Dr. McGrath's Project Perspective

Our client, Dr. Deborah McGrath, has enlisted the help of the Data Lab to assist in analyzing the data from her agroforestry partnership in the Haitian Central Plateau. Working with 50 small farms who struggle to secure a sustainable income, Dr. McGrath and Sewanee's Partners in Agriculture program are redeveloping agricultural capabilities and economic growth with their cash for carbon initiative entitled "Zanmi Kafe". Zanmi Kafe is a small-scale model with the potential to offset a large amount of atmospheric carbon that contributes to global warming. The farmers were interested in planting coffee, which needs shade and healthy soil to grow, and Sewanee is interested in exploring carbon offset payments as a means of promoting tree planting, agroecological resiliency, and community development. Carbon payments are offered to the farmers as incentives to plant and maintain trees that provide a shade canopy and soil nutrients which are needed to cultivate cash crops. The intention is to create a program in which Sewanee can neutralize their emissions from travel by buying carbon credits from the Zanmi Kafe farmers with the intention to not contribute to climate change. This summer Dr. McGrath needs our help to quantify the amount of carbon sequestered through these farms, which has proven difficult due to the large amount of data and discrepant formulas. The current allometric equations used by the program are broad, outdated, and we do not know if they provide accurate carbon sequestration data. Without accurate carbon sequestration data, it is unknown whether the carbon emissions from Sewanee students' travel to and from Haiti have been offset by the planting of trees and whether the farmers are being accurately paid for their carbon sequestration efforts. Due to the immense amount of data, Dr. McGrath recognizes a need for an automated process, and with the help of computational programs with greater capabilities than Microsoft Excel, we will determine the most accurate formulas and calculate the sequestered carbon in a more efficient way. We also aim to show that carbon payments will outweigh the opportunity cost of cutting down the planted trees to sell as charcoal material.

Dr. McGrath has asked us to further develop this project through data analysis this summer. Our training in R and RStudio will aid us in the creation of a database and an online platform that can be updated to show the results of current carbon absorption rates, allows for entry of more data, and encourages investment from other donors. Due to the lack of accuracy and consistency with the current carbon absorption calculations, our team must research and find more allometric equations to estimate the tree biomasses from height and diameter measurements. These allometric equations will aid in the carbon sequestration estimations of

each farm and will be used to verify the current estimates that were calculated with our current equations. Hopefully, through this research we will identify whether there is a relationship between carbon payments and the mention of charcoal making. The research of allometric equations will also aid in the creation of an accessible and accurate online database and platform.

The hopes of this project are to model a system that offsets atmospheric carbon, and provides small Haitian farmers with greater economic stability and a more sustainable agroforestry system. Our contributions to this project will lay the groundwork for it to be scaled up in the future. With specific allometric equations and efficient code, we will provide accurate projections for future carbon stores and payments. With the development of these tools, accurate carbon stock calculations could eventually be based upon subsampling farms or on drone surveys of land, but for the current state of the project, we aspire to provide our client with a visual representation of the yearly measurements and project growth.