Climate Resilient Open Partnership for Food Security (CROP-FS)

Background:
As part of the Worldwide Universities Network (WUN), a workshop of the "Climate Resilient Open Partnership for Food Security (CROP-FS)" Project was held at the University of Leeds in April 2016. Participants from USA, UK, China, India, and South Africa attended the meeting.

Purpose:
The purpose of this policy document is to highlight the importance of generating new knowledge concerning the impact of stresses associated with global climate change on plant growth, plant-soil-microbe interactions, and food security. The effort will support the international commitment towards UN Development Goals (2) Zero hunger; (12) Responsible consumption; (13) Climate action, and (15) Life on land. The CROP-FS network combines expertise in plant resistance to abiotic stresses, the soil biome, climate change impacts on plant and soil communities, soil remediation to limit degradation and toxicity, and social science. A strong research and development effort is required to provide a significant contribution to sustainable food production in an environment-friendly manner within the context of social perceptions, economic requirements, and consumer acceptance.

Problem statement:
Climate change will have mostly negative impacts on food production by affecting soil fertility and carbon sequestration, soil matrix, microbial activity and diversity, and ultimately plant growth and productivity. Food and nutritional security require a strong focus on production, supply, and the quality of the final products. Current knowledge on the impact of climate change on the resilience of plants, soils, and their associated micro-biomes is limited. Little is known about how climate change will impact the nutritional quality of even our most widely consumed crops. The need to understand the impact of climate-change associated stresses on the composition and nutritional value of plant-derived foods is therefore urgent.

To ensure high yields, a particular focus has to be placed on ensuring that crop plants are able to resist or tolerate the challenges of both abiotic (e.g. drought) and biotic stresses that will arise as a major consequence of climate change. Improved crop varieties with better drought, heat, and salt -tolerances must be identified, but we also need to understand how resistance or susceptibility to abiotic stresses alters responses to pests and diseases. However, food safety covers far more than the cultivation of high yielding stress tolerant crops. Many soils urgently need remediation to improve health and to control toxicity. Along with food security, efforts should be made to improve nutrition security by developing and adopting new nutrient rich cultivars suited to growth under changing climate conditions. Another aspect is the soil biome and its constituents, which are the finite resource that needs to be husbanded with care. A deep understanding of the impact of cropping systems and irrigation practices on the soil biome and communities that contribute to nutrient acquisition, under optimal and stress conditions, is essential to climate-proofing food security.

The social dimensions of food security are just as complex as their related molecular and environmental dimensions. Engaging with agricultural communities is a key part of conducting scientific research on food security. Agricultural communities are complex systems of farmers, consumers, politicians, businesses, and regulatory agencies among other involved parties. Agricultural systems are embedded in social contexts and human practices, as is the system-level climate change and its effects on soil, microbiomes, and plant productivity. The necessary knowledge and methods for analyzing these systems comes from basic research in the social sciences.. Hence social science is an integral part of the CROP-FS.

Strategies for policy development:

The impact of stresses associated with global climate change on plant growth, plant-soil-microbe interactions, and food security will only be understood by a consolidation of effort. The CROP-FS global network was formed to address this challenge by pooling resources and information, driving the application of innovative technologies, promoting soil health and food safety, within the context of environmental and social science perspectives. This requires innovation and strategic funding. The CROP-FS network therefore welcomes a dialogue with national funding agencies to ensure innovation, strategic funding, and relevant training of a team of next generation researchers in the state of the art approaches in disciplines relevant to food and health sectors.

Essential recommendations of the CROP-FS network are:

- To develop a global, publically funded network to share data and tools and to address key scientific issues in a coordinated, interdisciplinary and integrated manner.
- To train next generation scientists familiar with the diverse agricultural practices and constraints worldwide.
- To develop transferable skills that benefit diverse agricultural communities to increase their economic and social resilience to effects of climate change.
- To add additional essential social science expertise to the network including agronomists and agricultural economists.
- To evaluate cost/benefits of new technologies and identify their associated barriers and enabling factors. .
- To open a two-way communication between scientists and publics about the importance of climate change for food supply
- To investigate how agriculture and food security are linked to other aspects of sustainable development, poverty reduction, and economic growth.
- To understand the diffusion, deliberation, and negotiation of agricultural technologies between publics and the scientific community.
- To engage major stakeholders such as farmers to raise awareness of emerging technologies.
- To provide scientists with skills for public engagement.

to drive international research collaboration and address issues of global significance. Further details are available at: http://www.wun.ac.uk/about.html