



Food and Agriculture
Organization of the
United Nations

4th Meeting of the Near East and North African Laboratory Network (NENALAB)

22 January 2024

THE STATUS OF SOIL LABORATORIES IN THE NENA REGION

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NENALAB
NEAR EAST AND NORTH AFRICAN SOIL LABORATORY NETWORK



LAYOUT

- Introduction
- Assessment procedure
- Main findings
- Conclusion and Recommendations

TCP/RAB/3802

Capacity Development for the Sustainable Management of Soil Resources in NENA Region to Achieve the Sustainable Development Goals

BASIC INFORMATION

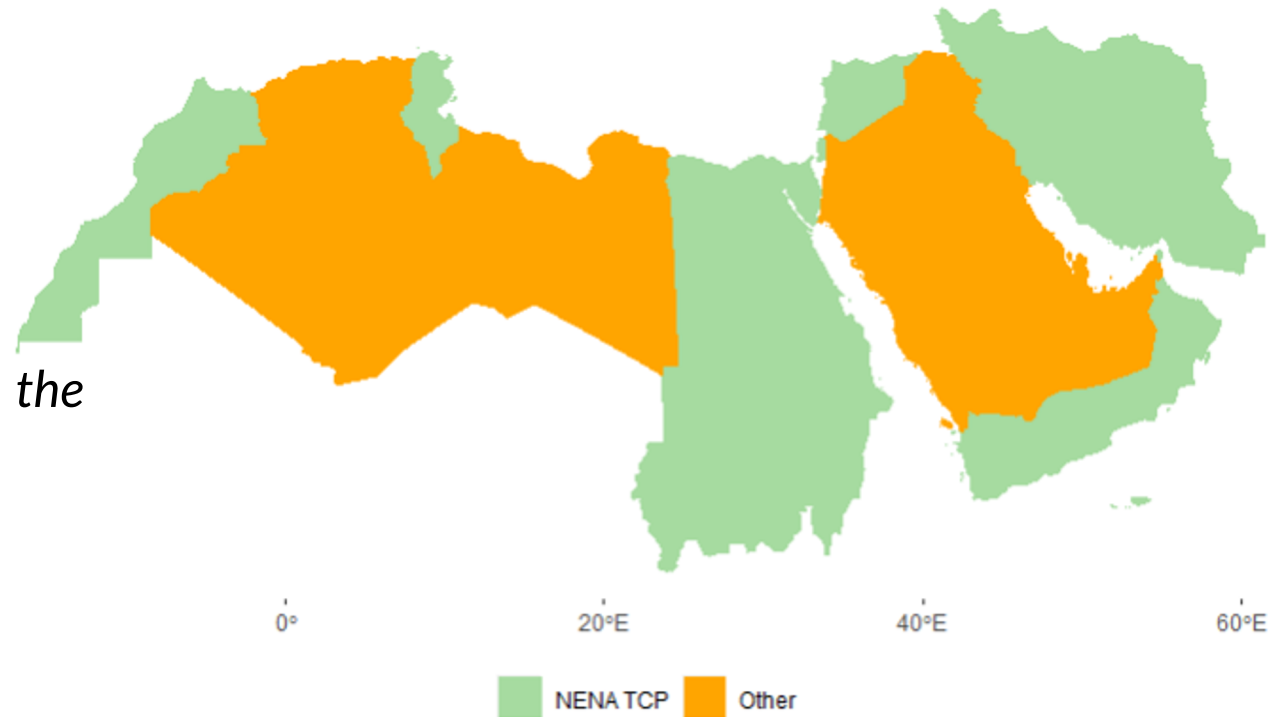
- **12 NENA countries**

Egypt, Jordan, Iran, Morocco, Lebanon, Iraq, Sudan, Tunisia, Yemen, Palestine, Oman, the Syrian Arab Rep.

- **Starting date 21 October 2020**

- **End date April 2023**

- **Total Budget USD 400,000**



Source: UN, 2020. Map of the World, United Nations.

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Capacity Development for the Sustainable Management of Soil Resources in NENA Region to Achieve the Sustainable Development Goals

Project components

SOIL
LABORATORIES

SOIL DATA MANAGEMENT
& MAPPING

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Capacity Development for the Sustainable Management of Soil Resources in NENA Region to Achieve the Sustainable Development Goals

SOIL LABORATORY ACTIVITIES

Implemented activities and outcome documents:

Activity 1. Laboratory assessment

Outcome document:

- Laboratory assessment report. This includes recommendations for the government to include in the National Action Plan
- Training programme

Activity 2. Training (either virtual or in person)

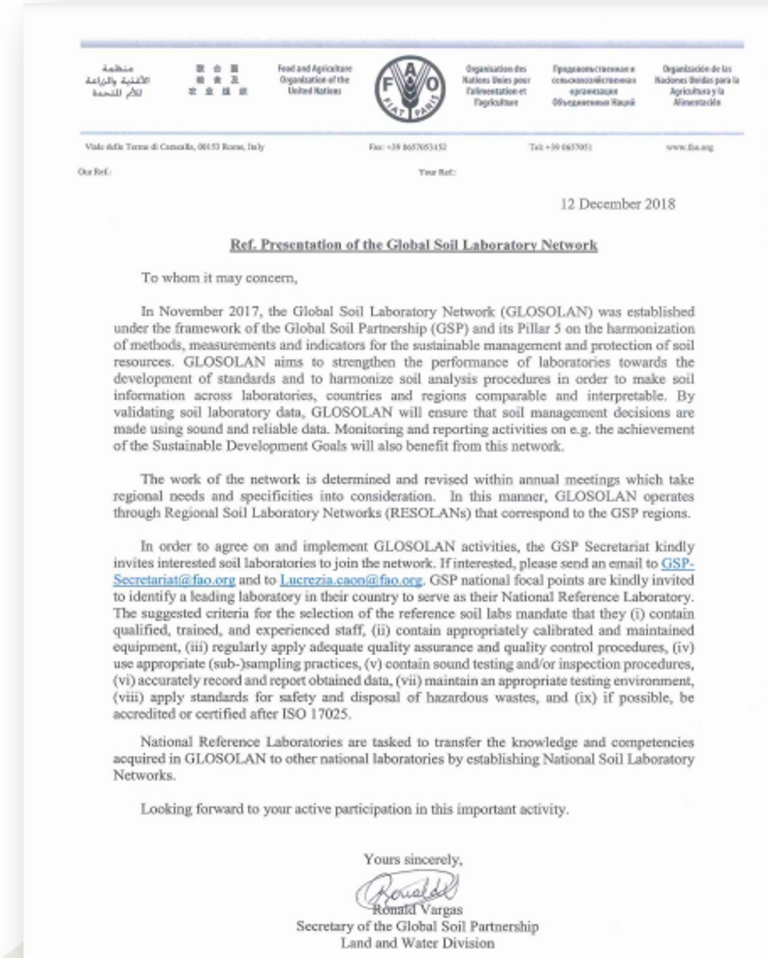
Outcomes:

- Video recording of the training (for virtual training)
- Recording of training videos (for in person training)

Capacity building: beneficiary laboratories

The **National Reference Laboratory** in each beneficiary country.

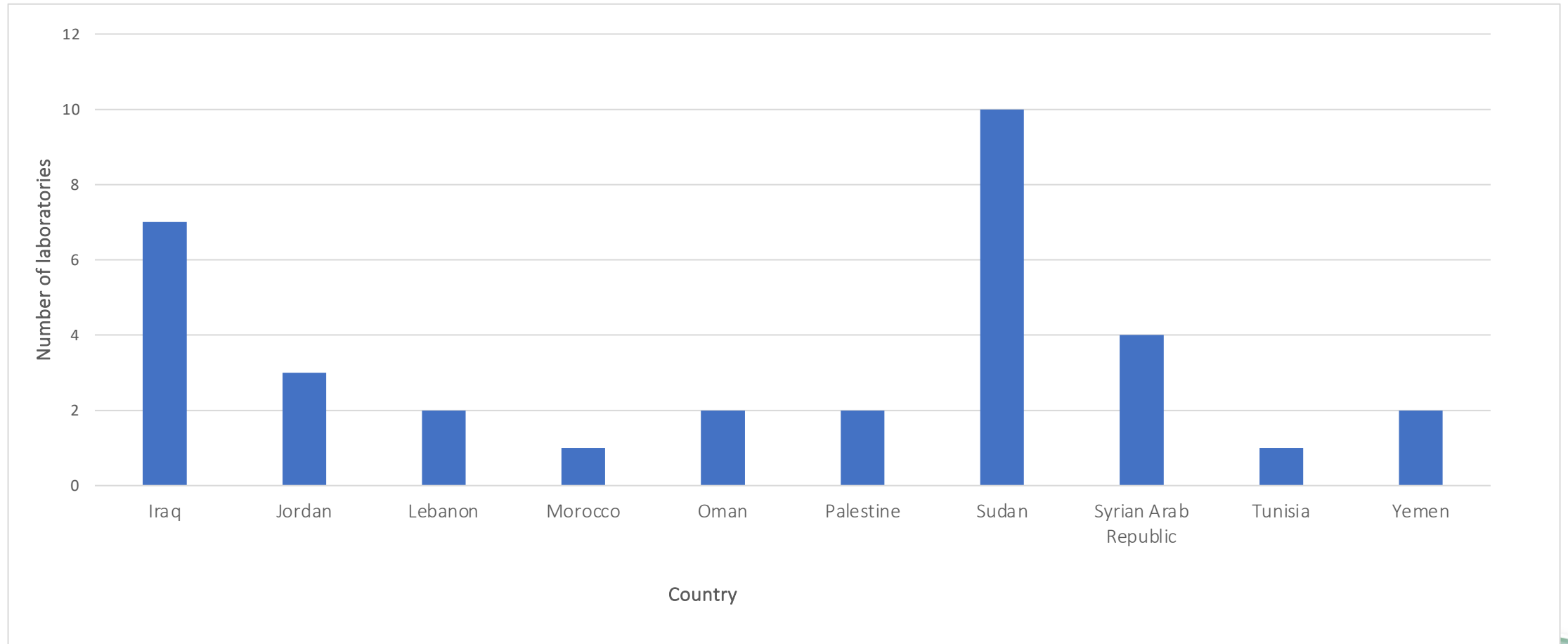
https://www.fao.org/fileadmin/user_upload/GSP/docs/Presentation%20of%20GLOSOLAN.pdf



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Beneficiary laboratories in the project

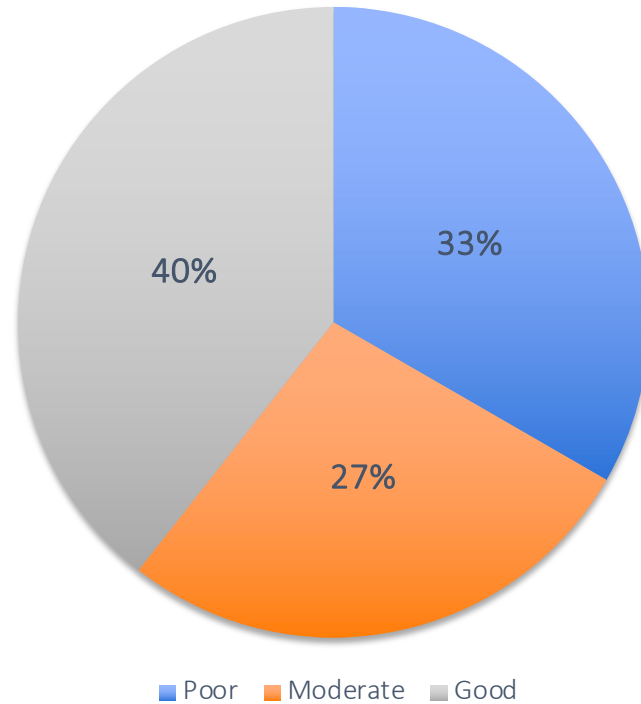


Assessment Procedure

- To build the capacity of laboratories and generation of reliable data for decision-making at all levels.
- To explore ways to overcome any barriers preventing the generation of good quality soil data.
- A five-day assessment per each laboratory/country:
 - Questionnaire (managers, technicians).
 - Photos (instruments, building, etc).
 - Personal contact through email, WhatsApp, etc.

Main findings

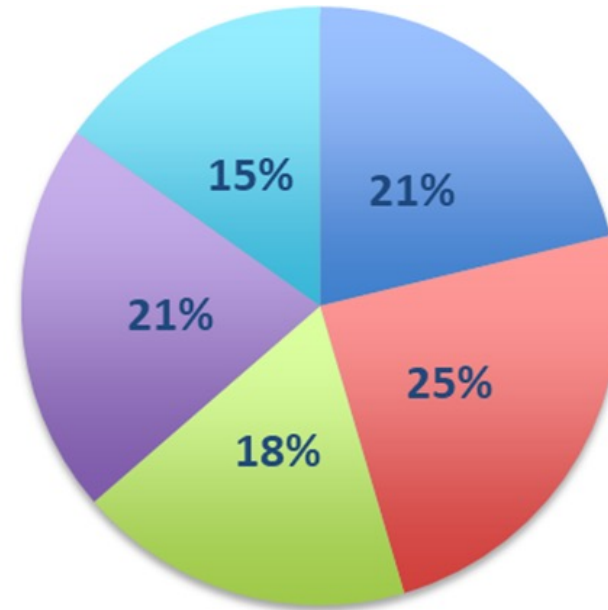
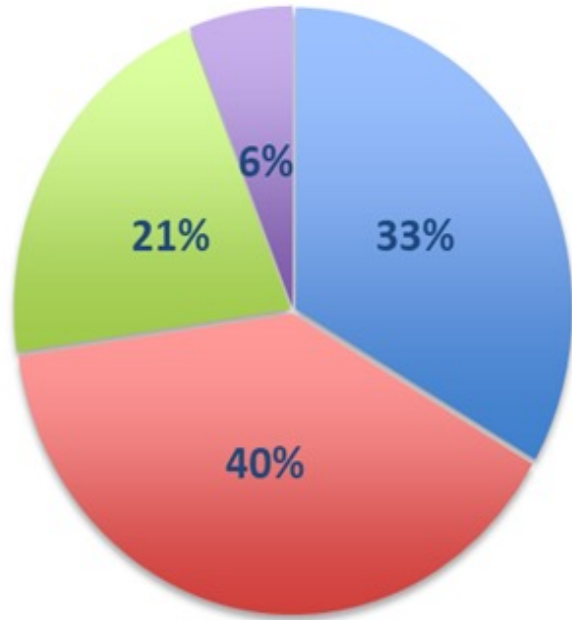
Status of the infrastructure in beneficiary laboratories to the project



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Infrastructure of the beneficiary laboratories (area, number of rooms)



■ < 100 m²

■ 100-300 m²

■ 300 - 600 m²

■ > 600 m²

■ 1

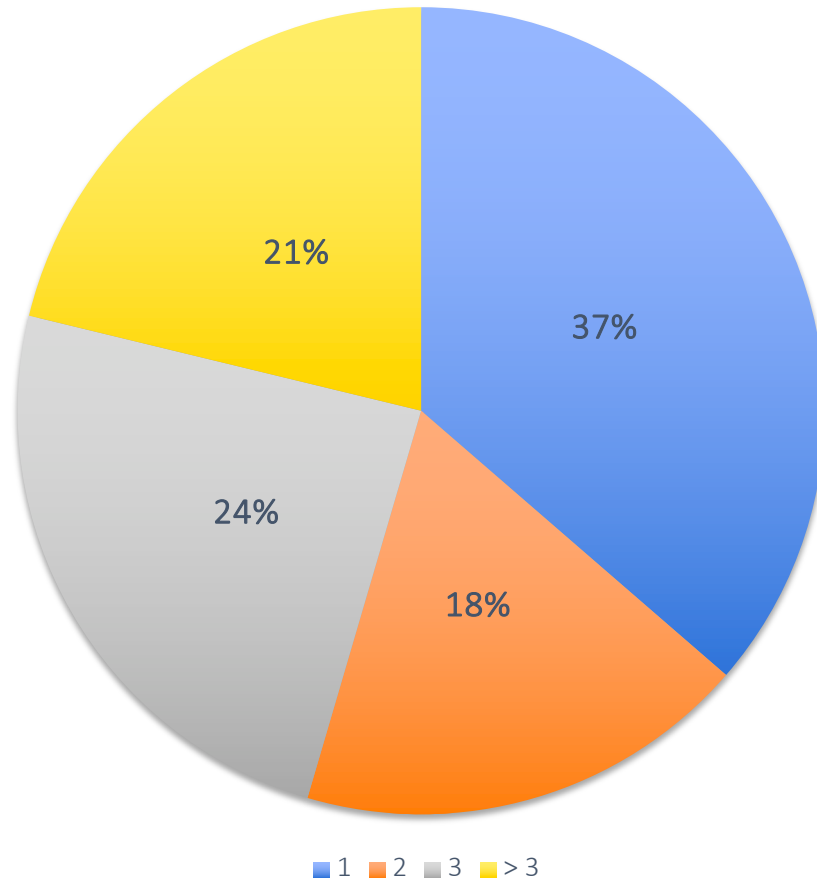
■ 2 to 4

■ 5 to 7

■ 8 to 9

■ 10 or more

Number of departments in beneficiary laboratories to the project



Management and Financial setup

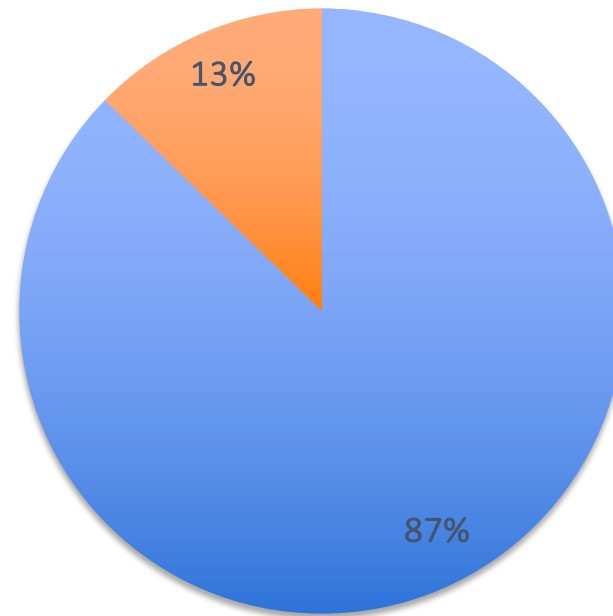
- Weak promotion of soil laboratories activities by agricultural policies.
- Well established management system.
- Good soil sample registration and provision of results and recommendation.
- Well implementation of SOP for soil analyses (In English, Arabic).
- Weak irregular governmental financial support due political instability and economic crisis.
- Fees of analytical services to third parties provide support but only Sudan and Yemen are able to use these fees.

Clients

- Governmental institutions and companies;
- Private agricultural companies;
- Fertilizer companies;
- International organizations like FAO and the International Fund for Agricultural Development (IFAD) and others;
- farmers;
- non-governmental organisations (NGOs); and
- universities (academics, researchers, and students).

Laboratory staff

Type of contract of laboratories' technicians and managers at the regional level

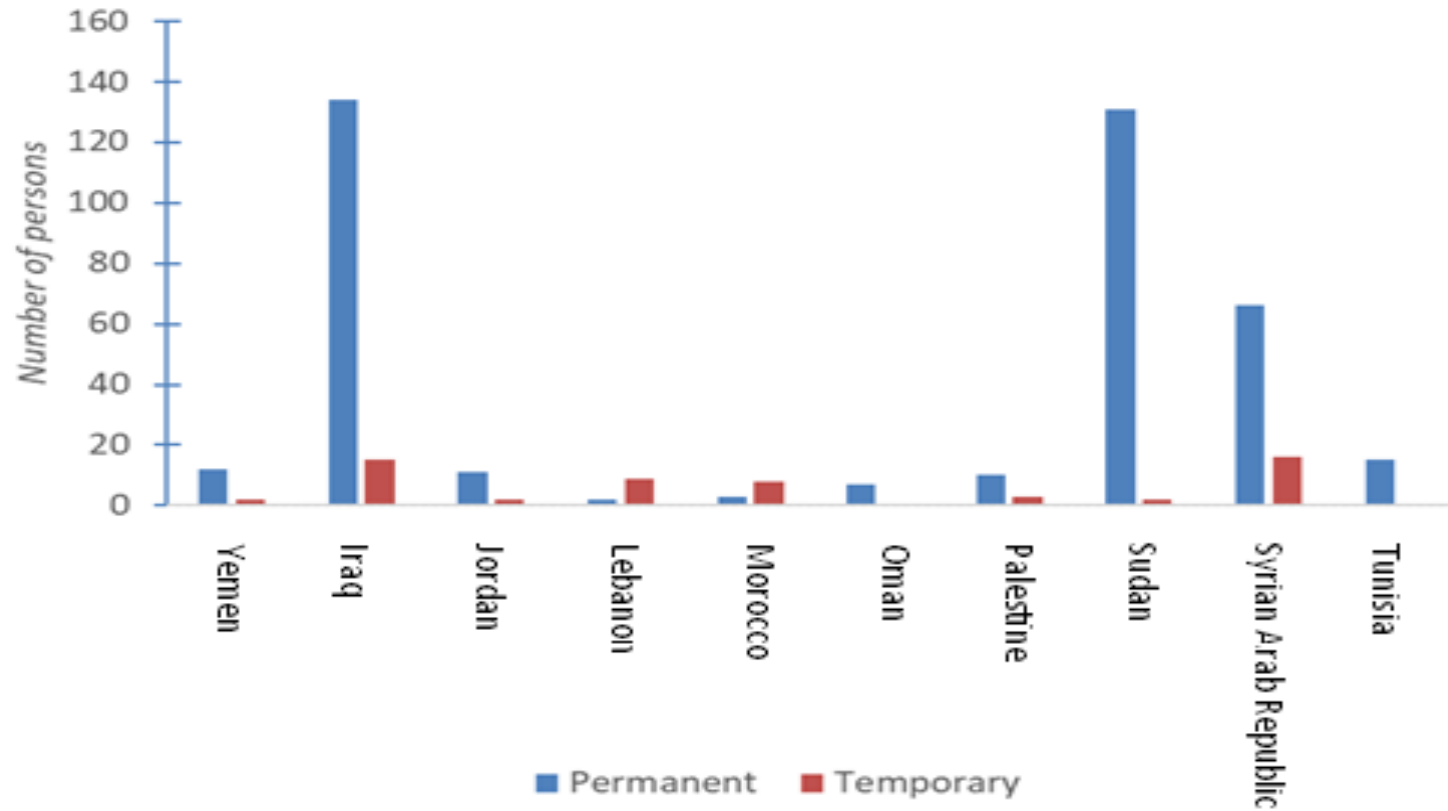


■ Permanent ■ Temporary

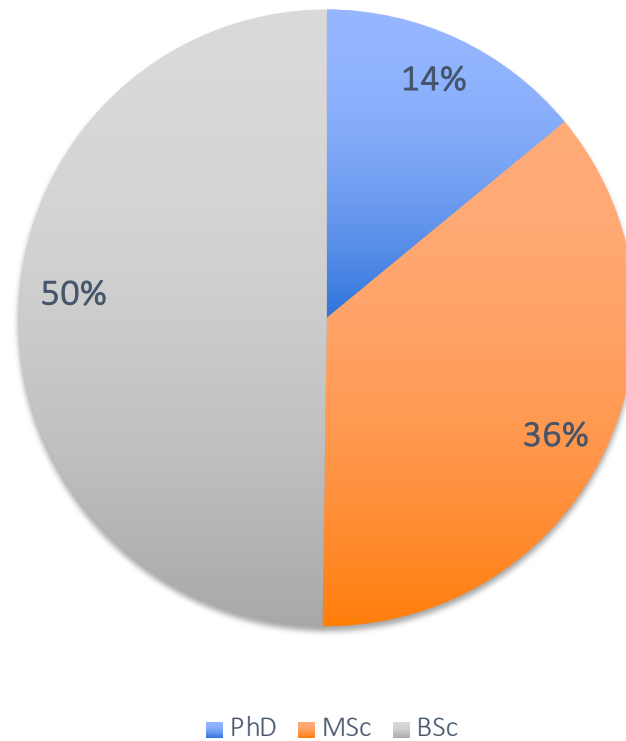
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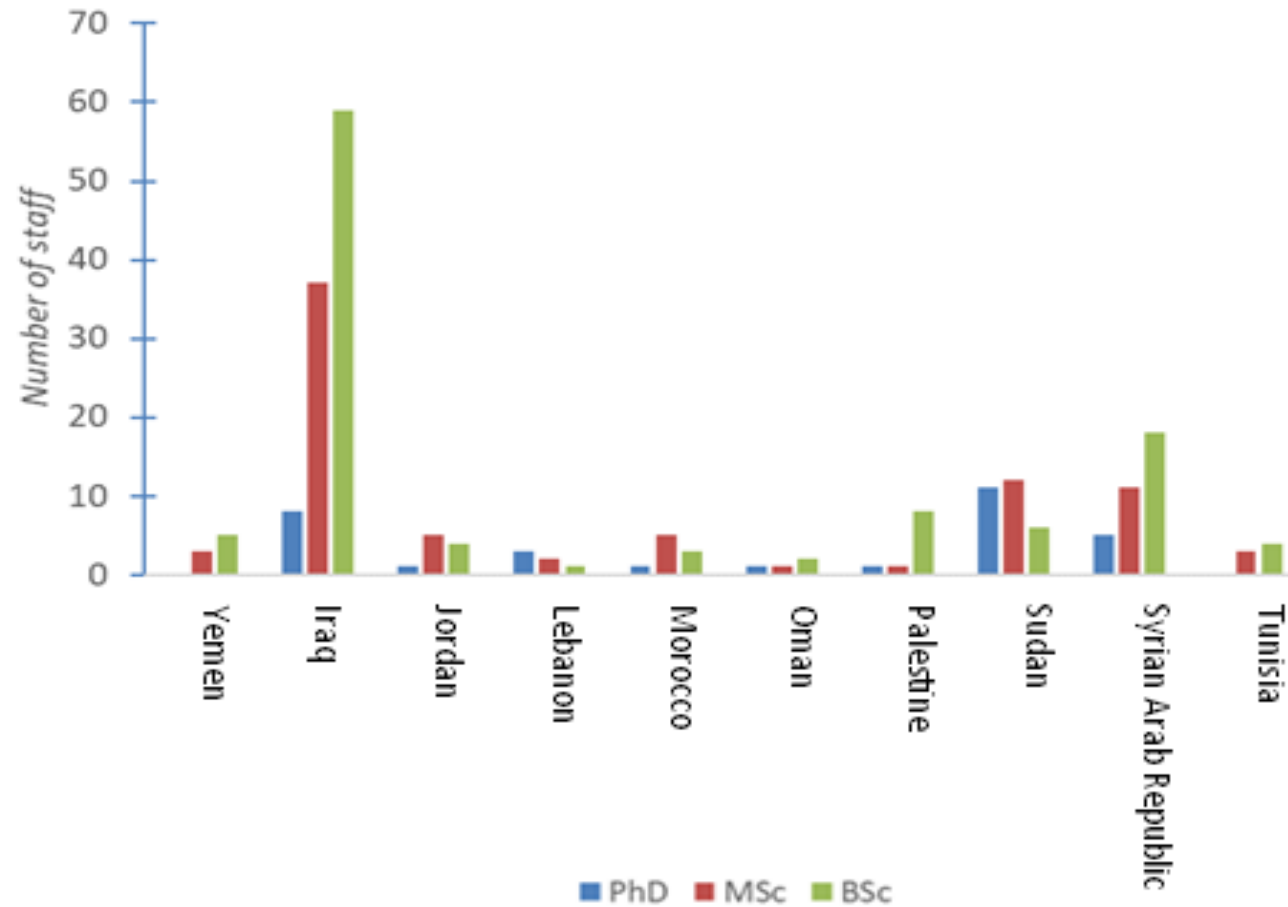
Type of contract of laboratories' technicians and managers at the country level



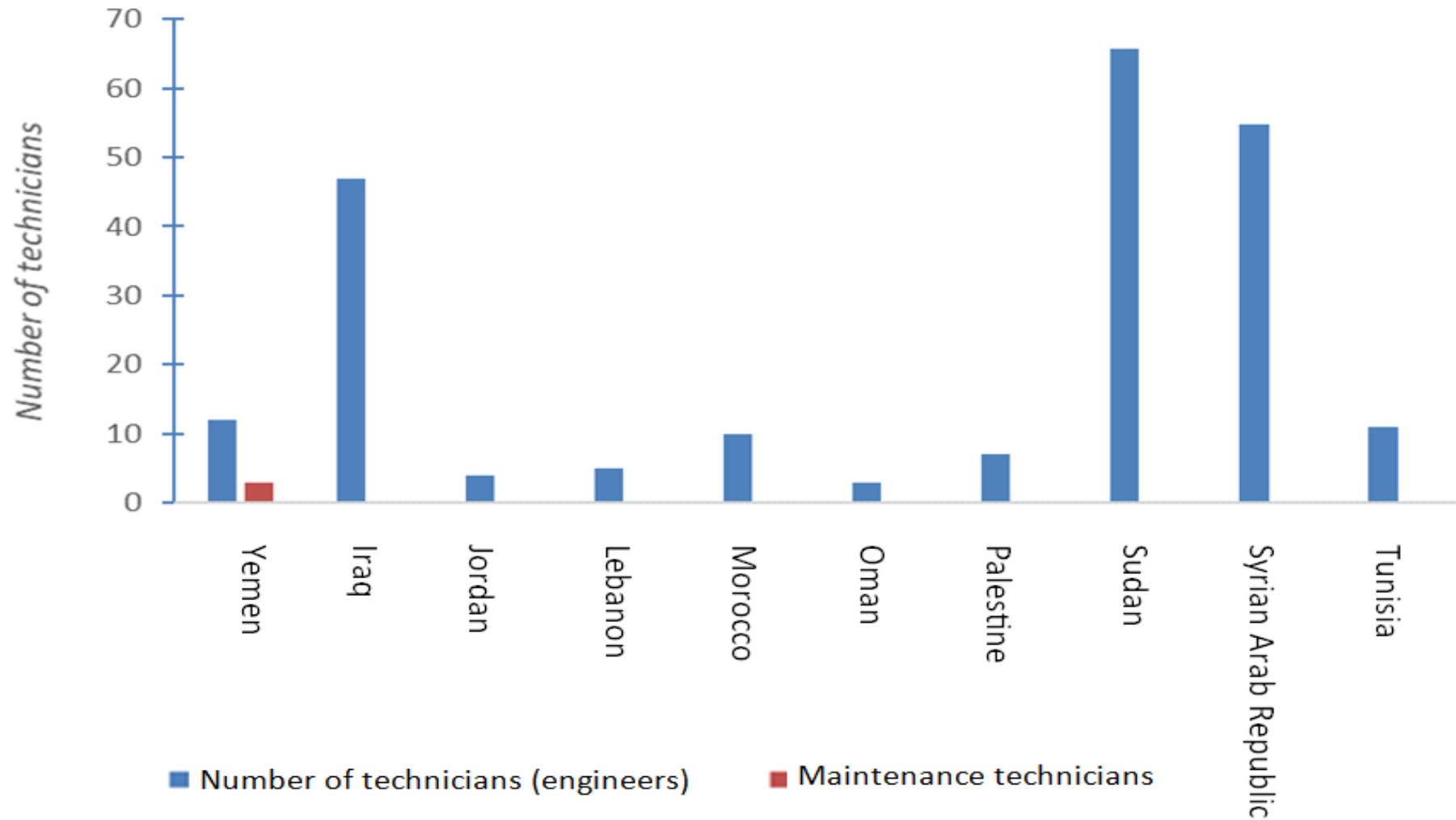
Academic qualification of staff in beneficiary laboratories to the project at the regional level



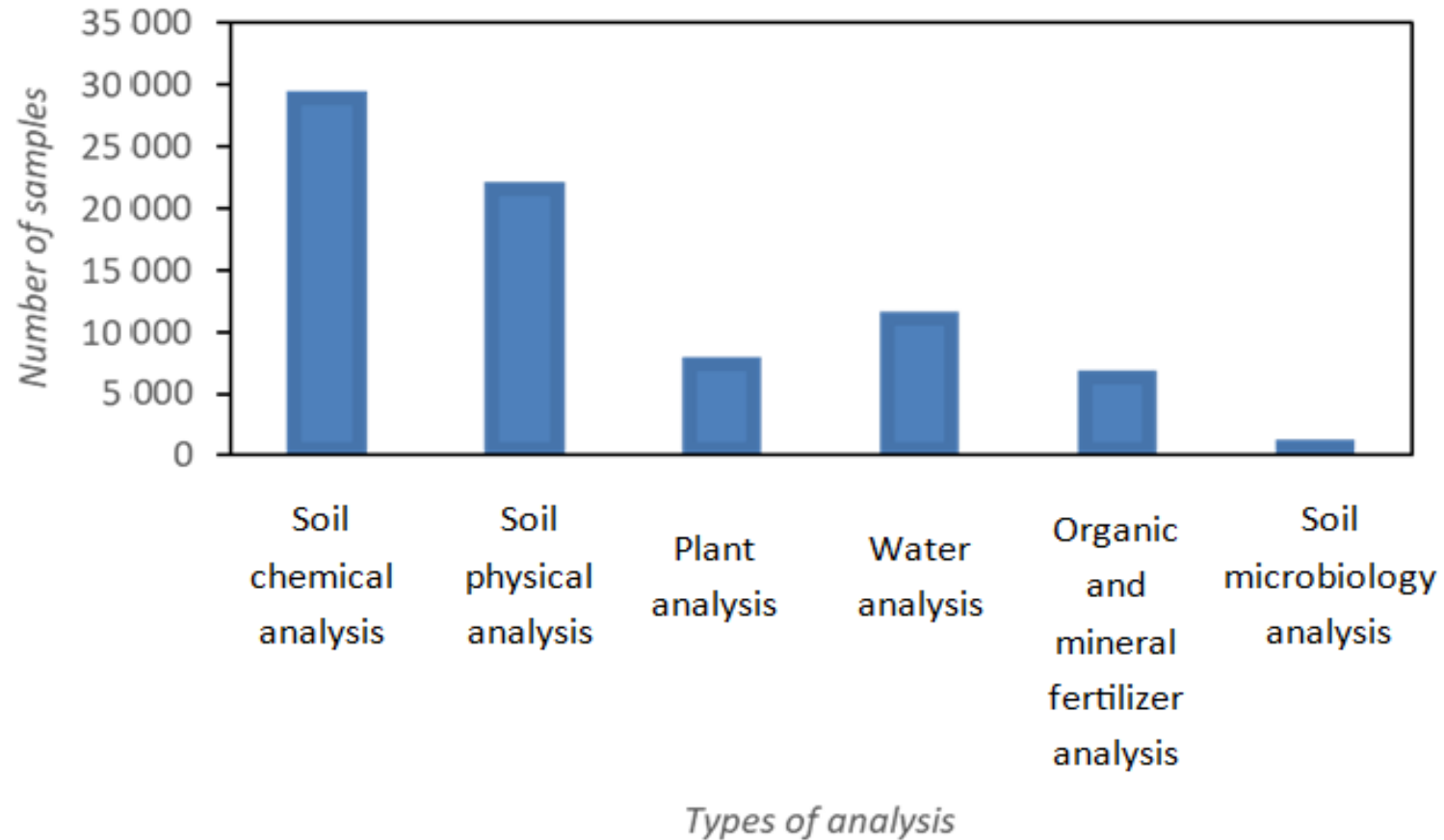
Academic qualification of staff in beneficiary laboratories to the project per country



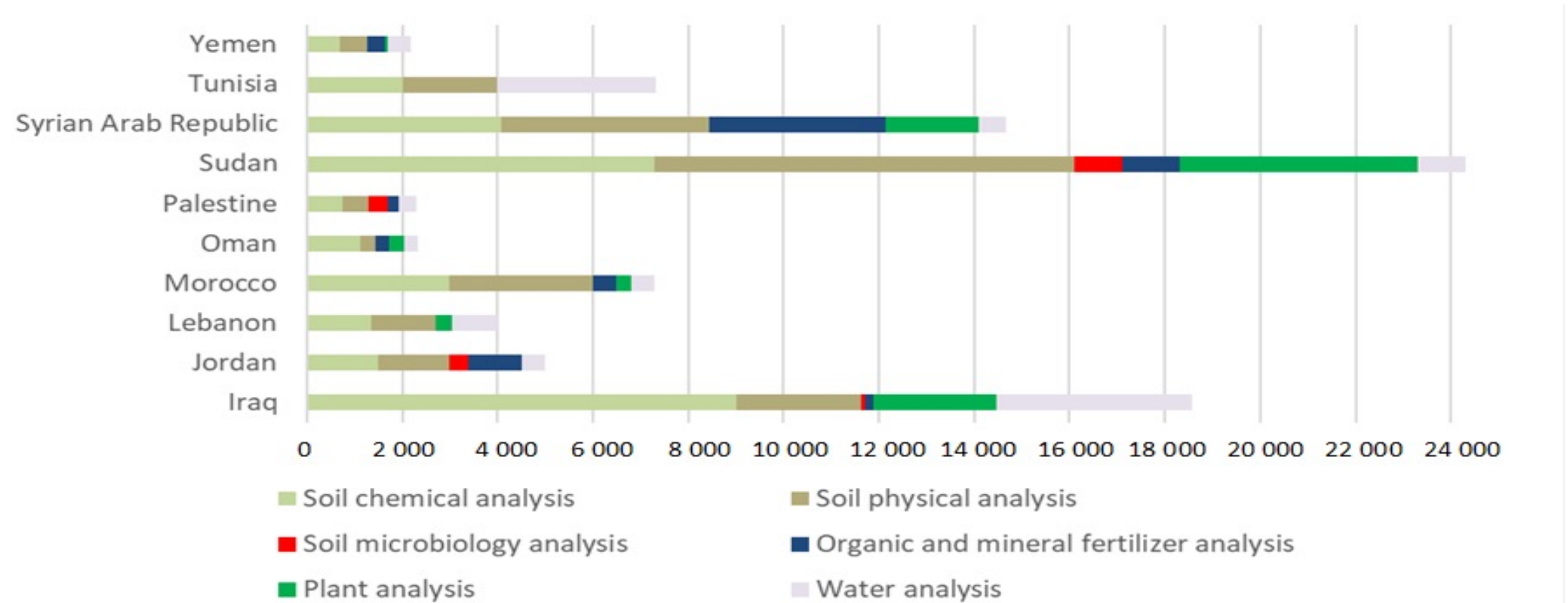
Number of technicians in beneficiary countries to the project



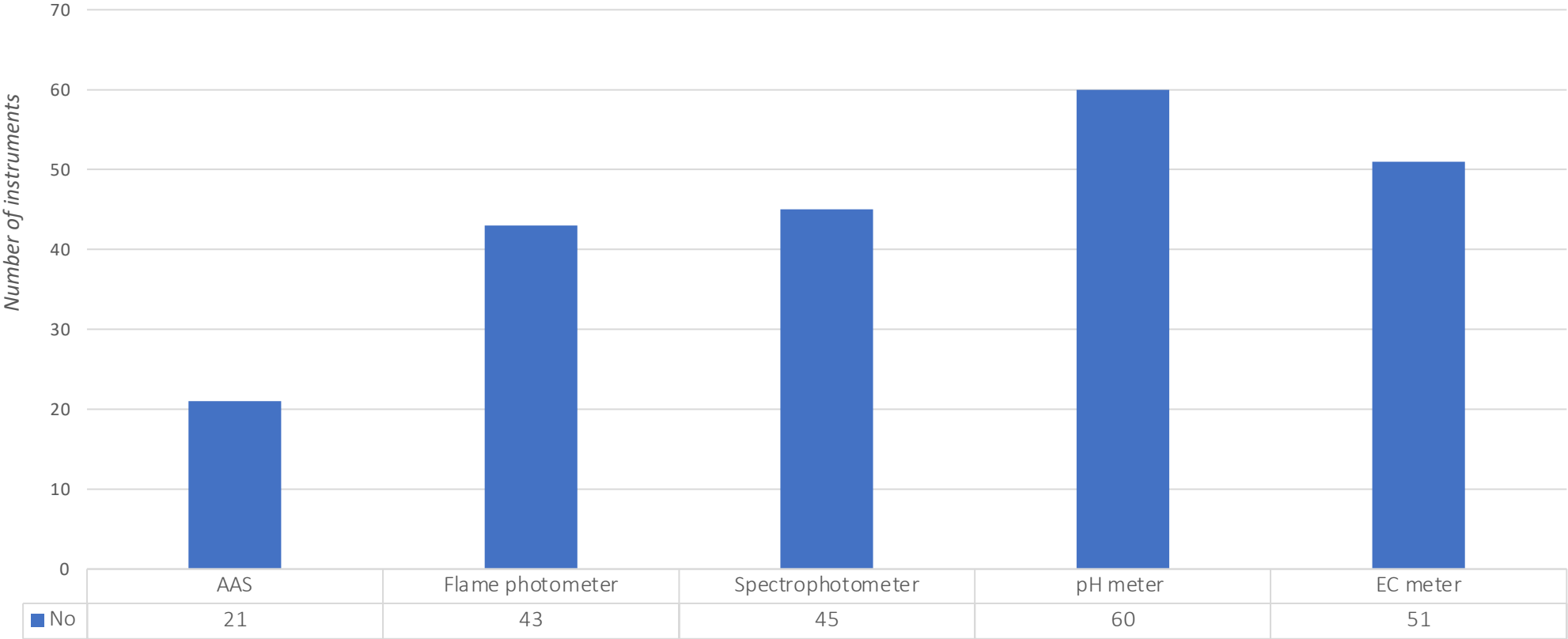
Number of samples per type of analysis processed in the region annually



Number of samples analysed by each country annually



Number of pieces of the five most relevant equipment to conduct basic routine soil analysis in the region



Procurement system

- Buy or replace of a device follow standard international procedure and is based on:
 - The efficiency and accuracy of the available devices
 - Availability of annual budget authorized by the Ministry.
- Very weak replacement or buy of new devices (due to political or economical crises).
- Affects the quantity and quality of soil analysis per year.

Staff training

- Staff hold Bachelor (BSc), Master (MSc) or doctoral (PhD) degrees.
- Laboratories in Jordan, Palestine, the Syrian Arab Republic, and Tunisia provide regular training to their staff, although this does not happen in other countries.
- Provision of training to university students and researchers.
- No training programme on health and safety and quality assurance and quality control (except Tunisia and the Syria)

Drainage and waste management system

- Very poor laboratory waste management despite some national laws or legislation exist in Jordan, Morocco, Tunisia, and Lebanon (not well implemented).
- Do not adopt any specific waste management system.
- Laboratories' drainage systems are not isolated from the public drainage system.

Quality assurance/quality control (QA/QC)

- QA/QC procedures are in place in Jordan, Morocco, Palestine, and the Syrian Arab Republic and moderately implemented in Iraq (certified reference materials (CRMs), standard reagents and blank samples).
- The weakest QA/QC are Lebanon, Oman, Sudan, and Yemen.
- Lebanon, Iraq, Jordan, Morocco, Sudan, the Syrian Arab Republic, Tunisia, and Yemen participated in the proficiency test (PT) organized by GLOSOLAN in 2022.
- Palestine attempted to participate in PT and Oman did not participate.

Health and safety

- Overall, weak health and safety systems in the region.
- Relatively good (Oman), Moderate (Iraq, the Syrian Arab Republic, and Tunisia), Weak (Jordan, Lebanon, Morocco, Palestine, and Sudan) and Poor (Yemen).
- Not well distributed ventilation systems.
- Opening of windows and the turning on of the air conditioners use to compensate for the absence of a ventilation system.
- Most laboratories have protective cupboards.
- The majority of beneficiary laboratories have fire extinguishers.

Strengths of the beneficiary laboratories

- Well distribution of laboratories on the national territory to serve farmers in several agroecological zones.
- High qualified and committed human resources.
- Well established administration and management systems.

Laboratory issues

- Lack of equipment, consumables.
- Not enough Technicians.
- Absence of a regular recruitment system.
- Lack of regular training and skills-improving programmes
- Overall, laboratories have old instruments and equipment in need of maintenance or being replaced.
- The absence of maintenance technicians.
- The establishment of staff laboratory mobility programmes could help laboratory technicians and managers to increase their knowledge and eventually acquire international experience.

Laboratory issues

- Financial constraints and inadequate direct cash incentives.
- A frequent malfunctioning of instruments.
- Instability of electrical power supplies.
- Very poor waste management and drainage systems.
- Weak health and safety systems that therefore increase the risk of accidents for laboratory technicians and managers.
- Weak QA/QC procedures, meaning that the quality of results of the analysis.

Laboratory needs

- During the national assessments, laboratories' needs were divided into three categories:
 - needs to be addressed through the project (mainly related to training);
 - needs to be addressed through a second phase of the project (related to training and procurement); and
- needs to be addressed with the support of the government.

Project Acheivements

- Two hundred twenty seven (227) laboratory technicians and managers were successfully trained.
- In person (Jordan, Morocco, Oman, Sudan, and Tunisia).
- Online (Iraq, Lebanon, Palestine, the Syrian Arab Republic, and Yemen).
- Training videos on the implementation of some SOPs were recorded during the training in Iraq, Oman, and Sudan. These will be made available on the GLOSOLAN website in 2023.

Training topics

- soil samples collection and storage;
- preparation of soil samples for different routine soil analyses;
- preparation of standard solutions;
- implementation of GLOSOLAN's SOPs for the analysis of chemical and physical soil parameters. If GLOSOLAN SOPs were not available, training was provided on the implementation of SOPs released by ICARDA and national institutions;
- pH (soil–water suspension or SPE);
- electrical conductivity (EC) (SPE and soil–water suspension);
- soluble cations and anions (Ca, Mg, Na, K, CO₃, HCO₃, and Cl);
- available P by Olsen Method;
- analysis of total nitrogen;
- total and organic carbon analysis by Walkley and Black method and the calculation of organic matter from total carbon;

Training topics

- management and disposal of chemicals;
- soil moisture content analysis;
- soil texture analysis;
- QA/QC for soil analysis;
- calibration of laboratory equipment;
- internal quality control;
- external quality control (proficiency testing);
- soil report writing;
- interpretation of soil results and provision of recommendation; and
- health and safety.

Training evaluation by trainees

- Very satisfied with the training and the trainer.
- Future in person training should be for a longer period of time, less intensive.
- As response to request of governments the training duration and modality was adapted to the number of trainees, which was higher than expected in almost all countries.
- Additional training was also requested on topics like soil microbiology, fertilizer analysis, and the maintenance of laboratory equipment.
- Trainees also suggested future projects to include visits to soil laboratories located abroad.



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Laboratories needs – From national governments

- Establishment of regular national training programmes and national and international exchange programmes.
- Formulation and implementation of laws and regulations for the management of soil laboratories' waste and the disposal of expired chemicals and the drainage systems, which should be regulated in order to limit water and environmental pollution, as well as to reduce the risk and exposure of people to toxic substances.
- Establish policies and regulations on the minimum data quality required for decision-making on soil management.
- To issue permanent maintenance contracts for regular checking and repairing of analytical instruments.
- To establish policies and regulations on health and safety, and to invest in the installation of health and safety equipment in soil laboratories.

Conclusions and recommendations

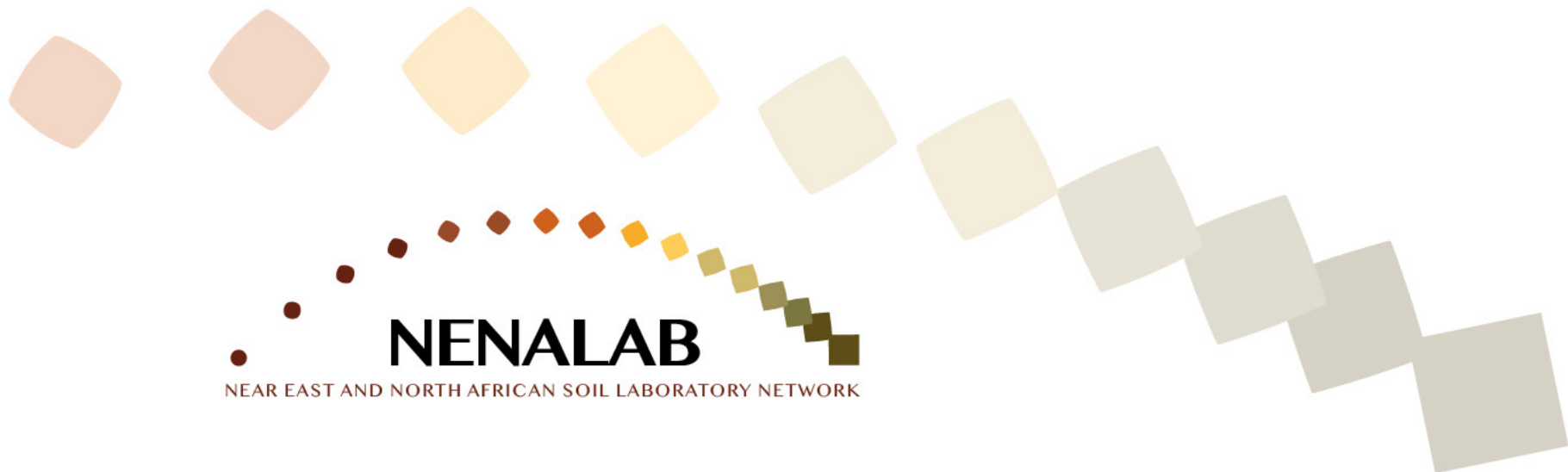
- The project successfully assessed the capacities and needs of 34 laboratories.
- Two-hundred and twenty-seven laboratory technicians and managers were trained.
- Training was successful with some limitations related to the availability of **budget and time, and the ability of the trainer to travel to the different beneficiary countries in the project.**
- Detailed information on each beneficiary laboratory's specific needs in terms of training and procurement.
- **Training requests that could not be addressed through this project were included as recommended activities for future projects.**
- Activities that require the **direct intervention of the government** were also identified.
- Lack of political and financial support, equipment and consumables, and the instability of the electrical power supply in many countries affect the ability of laboratories
- Poor legal frameworks and regulations on the laboratory's waste and drainage management system
- Implementation of health and safety measures increase the risk for accidents and the exposure of soil laboratory's personnel to toxic substances as well as the risk of release into the local environment.

Conclusions and recommendations

- National governments need to invest in solutions to these issues (minimum data quality , implementation of internationally recognized SOPs).
- Support of the National reference laboratories to GLOSOLAN.
- Formulation of national or regional projects capable of addressing the training and procurement requests highlighted in the national soil laboratory assessments.
- Regional findings can be used to promote the implementation of coordinated actions among countries and facilitated by the endorsement of an international declaration on sustainable soil management for the region.
- Execution of soil laboratory assessments for other countries and regions, as it has the potential to stimulate financial resource mobilization and policy actions.



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