Food Safety Research
Nicaragua	Leonardo Garcia	Educativa
Niger	Elh Moudi Moustapha Abdourahaman	INRAN (Institut National de la Recherche Agronomique du Niger)
Niger	Maidagi Maman	LASEVE
Niger	Saidou Addam Kiari	INRAN
Nigeria	Yakubu Mohammed	National Cereals Research Institute Badeggi. Central Services Laboratory
Nigeria	Abdul Baba Kudu	National cereals research institute Badeggi p m b 8 BIDA N/state Nigeria
Nigeria	Afusatu Olanike Babalola	ED. MIN. of AGRIC. AND RURAL DEV. (FMARD)
Nigeria	Igwe Chijioke Uche	NRCRI, Umudike
Nigeria	Ilu Ibrahim	Ahmadu Bello University Zaria
Nigeria	Innocent Onyekwere	National Root Crops Research Institute Umudike
Nigeria	Joseph Uponi	IITA
Nigeria	Koleola Abidemi	Soil Sci. Dept FUT Minna
Nigeria	Oluremi Olalekan	Institute of Agricultural Research & Training Moor Plantation Ibadan (Obafemi Awolowo University Ile-Ife)
Nigeria	Popoola Kunle Joseph	Institute of Agricultural Research And Training Obafemi Awolowo University
Nigeria	Suleiman Garba	Institute for Agricultural Research Ahmadu Bello University Samaru Zaria Nigeria
Nigeria	Suleiman Usman	Federal University Dutse
Nigeria	Tunde Bello	fed. Min. of Agric

Nigeria	Williams Egbe	National Fertilizer Development Center, Farm Input Support Services Department, FMA&RD, Kaduna.
North Macedonia	Hristina Poposka	Institute of agriculture
Oman	Saud Al Farsi	FAO OM
Pakistan	Ishtiaq Hyder	NARC/ PARC Islamabad
Pakistan	Raza Khan	Pakistan Agricultural Research Council
Panama	Jose Villarreal	Idiap
Papua New Guinea	Tata Telawika	UASL PNG University of Technology
Paraguay	Patricia Rojas	Facultad de Ingenieria Agronomica- Universidad Nacional del Este
Peru	Giuliana Shelly Lizana Flores	Universidad Nacional del Centro del Perú
Peru	Irene Claudette Torres De la Rosa	INIA
Peru	Lucía Escalante Ortiz	Instituto Nacional de Innovación Agraria, Cajamarca, Perú
Peru	Oscar Roylander Loconi Cerquera	INIA
Philippines	Kiven Florendo	Philippines Regional Soil Laboratory IX
Philippines	Mary Claire Alyssa Pras	Laboratory Services Division Bureau of Soils and Water Management Department of Agriculture
Philippines	Adrienne Mae Zabate	Regional Soils Laboratory XI
Philippines	Aileene Millare	Department of Agriculture Regional Field Office 1
Philippines	Aurora Manalang	Bureau of Soils and Water Management - Laboratory Services Division
Philippines	Babylou Magdaug	
Philippines	Beatriz Magno	Bureau of Soils and Water Management
Philippines	Bergil Bernaldo	Bureau of Soils and Water Management - Laboratory Services Division
Philippines	Carleen Calimpon	Department of Agriculture Regional Field Office 7
Philippines	Christopher Ian Bahinting	Department of Agriculture - Regional Soils Laboratory
Philippines	Eiman Rey Flores	Davao Trade Exponents, Inc.
Philippines	Elly Paul Tomas	Department of Agriculture Regional Field Office 12 Regional Soils Laboratory
Philippines	Emma T. Tayad	Regional Soils Laboratory, Department of Agriculture-RFO 7
Philippines	Ezra Mae Gamboa	Bureau of Soils and Water Management
Philippines	Florfina Sanchez	Bureau of Soils & Water Mgt Laboratory Services Division
Philippines	Gerame Calapre	Department of Agriculture RFO VII
Philippines	Gina Nilo	Bureau of Soils andWater Management
Philippines	Gloria Urriza	Bureau of Soils & Water Management

Philippines	Jamie Ann Tumolva	Bureau of Soils and Water Management
Philippines	Jenny Rose Cubar	
Philippines	John Rey Labajo	Central Mindanao University
Philippines	Joshua Mikhel Reye	Bureau of Soils and Water Management
Philippines	Lawrence Adrian Marave	Department of Agriculture 4A - Regional Soils Laboratory
Philippines	Leah Fe Briones	Department of Agriculture 9
Philippines	Liwayway Honrade	Department of Agriculture IV-A - Regional Soils Laboratory
Philippines	Ma Kris Villarin	Regional Soils Laboratory
Philippines	Ma. Joerdette Jimenez	Bureau of Soils and Water Management
Philippines	Mabelle	Department of Agriculture IV-A - Regional Soils Laboratory
Philippines	Madonna Go Lim Tai	Bureau of Soils and Water Management
Philippines	Margen Balunan	Regional Soils Laboratory XI
Philippines	Maria Gemma Genaldo	Government
Philippines	Maribel Jalalon	Bureau of Soils and Water Management
Philippines	Marife Rebalde	
Philippines	Marilyn Gonzales	Department of Agriculture IV-A - Regional Soils Laboratory
Philippines	Marjorie Jean Tao	Bureau of Soils and Water Management
Philippines	Mary Elizabeth Banda	DA-RSL5
Philippines	Mel Chrisel Sales	USMARC-CL
Philippines	Morena Arnigo	Department of Agriculture IV-A - Regional Soils Laboratory
Philippines	Neil Ivan Baribe	Philippines BSWM
Philippines	Nora Talain	Department of Agriculture IV-A - Regional Soils Laboratory
Philippines	Normindra Sarawi	Department of Agriculture
Philippines	Purisima Juico	Central Luzon State University
Philippines	Quincy Ybanez	University of the Philippines Los Banos
Philippines	Rainear Mendez	Central Mindanao Universiry
Philippines	Rico Legaspi Jr.	Bureau of Soils and Water Management
Philippines	Rikko Jeremy Pedroza	department of agriculture- Regional Soils Laboratory 9
Philippines	Rosalie Laxamana	Regional Soils Laboratory-Department of Agriculture RFO III
Philippines	Rosalina Salve	Regional Soils Laboratory XI
Philippines	Sarah Aquino	Department of Agriculture-Ilagan Soils Laboratory
Philippines	Shirley Buduan	Bureau of Soils and Water Management
Philippines	Veronica Migo	University of the Philippines Los Banos
Philippines	Vince Albert Ching	Bureau of Soils and Water Management
Portugal	Alan Evans	A2 Analises Quimicas, Lda
Portugal	Cristina Sempiterno	INIAV, I.P.

Portugal	João Moura	INIAV
Portugal	Raquel Mano	Lab. Quimico Agricola Rebelo da Silva (INIAV/SAFSV/LQARS)
Russian Federation	Elizaveta Pestryakova	JSC “NIUIF”, PhosAgro
Russian Federation	Elizaveta Pestryakova	Phosagro
Russian Federation	Gleb Nazarov	PhosAgro
Russian Federation	Inna Kochetova	АО "НИУИФ" (ФосАгро)
Russian Federation	Natalya Nikolaeva	JSC "NIUIF"
Russian Federation	Александр Антонов	PhosAgro
Russian Federation	Alexander Sharabaiko	PhosAgro
Saint Lucia	Kwesi Goddard	Ministry of Agriculture
Saint Lucia	Luke Emmanuel	Ministry of Agriculture, Government of St. Lucia
Samoa	Tanu John Toomata	Ministry of Agriculture and Fisheries, Crops Division
Saudi Arabia	Mohammad Almutari	
Senegal	Ababacar Sadikhe Ndao	Institut de Technologie Nucléaire Appliquée (ITNA), Université Cheikh Anta Diop de Dakar, Sénégal
Senegal	Alassane TRAORE	Institute of Nuclear Techniques for Applications
Senegal	Anna Ndiaye	Ceres Locustox
Serbia	Maja Manojlovic	Faculty of Agriculture, University of Novi Sad
Solomon Islands	Merald Ajo	Solomon Islands National University (SINU)
South Africa	Boitumelo Patience Lekgoathi	
South Africa	Kopano Phefadu	University of Limpopo
South Africa	Matshwene Moshia	The University of Fort Hare
South Africa	Phesheya Dlamini	University of Limpopo
South Africa	Sello Simon Nong	
Spain	José Víctor Tamariz Flores	
Sri Lanka	Udaya A.J. Ratnayake	Department of Agriculture
Sudan	Intisar Arabi	Ministrary of Agriclture and Natural Resource \ Natural resource adiminsrtation \ Central lab
Switzerland	Alexandra Gisler	Federal Office for Agriculture (FOAG)
Syria	Manhal Alzoubi	GCSAR
Syria	Solaf Halloum	Lattakia laboratory
Tajikistan	Oleg Guchgeldiyev	
Thailand	Charirat Kusonwiriyawong	Department of agriculture
Thailand	Agricultural Chemistry Group	Agricultural Production Science Research and Development Office, Department of Agriculture
Thailand	Jittirat	Agricultural Chemistry Group, Agricultural Production Sciences Research
Thailand	Nopmanee Suvannang	GLOSOLAN Chair
Thailand	Rujisa Boonprasitporn	Land Development Department, Regional Office 10

Thailand	Somsak Maneepong	Walailak University
The former Yugoslav Republic of Macedonia	Biljana Jordanoska Shishkoska	University St. Kliment Ohridski, Scientific Tobacco Institute-Prilep
Togo	Gbénonchi Mawussi	Ecole Supérieure d'Agronomie - Université de Lomé
Tonga	Viliami Manu	Ministry of Agriculture, Food and Forests
Trinidad and Tobago	Gabrielle de Souza	Ministry of Agriculture, Land and Fisheries
Trinidad and Tobago	Gaius Eudoxie	The University of the West Indies
Tunisia	Attia Rafla	Ministère de Agriculture - Direction des SOLS DGACTA
Tunisia	Leila Ep Ben Daya	Ministery of agriculture and water ressources
Turkey	Atilla Polat	Soil Quality and Fertility Analysis Laboratory
Turkey	Huriye Bayram	International Agricultural Research and Training Center (IARTC-UTAEM)
Turkey	Onder Ozal	IARTC
Turkey	Sevinc Madenoglu	Ministry of Agricultural and Forestry, General Directorate of Agricultural Research and Policies
Turkey	Taher Ahmadzade	KIMIA AB Environmental & Agricultural Consulting Laboratory
Ukraine	Larysa Bondarenko	Ukrainian Soil Partnership Association
Ukraine	Mariia Ditkovska	FARMER.UA LLC
Ukraine	Mariia Netsyk	
Ukraine	Oksana Davis	FAO
Ukraine	Olena Popiuk	LLC Irlen
Ukraine	Tymur Kosiak	TerraTarsa
Ukraine	Anna Davidyuk	National Scientific Center "Institute of Agriculture of the National Academy of Agrarian Sciences of Ukraine"
Ukraine	Bogdan Khmara	Ministry of Economy
Ukraine	Irina Klimenko	National Scientific Center "Institute of Agriculture of the National Academy of Agrarian Sciences of Ukraine"
Ukraine	Lyudmila Shkarovskaya	National Scientific Center "Institute of Agriculture of the National Academy of Agrarian Sciences of Ukraine"
Ukraine	Nadezhda Dovbash	National Scientific Center "Institute of Agriculture of the National Academy of Agrarian Sciences of Ukraine"
Ukraine	Oleksandr Dymov	Institute of Irrigated Agriculture of NAAS
United Arab Emirates	Ajish Mathew	AL Hoty Stanger Laboratories
United Arab Emirates	Ayeda Al Hosani	Central Testing Laboratory
United Arab Emirates	Bayan Athamneh	Environment Agency- Abu Dhabi
United Arab Emirates	Dharmesh Verma	RNZ International FZE

United Arab Emirates	Raza Soomar	RNZ INTERNATIONAL
United Arab Emirates	Sandeep PK	AL HOTY STANGER LABORATORY LLC.
United Arab Emirates	Simon Mafabi	Al Hoty Stanger Laboratories
United Kingdom	Boguslaw Skowron	ICL Group
United Kingdom	Carolina Lisboa	Rothamsted Research
United States of America	Hugh Rodrigues	Thorton Laboratories
United States of America	James Bartos	Office of Indiana State Chemist
United States of America	Job Fugice	IFDC
Uruguay	Eliana Pereira	Ecotech
Uruguay	Mónica Fernández	
Venezuela (Bolivarian Republic of)	Jose Lucas Peña	Instituto Nacional de Investigaciones Agrícolas INIA
Yemen	Mohammed Hezam Al-Mashreki	Agricultural Research & Extension Authority
Zambia	Brian Gondwe	Zambia Agriculture Research Institute
Zambia	Gideon Musukwa	University of Zamabia
Zimbabwe	Takesure tendayi	University of Zimbabwe
Zimbabwe	Thembinkosi Mbedzi	University of Zimbabwe
Zimbabwe	Washington Mutatu	Zimbabwe Sugar Association Experiment Station

Other participants (affiliation and country unknown):

Evgenia Mescherova
Mohammed Yakubu
Simphiwe Madonsela
Andjelka Tomasevic
Godson Urassa
Melba Salaver
Michael Madumba
Shijil Erunamcheri

From FAO:

Mr. Ronald Vargas, Secretary of the Global Soil Partnership, FAO
Ms. Vinisa Saynes Santillan, Global Soil Partnership, FAO
Mr. Haekoo Kim, FAO
Ms. Lucrezia Caon, GLOSOLAN coordinator at the GSP, FAO

Mr. Filippo Benedetti, Assistant GLOSOLAN coordinator at the GSP, FAO
Ms. Carolina Olivera, Global Soil Partnership, FAO