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Editorial

Soil: a C sink to mitigate climate change

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1. Introduction

Although we are still far from a global consensus, there is growing awareness that soil is vital to the production of food, fiber, and global ecosystems function. Food security for a growing human population, global climate change, loss of biodiversity and natural capital, desertification, increasing of poverty, higher social inequality, environmentally-induced human migrations and peace, are among the most pressing concerns associated with soil degradation.

However, despite the advances in soil conservation approaches, and the efforts of different international organizations to address the problem, we have failed to halt soil degradation. This editorial article shows the context and provides a general overview of the topics discussed in this special edition of AIMS Agriculture and Food entitled: "Land Management Practices for Soil Conservation in Climate Change Scenarios". We wish to increase our knowledge and create growing global awareness of the urgent necessity of soil conservation. Different case studies of soil conservation are examined through reviews and recent research addressing soil protection and restoration approaches in Africa, Asia, America and Europe.

It has been suggested that the changes in climate affect soil functions and *vice versa*, changes in soil health affect GHG concentrations in the atmosphere. Therefore, special attention is given in this edition to the adaptation of soil conservation to different climatic scenarios. Likewise, there is clear evidence that soil resilience against degradation and adaptation to climate change is largely dependent of soil organic matter, being considerably lower in soils poor in organic matter content, like those of arid and semiarid areas. According to the land use, soil can function as a source or sink of carbon, accelerating or mitigating, respectively, climate change.

Society will not be able to achieve a sustainable future if we are not able to control soil

degradation and, globally, implement appropriate approaches for the conservation and restoration of soil. The inquietude for these goals is expected to increase in the future as society better understands the important links between soil and the environment. The Global Environment Facility (2005) emphasizes that investing in sustainable land management to control and prevent land degradation is an essential and cost-effective way to deliver other global environmental benefits, such as maintenance of biodiversity, mitigation of climate change, and protection of international waters.

The objectives of this special edition were: (i) to compile and discuss different topics of research on soil conservation, (ii) to increase our knowledge of climate change mitigation and adaptation, and (iii) to review different approaches for soil conservation at the global level.

2. Challenges and opportunities that are addressed in this edition

2.1. Indicators for assessing the vulnerability to soil degradation

The development and validation of suitable indicators of the land degradation risk, in different environmental conditions and geographical locations, could serve as a very important tool in the planning and implementation of effective strategies for soil conservation under different climatic scenarios. Vulnerability to land degradation in the context of climate change must be addressed within complex and uncertain conditions and hence calls for interdisciplinary and multiple expertise. Aimed at determining the possibility of present and future land degradation, in the context of global warming, through the use of the aridity index, sea level rise trends and soil analysis, Praveen et al. report a conceptual framework for assessing vulnerability, including all the key components of land vulnerability.

2.2. The effect of soil covers

The pedological effects of surface protective covers may be very important for soil and water conservation in drylands. The positive effects of soil covers include: improved infiltration and water storage, decreased runoff, lower evaporation rates, soil protection from rainsplash compaction and erosion, lower maximum temperatures, and greater sunlight reflection due to high rock albedo. The paper by Perez shows how a rock fragments cover allows plants to survive harsh environmental—mainly climatological—limitations.

2.3. Toward new paradigms in soil conservation approaches

Despite many attempts and efforts by different International Institutions and Organizations to maintain healthy soils, the degradation of soils continues and conservation approaches have not had the expected success. Hellin and López-Ridaura report that many of the recently promoted practices of climate smart agriculture in Central America are the same practices that were promoted in the 1980s and 1990s, which did not have good acceptance by farmers.

2.4. Reforestation to improve soil health and resilience to climate change

The introduction of exotic species in soil conservation and restoration is a controversial topic. Together with some positive effects on the soil and the economy, some of these species can produce

serious negative effects on biodiversity. Liang and Reynolds deal with this topic, they report that although soil in eucalyptus stands is more acidic and has lower organic matter and nutrient levels than nearby church forests, eucalyptus plantations also exhibit consistently higher organic matter and nutrient levels when compared to adjacent agricultural land.

2.5. The use of models in the design of erosion control

In large areas of the Mediterranean semiarid zone, most traditional soil conservation measures have been eliminated to facilitate the movement of machinery in the fields. In such conditions, high erosion rates are recorded. Given the predicted trends of climate change in the semiarid areas, an increase in erosion processes is expected. Ramos uses the WEPP model to evaluate erosion processes under different climate change scenarios, as well as the effects of implementing drainage terraces in vineyards.

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