Yale SCHOOL OF THE ENVIRONMENT

Ucross High Plains Stewardship

FELLOWSHIP BRIEF

Soil Health and Carbon Sequestration in Regenerative Agriculture

Darya Watnick, MEM '21

The Need.

Every year, the U.S. loses approximately 996 million metric tons of soil due to erosion, and 4.4 billion pounds of nutrients are lost to the environment because of degraded soils. Managing for healthy agricultural soils can address these issues through the improvement of the soil's structure, fertility, and water-holding capacity. Some of the benefits of improved soil health include higher rates of productivity and profitability. Supporting soil health also serves as a way to steward carbon stored and reduce greenhouse gas emissions, mitigating impacts of climate change.

Farming in Colorado. Photo credit: Jane Cavagnero, Mad Agriculture

The Project.

Darya Watnick supported Mad Agriculture (Mad Ag), a Colorado-based organization that strives 'to reimagine and restore our relationship with Earth through agriculture,' with their soil health efforts. In conjunction with the Colorado Collaborative for Healthy Soils (CCHS), Darya wrote a grant application that aimed to increase the number of farmers managing their land with soil health practices. Darya also studied a farm and ranch carbon and greenhouse gas accounting system, COMET-Farm, to understand how changes to the tool's parameters affected estimated carbon sequestration amounts. Specifically, Darya investigated changes to planting date, harvest date, yield, residue removal, tillage date and method, fertilizer application date and rate, irrigation date and volume, and manure/compost application.

The Findings.

Darya provided support for the USDA grant application through research of specialized information such as geographic units, informative maps, and parallels to conservation practice standards designated by the Natural Resources Conservation Service. She also authored sections of the grant that provided background and highlighted the importance of integrating soil health management practices into agriculture. The grant writing and research process was an invaluable experience that Darya will continue to use throughout her career in the environmental field.

Investigating COMET-Farm demonstrated that certain parameters within the tool have no impact on carbon sequestration, namely yield and irrigation. However, Darya found that changing other parameters, such as tillage method and manure/compost application, increased the estimated amount of carbon sequestrated.

The Impact.

The Colorado Collaborative for Healthy Soils was created to be a community-driven and producer-centered collective working towards a comprehensive soil health program for the state. Darya's work is helping the CCHS in developing pieces of the program that provide producers with financial and technical support to facilitate adoption and implementation of soil health management practices.

Currently, the data requirements for COMET-Farm are a big lift for users. Therefore, finding out how to quickly input data while achieving accuracy is important if this tool is going to be used by farmers or carbon accountants to track carbon sequestration on farms. Darya's analysis was the first step in evaluating the level of precision needed for data input for COMET-Farm's model and therefore, the first step toward building a tool to support soil carbon data collection and management.

The Student.

Darya Watnick is a Master of Environmental Management candidate at the Yale School of the Environment, focusing on agriculture & food systems. She is particularly interested in regenerative agriculture practices and soil health. Her passion for food and agriculture began during her childhood in Southern California, growing up near avocado and citrus orchards and many strawberry fields. She holds a BA in Environmental Studies from Lewis & Clark College in Portland, OR.