Report on 2015 Global Soil Security Symposium

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Scientists, policy influencers, investors, and citizens met at Texas A&M University in College Station, TX from 19th – 21st May 2015 to discuss the need for a new focus on soil security. Approximately 85 people from 14 countries and 40 institutions met to discuss the topic of soil security. The Symposium was jointly organized by Texas A&M University, the University of Sydney, the United States Studies Centre at the University of Sydney, the Soil Science Society of America and represents the International Union of Soil Science's contribution to the International Year of Soils. The symposium was generously supported by the Samuel Roberts Noble Foundation, the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey Division, and Texas A&M AgriLife Research. Governmental bodies and organizations represented included the Australian Government, USDA, European Commission, and INRES (Industrial Safety and Environmental Protection of France). Attendees participated in a frank and open discussion focused on each participant's perspective on how to achieve soil security.

Soil security requires maintenance and improvement of the soil resource to produce food, fiber, and fresh water, to contribute to sustainable energy production, adapt to climate changes, and to maintain biodiversity, human health, and function in ecosystems. Those concerned with achieving soil security recognize that attainment involves scientific, economic, industry and political engagement to effectively and credibly inform policy and legal frameworks and implement appropriate actions. Soil security, like food security, has a number of dimensions that interact with environmental, social, and economic components. The discussion at the Global Soil Security Symposium was organized around the five dimensions of soil security, which include (1) capability, (2) condition, (3) capital, (4) connectivity and (5) codification.

To work toward achieving soil security in the next two decades, participants identified goals to secure soil so that it can contribute to solving other global issues. Specific goals for each dimension were designed to achieve the overall goal of soil security, catalyse research and practice, and contribute to soil policy.

Capability

The capability of a soil refers to its potential functionality ("what can the soil do?"). It is well recognized that not all soils share a similar ability to provide the seven soil functions that are distinguished by the Soil Protection Strategy of the European Union (biomass production, filtering nutrients, source of biodiversity, cultural environment, raw materials, carbon pool, heritage). When soil is not managed to its identified capability, negative impacts on soil conditions can occur that negatively affect its contributions towards general ecosystem services. Soil capability needs to be evaluated according to the seven functions. However, the function that is generally focused on is biomass production while neglecting its link with the other functions in a sustainable production system. For each function, there are indicators that evaluate capability. The USDA NRCS Soil Survey Division has developed many (hundreds) soil interpretations as indicators of soil capability and are linked to soil series descriptions. The USDA's empirical estimates can be quantified by process-oriented computer simulations that also allow risk assessments based on soil limitations. Aside from defining soil capability it is also desirable to explore ways in which potentials can be reached using management support systems, with precision agriculture as an important component. Soil capability is also limited by erosion due to natural (i.e. wind and water) or human (e.g. used as building material) forces and by surface sealing. The current rate of surface sealing for the globe is approximately 16,000 ha day^{-1} over the next 20 years.

To achieve soil security in the capability dimension, one overall goal was identified,

50% of soil is used according to its capability by 2030.

Toward achieving this goal, more specific objectives may include the following:

1) Reduce loss of soils with a high capability to less than 4000 ha per day by 2030;
2) Document successful sustainable land-use systems where soils have been managed to their capability in 50% of the regions (global) by 2030; and
3) Integration of soil capability criteria in 90% of policy-oriented models on climate change, food and energy security, biodiversity loss and water availability by 2025.

Condition

The dimension of soil condition refers to the current sta*te of a soil, reflects human management of soil, and how state and management alters or enhances the seven* soil functions. Other concepts of valuing and caring for soil through management include soil health, quality, change, and, resilience. Much of the focus on soil condition is associated with agriculture, but functions of soil not linked to agriculture (e.g. – urbanization, mining, and nature preserves) are equally important. The assessment of soil condition is commonly associated with measurement of soil organic carbon as an indicator of improved soil condition; however, improvements in soil condition or function may not always be reflected by changes in soil organic carbon.

To achieve soil security in the condition dimension, one overall goal was identified,

Soil condition is optimally managed according to the inherent capability in 50% of managed soil systems by 2030.

Toward achieving this goal, more specific objectives may include the following:

1) Reduce soil nutrient depletion by 50% by 2030 against 2015 levels.
2) Increase water capture by 20% by 2030 against 2015 levels.
3) Increase carbon content of agriculture topsoil above 2015 levels by 20% by 2030
4) Reduce soil losses to the tolerable soil erosion rate for 90 % of managed soil by 2030

Capital

The dimension of soil capital refers to the economic and natural capital value of the soil resource. Placing a monetary value on an asset enables a society to value or secure the asset. Therefore a societal focus in soil security can be economically driven. Monetary value also provides a way for capital and risk markets to engage with valuation of soil as an asset for economic flows. Financial incentives that clarify and define natural capital and ecosystem services are ways to value soil. Other indices that describe soil value can exist, but might be more difficult to assess. Examples include soil rarity, soil diversity, or where soil directly provides food for consumption (subsistence agriculture).

The economic value of soil can develop "top-down" through government, market and institutional frameworks or bottom-up through standards, labelling and social licensing of soil products.

To achieve soil security in the capital dimension, two overall goals were identified,

1. *Increase annual capital value of soil ecosystem services by 5% per annum by 2030; and*
2. *Commercial land values based on full economic value of soil capability and condition, by 2020.*

Toward achieving this goal, more specific objectives may include the following:

1) Natural capital becomes part of 90% of lending decisions by 2030; and

2) Incorporate soil management accreditation into 90 % of environmental stewardship branding or labeling of products by 2030.

Connectivity

Connectivity refers to the connection of individual land managers/farmers with the soil they manage and the broader connection of soil to society and with society to soil. Connectivity also encompasses issues of knowledge, education, training, and awareness.

The group identified many ways to know, understand, and value soil. Aesthetic consideration can drive the general population to appreciate and understand the relevance of soil. Participatory learning by managers and experiential learning at schools have the potential to change mindsets on soil value and management. Inter-generational equity is a strong human driver of soil security. The soil health concept provides an effective means of connecting the importance of sustainable soil management by soil managers with the broader community and the means to help build recognition by society of the important role that soil managers play in maintaining soil function for the production of food, fibre, and other ecosystem services.

To achieve soil security in the connectivity dimension, an overall goal was identified,

90% awareness and understanding of soil security amongst the general public by 2030.

Toward achieving this goal, more specific objectives may include the following:

1) Integrate soil security policy with agricultural policy in nations that are net exporters of food by 2020;
2) Establishment of community gardens in 90% of primary schools globally, supported by a learning curriculum, by 2020;
3) Increase the area of agricultural soil managed by those with soil management certification by 50% by 2030;
4) Engage 0.1% of the population to nurture and connect their values with securing soil by 2030; and
5) Increase the use of practices focusing on soil aesthetics (art, poetry, music, stories, etc) into strategies to secure soil by 100% by 2030.

Codification

Codification refers to the policies, regulations and governance arrangements, in both the public and private sectors that enable soil security.

Many countries have formulated soil policy and regulations. Both carrot (incentive programs) and stick (regulatory penalties) approaches are used. The U.S. has many financed incentive programs that implicitly embed soil security policies. Australia has a free market economy and relies less heavily on government programs; however an issue is that government programs for soil tend to be weighted towards natural resource management programs, rather than treatment of soil security for agricultural productivity.

Soil security is an internally focussed goal for countries that grow and export much of their food and fibre production and an externally focussed goal for those that rely on the soil of other nations for food and fibre through imports. While there are national arrangements, international policy around soil security so far has been missing; possibly due to its importance in different domains, e.g., desertification, food security - causing a degree of ownership conflict. The European Union has made the biggest attempt, so far, through the European Soil Thematic Strategy. Sustainable development goals and similar instruments may offer a way forward.

To achieve soil security in the codification dimension, an overall goal was identified,

50% of national governments recognize soil security in their laws by 2025

Toward achieving this goal, more specific objectives may include the following:

1) Recognition and integration of soil security policy in major international instruments for sustainable development, including the UNCCD, UNCBD and the UNFCCC, and the SDG's by 2025.
2) Soil carbon becomes an indicator for soil-related sustainable development goals by 2020
3) Net exporting food nations integrate soil security with agricultural production policy and governance by 2025.

NEXT STEPS

The discussion of Global Soil Security will continue with a focus of developing dialogue between land managers, multi-disciplinary scientists and policy makers at the 2016 Global Soil Security Symposium in Paris. Over the next year, a quantitative framework for assessing each of the dimensions will also be developed. As well, those that want to achieve global soil security will continue to increase awareness, through conservation, a book on global soil security that includes the talks shared at the first symposium, and continued conversations within and between governments.

Websites for Presentations

Soil Science Society of America Website:
https://dl.sciencesocieties.org/publications/meetings/browse/sssa/2015GS
United States Studies Centre Website
http://ussc.edu.au/events/past/global-soil-security