FARM SCALE SUSTAINABLE WATER MANAGEMENT DECISION SUPPORT SYSTEM DEVELOPMENT THROUGH GEOHYDROLOGIC MODELS

Mallika Dinesh[1] and Sudhanshu Sekhar Panda[2]

AFFILIATION: [1]University of Georgia, Athens, GA; [2]University of North Georgia, Gainesville, GA
REFERENCE: *Proceedings of the 2017 Georgia Water Resources Conference*, held April 19-20, 2007, at the University of Georgia

Erratic weather pattern is a consequence of global warming and climate change. This El Nino and La-Nina based effect is being encountered often over all parts of globe including California. Last year, California entered the fourth year of a record-breaking drought creating an extremely parched landscape forcing strict conservation measures statewide. Very recently, Georgia also encountered such scenario. Therefore sustainable water use is a bigger requirement in today's time, especially in agricultural farms. It could be achieved through site-specific water management (SSWM). Almonds, a major component of farming in California, use up some 10 percent of the state's water reserves according to federal estimates. Iyer farms, spans 1800 acres between the cities of Gustine and Newman in California, needs a steady source of waters supply. The goal of the study was to develop two geohydrologic models to i) determine efficient irrigation scheduling on plot-scale basis through the spatial analysis of soil, hydrology and hydrography of the farm and ii) suggest effective site-specific fertilizer/pesticide application with irrigation water based on the groundwater contamination vulnerability analysis in the farm on plot-scale. An automated geospatial model was developed in ArcGIS ModelBuilder using several characteristics, such as hydrologic group, texture, available water content, drainage, and soil erodibility factors of the soil (gSSURGO) spatial data available for the farm on parcel basis. Geologic data (shallow aquifer availability) of the farm also supported in our decision support on the orchard management, i.e., suggesting type of horticultural plants to grow in which part of the farm. An automated DRASTIC (D = Depth of Water, R = Net Recharge, A = Aquifer Media, S = Soils, T = Topography, I = Impact of Vadose Zone, and C = Hydraulic Conductivity) model was developed in ArcGIS ModelBuilder for the study farm using USGS data for groundwater and hydrology, well points data obtained from California GIS department, gSSURGO soil, geology, hydrography, and precipitation raster data from USDA-NRCS Geospatial Data Gateway. Finally, based on the results obtained from this study, we established the following decision support on the line of sustainable water management in the horticultural farm. They are such as i) grow horticultural crops in appropriate parcels according as their rate of irrigation requirement and water availability in each parcel, ii) improve soils in parcels that are vulnerable to soil erosion and excessive drainage using organic matter amendments so that it would decrease water requirement, and iii) in-stead of using, fertilizers or pesticides mixed with irrigation water, organically improve the soil in parcels that are more susceptible to ground water contamination. This comprehensive geohydrologic model based results were groundtruthed in the farm and shared with the farm owners to uptake the suggested sustainable water management decision support in the farm for efficient fruits and nuts crop production.

Program reference: 6.3.2