ICID Young Professionals e-Forum (IYPeF)

https://www.linkedin.com/groups/6990321

Soil conditions to ensure sustainable agriculture and coping with climate change

Background Note for Discussion

15 - 31 March 2019

Introduction

"Healthy soils provide the largest store of terrestrial carbon. When managed sustainably, soils can play an important role in climate change mitigation by storing carbon (carbon sequestration) and decreasing greenhouse gas emissions in the atmosphere" – FAO.

Healthy soil is the key to food security and nutrition for all, 95% of our food comes from our soil. Soil health is able to manage a range of essential soil functions including store and cycle water and nutrients, sustain soil biota and plant life, decompose organic matter, and protect water quality to sustaining agricultural production and ensuring food security of the nation (Rattan Lal, 2015).

Soil health can mitigate environmental threats (global warming, climate change, greenhouse gases emission). The total soil carbon pool is four times the biotic and about three times the atmospheric pool. The process of soil organic carbon (SOC) depletion can be reversed. Improvements in quality and quantity of the SOC pool can increase biomass/agronomic production, reduce sedimentation of reservoirs and waterways, and mitigate the risk of global warming (Rattan Lal, 2015).

The amount of carbon in soils typically varies from one location to another and it generally depends on land management practices, such as tilling and deforestation. Such practices also determine how long soils can retain carbon. Because nearly half of the arable land in the world has been converted to rangelands, pastures and croplands. Soils across the world have lost anywhere from 50 to 70% of their initial carbon content, contributing to nearly 25% of all man-made greenhouse gas emissions globally. Some of the agriculture practices that cause soils to lose carbon include excessive use of pesticides and fertilizers, tilling, mono-cropping, over-

grazing and removing crop residue. Additionally, practices such as thawing permafrost, draining of peatlands and deforestation can also cause soils to lose carbon.

Carbon sequestration can be done by performing no-till, minimum till or conservation tillage farming system. Using cover cropping such as clover, small grain crops to protect soil from degradation, decreasing nutrient loss, improving water infiltration and reducing runoff, aid this process. Indeed, the combined application of no-till practices and cover cropping will significantly build organic matter and protect soil from heavy rains. Crop rotation and crop biodiversity practices will improve soil health as well (SARE, 2012).

According to researchers, climate change will likely alter the soil system in various ways. For instance, changes in the atmospheric carbon dioxide concentrations, temperatures, and precipitation patterns and amounts will determine decomposition rates, modifying the soil-plant system. In turn, this will have an impact on the amount of organic carbon levels in soils. This is particularly important because organic carbon determines important soil qualities, such as soil fertility, structure and microbial population in soils.

Secondly, precipitation and temperature typically affect the amount of carbon in soils as well as the distribution of organic matter in soils. For instance, studies have found that soils heated 5 to 20 cm deep tend to release 9 to 12% more CO2 than normal, whereas soils 100 cm deep release as much as 37% more CO2 than normal when they experience a 4˚ C temperature increase. This is because soils in the deeper levels contain more than 50% of the global soil carbon. More specifically, worldwide, the first meter of soil stores about 1420 gigatons (Pg) of carbon, while the above-below ground vegetation and dead organic matter store about 460 Pg of carbon.

There are great opportunities for agriculture to adapt to a more sustainable future in a changing climate. This discussion will explore how soil health can influence sustainable agriculture and help mitigate climate change impacts. Around the world there are many practices already in place, including resilient crop varieties that can tolerate drought and temperature stress and increased ability to predict, plan and respond to extreme weather events. A range of new and improved land use management practices and investment in improving water infrastructure have also had a

significant impact. With this in mind, and the many more opportunities yet to be explored, Young Professionals in the Irrigation and Drainage sector are encouraged to call upon research or experience and share their views on the questions indicated below.

Objectives

The discussion on the topic “Soil Conditions to ensure Sustainable Agriculture and Coping with Climate Change” is expected to achieve the following objectives; amongst others:

1. Discuss how soil conditions impact sustainable agriculture.
2. Discuss how a healthy soil environment can be used to cope with climate change.
3. Share documented, regionally specific examples of the opportunities for improvements in both sustainability and climate resilience through soil health.
4. Define the main challenges faced in achieving these goals.
5. Highlight varying views of YPs on the opportunities they see for soil health and management to ensure sustainable agriculture and climate resilience.

Expected outcomes

During the IYPeF e-discussion, Young Professionals will explore answers to following questions:

1. How does soil health impact agriculture production around the world?
2. What impact does soil health have on our ability to cope with climate change?
3. Supported with case studies and country experience, what are the main opportunities for ensuring a sustainable future for agriculture under increasing climate change pressures?
4. What are the main challenges you see in achieving these goals?
5. How can YPs contribute to a sustainable and climate resilient future for agriculture through soil health management?
6. What technical innovations, research, training or education needs will assist in achieving these goals?

Discussion Mentor

- Dr. Abdul Walid Salek, Professor at Kabul University of Afghanistan

Discussion Co-ordinators

- Mr. Shoaib Saboory, Water Resources Consultant, World Bank.
- Mrs. Kathleen Murray, Extension Agronomist at Verterra Ecological Engineering.

SELECTED REFERENCES FOR FURTHER READING

https://www.researchgate.net/profile/Rattan_Lal2/publication/267299207_Soil_Carbon_Sequestration_for_Climate_Change_Mitigation_and_Food_Security/links/54c2ab310cf219bbe4e9295f/Soil-Carbon-Sequestration-for-Climate-Change-Mitigation-and-Food-Security.pdf?origin=publication_detail

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