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STRENGTHENING SOIL LABORATORY FACILITIES AND PERFORMANCE TO SUPPORT EVIDENCE-BASED DECISION-MAKING

June 2022

SDGs:



Country:

Bhutan

Project Code:

TCP/BHU/3703

FAO Contribution:

USD 125 000

Duration:

1 January 2019 - 31 December 2021

Contact Info:

FAO Representation in Bhutan
FAO-BT@fao.org

Implementing Partner

Ministry of Agriculture and Forests.

Beneficiaries

Farmers; Extension service workers, Staff from regional Agriculture Research and Development Centres (ARDCs).

Country Programming Framework (CPF) Outputs

Strategic Objective/Organizational Outcome 20101: Innovative practices for sustainable agricultural production (including traditional practices that improve sustainability, such as those listed as Globally Important Agricultural Heritage Systems (GIAHS)) are identified, assessed and disseminated and their adoption by stakeholders is facilitated.

Regional Initiatives: Zero Hunger, Climate Change.

CPF Outcome 2: Improved multi-sector participation coordination, and value chain development in food and nutrition security programme as contribution to the enhanced food and nutrition security.



BACKGROUND

Bhutan is facing serious issues with land degradation, driven by unsustainable agricultural practices, such as overgrazing, as well as infrastructure construction lacking adequate environmental measures, including mining. This is further problematic because Bhutan is a mountainous country, with existing land degradation problems, such as soil erosion, landslides and severe losses in soil fertility. These issues further compound issues with agricultural productivity, the environment and food security and the overall quality of life.

Furthermore, the country lacks a national soil map and there is very limited data available on soil quality. Existing soil data are outdated and scattered among institutions, often having been collected through ad-hoc surveys, and fundamental data, such as geographic location description (geocoding) of sampling sites, is missing, with limited soil profiles mapped. Analytical soil data is crucial for decision-making regarding soil fertility, which impacts various key areas, including food security, agriculture, the environment, climate change and sustainable development.

Therefore, investments in soil laboratories to enable the development and collection of detailed and precise soil resource data for sustainable soil management and land use planning is a priority in order to achieve food security and nutrition in the country. This project targeted four regional Agriculture Research and Development Centres (ARDCs), their Soil Service Units (SSUs) and the Soil and Plants Analytical Laboratory (SPAL) under the National Soil Services Centre (NSSC). It aimed to strengthen the four SSCs in Bajo, Bhur, Wengkhar, and Yusipang and provide support, including laboratory equipment and facilities needed for basic soil analysis, and training for 15 SSU staff/laboratory technicians on proper soil sample handling (soil sample collection and preparation), soil analysis methods, procedures (use of laboratory facilities and equipment) and processing and the interpretation and presentation of data (e.g. laboratory report and database preparation).

IMPACT

The basic soil equipment provided enables ARDCs to better provide soil analytical and advisory services to various users, including farmers, which will help them improve soil management and contribute towards enhancing crop yield and production. Overall, the outcome of this project contributes to the efficient use of production inputs that can enhance soil health, food security, biodiversity conservation and the mitigation of climate change.

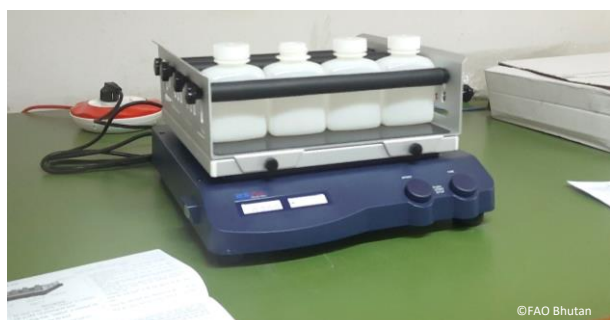
ACHIEVEMENT OF RESULTS

The project contributed to better management of nutrients, including the use different types of fertilizers, for a more balanced, sustainable and efficient targeting of nutrient needs for crops. The activities carried out support the development of government policies that promote and mainstream sustainable soil and land management in light of national targets for food and nutritional security, and enable access to better advisory services and the promotion of best practices in sustainable soil management.

The project achieved this by strengthening regional soil laboratories, installing new and additional lab equipment and providing hands-on training that enabled regional centres to provide basic soil analysis and advisory services to farmers and other stakeholders. Farmers now have greater access to laboratories for soil sample analysis (previously limited to the national soil and plant analytical laboratory in Thimphu), and field extension agents have enhanced capacities for soil sampling, soil result interpretation and fertilizer recommendations as a result of the trainings delivered by the project.

IMPLEMENTATION OF WORK PLAN AND BUDGET

Despite the global COVID-19 pandemic, most activities were implemented successfully. Public health and travel restrictions greatly impacted the procurement of laboratory equipment, hiring of international consultant, regional laboratory visits and training for national laboratory staff. The closure of international borders except for essential items greatly affected procurement, distribution and installation activities and prevented technical experts and consultants from traveling to Bhutan. As a result, two activities were incomplete: (i) the installation of laboratory equipment and performance testing and hands-on training at ARDC Samtenling and (ii) training of field extension agents on soil sampling, soil result interpretation and fertilizer recommendations. A total of 15 laboratory and field extension staff were expected to be trained by the external consultant but in response to the travel restrictions, the training was instead provided by an in-house expert (the chief chemist) from NSSC. Due to travel restrictions, only two laboratory staff from Bajo could be trained under the training of trainers (TOT) programme. The trained staff from the regional soils service unit were due to train the 65 extension agents, however the TOT could not be completed. After the pandemic restrictions were lifted, the Government began an overhaul of the civil service, with many officials, including executives and secretaries, managed out. As a result, the Government withheld all trainings and seminars and further trainings could not be continued. To a large extent, activities were implemented within the planned budget, except for the activities that could not be carried out due to the COVID-19 pandemic. Resources from these activities were reallocated to other activities. Due to the limited budget resources of the project and the close proximity of one of the four target ARDCs (Yusipang) to the NSSC and SPAL at Semtokha, it was also decided supporting laboratory equipment would only be provided to the other three centres (Bajo, Samtenling and Wengkhar). The NSSC could provide all the soil services envisioned for the separate lab at Yusipang; therefore, setting up an additional centre was deemed unnecessary.



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FOLLOW-UP FOR GOVERNMENT ATTENTION

It is advised that NSSC/SPAL continue to provide technical support to the ARDCs, particularly in capacity-building, as there is regular turnover, which sees trained staff transferred and the joining of new staff. Additional funding should be explored as it would help further strengthen regional soil laboratories with new laboratory equipment that use fewer chemicals and increase the capacity for processing larger numbers of soil samples. Furthermore, additional financial support would also help to procure mobile soil testing laboratory vans, rapid soil testing kits and sensor based soil testing kits, bringing laboratory resources closer to the field and making them more accessible to farmers.

SUSTAINABILITY

1. Capacity development

The project helped in strengthening collaboration and partnership between the NSSC and the ARDCs. Decision-makers within the Department of Agriculture and the Ministry of Agriculture and Forests also fully recognized and embraced the importance of maintaining overall soil health for the sustainability of agriculture. The importance of determining fertilizer application based on soil test results and site specific fertilizer recommendations was well acknowledged, in particular to address issues of over- and under-use of chemical fertilizers.

Regional Soil Services Units were established under the approved organizational structure of the ARDCs, supporting the ministry's goal to strengthen regional soil laboratory and bring soil services closer to the farmers' fields. Moreover, the NSSC/SPAL will continue to provide technical support to the regional soil focal points within the ARDCs to ensure laboratory standards and quality services are maintained, including periodic proficiency testing to check soil test results.

2. Gender equality

The aim of the project was to strengthen regional soil laboratories, which are staffed by both men and women, and the basic laboratory equipment provided to the regional soil labs will support the soil focal points (which include both men women) to provide better services to farmers. Women were also key beneficiaries of the project because most of the land in Bhutan is registered to women landholders.

3. Environmental sustainability

The soil test results help ensure environmental sustainability by providing farmers with better advice and recommendations for using appropriate doses or balanced doses of fertilizers, thereby reducing negative impacts due to over use of chemical fertilizers.

4. Technological sustainability

The technologies introduced through this project were basic soil lab equipment that was procured based on the needs and specifications submitted by the project management unit; therefore, they were deemed appropriate and served their intended purpose. While additional technical assistance would be highly beneficial, the stakeholders and beneficiaries involved in the project are able to continue activities on their own, especially soil sampling, testing, result interpretation and providing fertilizer recommendations based on the soil test results.

5. Economic sustainability

The soil analytical services are provided free of cost to all clients, including farmers, and with the exception of other projects.



DOCUMENTS AND OUTREACH PRODUCTS

- **Jamyang.** April 2021. *A Basic Soil Testing Laboratory Set-up at ARDC Bajo. ARDC Bajo, Wangdue.* 4 pp.

ACHIEVEMENT OF RESULTS - LOGICAL FRAMEWORK

Expected Impact	Strengthened food and nutrition security		
Outcome	Improved yield and production of commodities farmed		
	Indicator	Equipped 4 ARDCs with lab equipment. A minimum of 15 laboratory staff trained in using equipment for soil analysis, sample collection and analysis; interpretation of laboratory results and writing laboratory reports.	
	Baseline	– 1 – 2	
	End Target	– 4 – 12	
	Comments and follow-up action to be taken	The procurement of basic soil equipment including high-density polyethylene (HDPE) bottles, composting temperature probe with data loggers, sample shakers, heating coils for distiller, resin cartridge for water deionizer and muffle furnaces was completed. However, the actual set up of lab equipment along with the equipment performance testing and hands-on training could be done only for ARDC Bajo, while for ARDC Samtenling the setup is still pending. Furthermore, because of the COVID-19 Pandemic situation, other key project activities (hiring of international consultant to train regional soil focal points and NSSC staff and training visit to a laboratory in the region) could not be implemented as planned in the project document. As COVID-19 pandemic situation continues, it appears challenging to implement the above activities. Therefore, based on the government's instructions and also to avoid risk, the project management unit (PMU) proposed to instead purchase additional equipment. The additional equipment distributed to the regional centres included the following: ovens, UV/VIS Spectrometer and fume hood with exhaust fan and glass shield (L-1.7m, H-2.5m, B-0.7m).	
Output 1	Soil laboratories at the research centres of Bajo, Wengkhari, Bhur and Yusipang, and SPAL strengthened with basic soil laboratory equipment		
	Indicators	Target	Achieved
Baseline	Equipped 4 ARDCs with lab equipment.	4	Yes
Comments	Procurement successfully achieved.		
Activity 1.1	Provide the Soil Services Unit (SSU) at the 4 ARDCs with basic soil laboratory facilities to improve their services		
	Achieved	Yes	
	Comments	Equipment for 3 SSUs (Bajo, Samtenling and Wengkhari), including soil analysis equipment for basic soil analysis, such as soil pH and nutrient contents, etc. was provided. With soil laboratory facilities at the SSUs, necessary advisory services were provided to farmers.	
Output 2	Capacity of 15 staff from the four regional soils service units (SSU) built on soil analysis and for efficient service delivery to farmers, institutions and investors		
	Indicators	Target	Achieved
Baseline	A minimum of 15 laboratory staff trained on using equipment for soil analysis, sample collection and analysis, interpretation of laboratory results and writing laboratory reports.	12	2 Bajo staff and 4 SPAL staff trained.
Comments	According to the original workplan, Activity 2.1 was to be implemented in 2019 and Activity 2.3 in 2019 and 2020, following the purchase, installation and training on basic lab equipment for staff. However, these two activities could not be implemented as originally planned due to the COVID-19 restrictions.		
Activity 2.1	Identify and deploy a national consultant/international consultant for 15 days		
	Achieved	No	
	Comments	It was not possible to recruit the international consultant due to travel restrictions. The budget for this activity was reassigned to the procurement of additional equipment for the regional centres as mentioned under the Outcome above. The PMU oversaw and monitored the setup of laboratory facilities and functioning in the 3 SSUs.	
Activity 2.2	Train 15 staff (laboratory technicians and managers) from Soil Service Units (SSU) and SPAL		
	Achieved	Partially	
	Comments	Although the international consultant could not be recruited due to COVID-19 travel restrictions, the chief chemist of SPAL provided hands-on/refresher training to staff at SPAL headquarters, while two staff from ARDC Bajo were also trained.	
Activity 2.3	Organize a week-long training/visit to a laboratory in the region		
	Achieved	No	
	Comments	The PMU could not arrange hands-on training due to COVID-19 restrictions. The budget for this activity was also reallocated to cover the earlier mentioned procurement of additional equipment for regional centres, which was overseen and monitored by the PMU.	

Partnerships and Outreach

For more information, please contact: Reporting@fao.org

Food and Agriculture Organization of the United Nations

Viale delle Terme di Caracalla
00153 Rome, Italy