Developing a Comprehensive Soil Health Roadmap for Armenia

Global climate change is one of the greatest threats facing our world. Global temperatures are rising higher than ever before (NASA, 2021, earthobservatory.nasa.gov), and temperature increases, drought, changing rainfall, flooding and pests threaten agricultural production and global food security (FAO, 2021, www.fao.org/climate-change). Agriculture is also one of the largest contributors of greenhouse gas (GHG) emissions globally. Farmers are among some of those most seriously affected by climate change because their livelihoods are at risk, and they also need to reduce GHG emissions from their operations. Globally, the country of Armenia is one of the most vulnerable to climate change.

In January 2020, I had the opportunity to contribute to an undergraduate honors research project led by Keelin Kelly '20. We interviewed Armenian farmers, extension specialists and government officials about their views and actions related to climate change. The consensus from those meetings was that farmers lacked clear information about how climate change is affecting their farms, and what changes they need to adopt to be more resilient to climate change.

Soil Health is one of the most important ways of addressingglobal climate change, because of soils' ability to sequester carbon from the atmosphere (Amelung et. al., 2020), and its ability to help with climate adaptation. Improving soil health contributes to greater resiliency of the soil to infiltrate water runoff from extreme precipitation. Many international organizations, countries and states are placing a high priority on improving soil health, such as the "NY Soil Health Initiative."

In Armenia, soils have been degraded and overused for many generations and there has not been a comprehensive soil health initiative in the country. Under the Soviet Union, the soil was exploited to maximize output without thinking about the long term sustainability. As a result, soils in Armenia are not as productive as they could be and there is little being done to change farming practices.

This means that Armenia is a prime candidate for a soil health initiative. The objectives of this project are to assess the current infrastructure and institutions as well as future capacity for a national soil health initiative in Armenia. The research questions include: 1)What is the existing infrastructure, institutions, and human capacity for soil health testing, improvements, training, and outreach in Armenia? How can existing infrastructure be improved in collaboration with research universities, international organizations and government agencies and farmer organizations? 2) What are the elements from Soil Health Initiatives at Cornell University, New York State, and the United Nations that can be modified for national circumstances to create a new Comprehensive Soil Health Initiative for Armenia.

In the first year of the project, I will work with collaborators in Armenia and at Cornell to assess institutions and infrastructure, policies, curriculum, and extension programs. In the second year, I would travel to Armenia to work with colleagues there to verify the findings of the assessment, and help to develop a "Soil Health Roadmap" in Armenia with partner organizations.

I will be working with two Cornell Humphrey fellows (Tatevik Martirosuan '21 and Artak Khachatrchan '20), as this project directly would support their research interests in sustainable agricultural development. I have established connections with UNDP Armenia and ICARE Armenia, and will reach out to the Armenian National Agrarian University and other agencies for the project. In the United States, I have good contacts with researchers working the Cornell Soil Health Program and New York Soil Health Initiative, and will reach out to the USDA NRCS service. This project aims to be interdisciplinary, combining the importance of sustainable development, agricultural science, history, and culture. My advisors include Dr. Lori Khatchadourian, whose research focuses on Armenia and post-Soviet socialism, my professor Dr. Sarah Giroux from the

Global Development Department, and Mr. Joseph Amsili, who coordinates the Cornell Soil Program.

This project will have two important impacts: 1) establishing stronger partnerships between soil health specialists at Cornell University and the Agrarian University of Armenia; and 2) establishing a comprehensive assessment of soil health institutions, infrastructure and capacity and developing a soil health road map for Armenia. Over the long term, the project can help provide a strong basis for international support of soil health initiatives, and help rebuild the soils of Armenia, to reduce GHG emissions and increase resiliency.