Computational Analysis of Surface and Groundwater to Support Sustainable Irrigation and Agricultural Production in the Lower Rio Grande Sub-Basin, Year II

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Surface water is decreasing in the Rio Grande as a consequence of climate change, intensifying the vulnerability of our aquifers due to higher demand for groundwater pumping. Agricultural production is the number one income producer in the Lower Rio Grande Sub-Basin and unfortunately, current climate conditions are limiting the water availability for the farming industry, affecting our economy. The purpose of my project is to compare the source of water being used for irrigation and determine how climate change affects agricultural production in communities alongside the Lower Rio Grande Sub-Basin. I gathered data from 1980 to 2023 on water sources used to irrigate crops; aquifer water levels; agriculture production; and climate conditions. I then completed a computational analysis by utilizing a prediction model of crop classification, a river elevation model, and machine learning models to predict the future of agriculture production and possible economic impacts in our communities up to the year 2050. My results confirm that groundwater pumping from aquifers increased in proportion to the decrease of surface water in the Rio Grande. My computational analysis reflects that the quantity and quality of water being used for agriculture irrigation is decreasing making a lower yield in agriculture production. The extreme drought and climate conditions also affect the absorption of water, depleting the moisture in the soil, causing lower quality crops. The net farm income is also negatively affected due to the lack of support in sustainable irrigation and will have major economic impacts in the Lower Rio Grande Sub-Basin.

Awards Won: