Laidlaw Program: Summary of Research Summer 2021

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Introduction

Armenia is extremely vulnerable to the rapidly changing climate as the country has faced heavy hail and frost, wind and water erosion, flooding and then periods of drought, landslides and even wildfires. Improving soil health enhances soil structure which helps with retaining water and nutrients. Wind and water erosion can be directly improved by using soil health farming practices, like no till and cover crops to improve soil structure. Currently many farmers in Armenia overuse the water resources for irrigation. If farmers improve their soil's health, they will also reduce runoff and the need for intensive irrigation.

This paper summarizes the work I did, how I did it and what I found during the first summer of the Laidlaw program. My project set out to assess the soil health institutions, infrastructure and capacity for soil health initiatives in Armenia. Included is a reflection on my leadership development.

Research Experience

I started my research this summer by creating interview and survey questions. I wanted to start with these tasks first so that I could apply for the IRB, Institutional Review Board for Human Participant Research, approval/ exemption. When writing these questions, I felt that it would have been better to do some more preliminary research to get a better idea of what questions to actually ask, but my faculty mentor, Dr. Lori Khatchadourian, informed me that IRB can take a very long time to approve research questions. I felt very rushed the first week and a half because of that but I had to push ahead. To account for any gaps I may encounter after researching I submitted any and all of the questions I think I would need (probably 2x as many as I actually used). My application was later deemed exempt.

After I submitted my IRB application, I started researching institutions in Armenia and potential soil professionals I would like to interview. I discovered that there is a Scientific Center of Soil Science, Melioration and Agrochemistry at the National Agrarian University in Yerevan, Armenia. I also knew that I wanted to interview Artak Khachatryan, a former Humphrey fellow at Cornell. Artak runs a cover crop demonstration field and is very knowledgeable on soils in Armenia. He was also very helpful in finding other people to contact and instrumental when it came to interviewing people because he could translate for me. I started contacting people and scheduling interviews.

It was around this time I also started reading some papers regarding soil conditions and soil work being done in Armenia. I wasn’t finding very much information on soils in general and if I was,

for every ten pages of research, there was maybe a paragraph of usable information. It was very frustrating. My faculty advisor suggested I start researching in Armenian because a lot of researchers in Armenia only publish in Armenian. I found a few more papers in Armenian, which had a lot more information but it took a very long time to read. I had to go paragraph by paragraph and enter each one into google translate and then read it. I did this about twice before realizing that this way of researching was going to be far too time consuming. I had also noticed that while I was specifically looking for research on soil health initiatives in Armenia, most papers and interviewees only referenced soil fertility and land management.

To put this into some context: Soil health is a concept which refers to understanding the soil almost as a living organism, that needs basic life necessities to function ie. food, water, shelter. Soil fertility and land management understand soil as a median for growth and how to maximize output. Soil fertility and land management are also components that make up soil health but they are not the whole picture. When I asked Artak if this was a translation error or a conceptual misunderstanding, he stated that most professionals and farmers in Armenia are concerned with output and they don't understand the soil as a living thing.

After discovering this, I went back to the drawing board. I looked back at my original research questions and tried to figure out if I should go about doing my research differently. I discussed it with Lori and we thought it would be interesting to research why soil health as a concept has been able to grow in the United States and why the same has not happened yet in Armenia and what barriers could potentially be holding it back.

When thinking about how to go about researching the concept of soil health in the United States, I thought it would be a good place to start locally. I interviewed Joseph Amsili, the program coordinator for the Cornell Soil Health Laboratory. Mr. Amsili explained that the rise of the soil health concept largely followed the organic movement with its increased focus on stewardship of the land and sustainability. The main thing he stressed during the interview was that the concept doesn't need to be there to have farmers adopt "soil health farming practices" but having a foundation of the concept is always good. He said that the concept and understanding of soil health had been researched and discussed in academic circles for a very long time. In fact, after the meeting Joseph sent me three really fascinating papers, each dealing with the concept in America at different points in time. It was very interesting to me because one of the papers he sent me is from 1944 and it was mostly focused on soil fertility which was similar to the information I was finding in Armenian papers.

Through my interviews and readings, I discovered that there are many barriers as to why soil health as a concept and it's farming techniques have not become popular in Armenia. One barrier is that most farmers in Armenia have another source of income, ie. farming is not their main source of income. Because they don't make a lot of money from farming, they are less willing to spend money on new farming techniques. Another barrier related to expenses is that they have very little access to the technology that makes soil health farming practices easier. For example,

Artak mentioned when I was discussing with him that there is only one no-till seed drill in all of Armenia. The equipment is available for purchasing from different agriculture equipment dealers but it is too expensive for Armenian farmers. The other problem with technology is that even if they had access to technology, they would know how to implement or utilize it.

A potential solution for this problem is to have farmers collectively buy and then share the equipment. There is also a USAID learning exchange program that happened in 2020 where farmers were provided with information on tools, technologies and resources to help boost their productivity. A similar learning exchange could be done on soil health practices next summer, where I could explain the tools, technologies and resources available that promote soil health. I would also like to explain why thinking about soil health is imperative for the rapidly changing climate. Artak Khachatryan's demonstration field could also be used to show farmers the effects of using multiple cover crops and rotational grazing patterns. Farmers are much quicker to adopt farming practices when they are able to see how it works in practice. Demonstration plots are really important because they not only prove to the farmer that these practices work but to other professionals in the field. For example, I spoke with someone at the UNDP of Armenia and she stated that she was unsure that no till and cover cropping would work in Armenia. In the United States, the Rodale Institute and cooperative extension services provided this vital research and demonstrated to farmers that cover crops and no tillage increased soil health. I would love to be able to help Artak expand this work and maybe create a no-till demonstration plot.

Because it was harvest/ growing season in Armenia, my advisors and I thought it would be better to wait to publish the farmer survey. It will be open until Feb. 2022 so that I can get as many responses as possible.

While a lot of this research was frustrating to hear about, I am still hopeful. Many interviewers mentioned a lot of barriers, as previously stated but they also mentioned really important things that are starting to happen. They mentioned that there are more discussions happening between farmers and scientists. When speaking with Gayane, she mentioned that farmers are able to get their soil tested through the soil center. They also mentioned that a lot of data is kept via print only and that they are working to make the data available on a new website. All of this is why I am still hopeful. Professionals want to do this work and they know that it is important.

Conclusion

My goal is to be able to create an Armenian Soil Health Initiative at the end of my two years and the background information and analysis I did this summer will be vital to be able to know what I need to do next summer.

Leadership Reflection

This summer I became much more independent. Before this summer, I had a hard time writing an email without someone checking it first. However, with all the communicating I have had to do, I have become far more independent with my communication, decision making and writing. That being said, I appreciated working with my grad mentor on my reflections. My grad mentor, Janani read my reflections before turning them in so that I could work on improving my writing. She would leave comments and always questioned how I should take my reflections a step further/ deeper. I have really enjoyed using the what, so what and now what as a way of reflecting not only on my summer and the research process but I want to continue to do it during my everyday life. Another one of my favorite moments from my critical reflection and leadership training this summer was during my cohort's second meeting. We were all discussing how our research had been going and what we had been noticing and feeling and I was pleasantly surprised to hear that what I was experiencing was also what my fellow cohort was experiencing, especially those of us working online. I also enjoyed that Janani gave us a picture exercise. She had put several pictures on the screen that included pictures of dice, a lighthouse, a disorganized stack of books, a sand timer, a pile of dirty paint brushes, a colorful mickey mouse hat, a metal tin and a collection of colorful lanterns. We were told to pick one of the pictures that resonated with us and our summer and that there was no deeper meaning to each of the pictures. I chose the sand timer because I immediately thought of time. I did always feel a little rushed and like I never had enough time with everything but that might just be the nature of research in the span of a summer. I am very excited and thankful that I get to do another summer of engaged research. I also really enjoyed one of the first leadership workshops we did. We were reading a paper that discussed fixing, helping and serving. I had never thought about it but using terminology like fixing or helping, you are implying that something is weak or broken. By serving, you are working with the community to uplift itself. While I was frustrated a lot this summer because it was very difficult finding data, it made me realize how important the work I am doing really is. If the data existed, then my project wouldn't be needed. Ultimately my project would be nothing without the collaboration of Armenian professionals and anything I do next summer will include working with farmers and professionals directly.