

Leaching Fractions Achieved in South Delta Soils under Alfalfa Culture

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The Sacramento – San Joaquin River Delta region is a unique agricultural region of California, with approximately 500,000 cultivated acres. Delta farming, however, is challenged by salinity, which can stress crops and reduce yields. Alfalfa is a widely grown Delta crop and is moderately sensitive to salinity. To prevent hay yield reductions, Delta soils should be leached of salts by applying water in excess of crop evapotranspiration. The leaching fraction (LF) is defined as the minimum fraction of the total applied water that must pass through the root zone to prevent a reduction in crop yield from excess salts. Two factors establish the LF: the salt concentration of the applied water and the salt sensitivity of the crop. Alfalfa is irrigated with surface water in the Delta; thus, the quality of surface water affects growers' ability to leach salts. The California State Water Resources Control Board adopts water quality objectives for the protection of various beneficial uses in the Bay-Delta, including agricultural uses. Current objectives for the south Delta – approximately 100,000 cultivated acres southwest of Stockton, CA – were set in the 2006 Water Quality Control Plan. The objectives are 0.7dS/m (April-August) and 1.0dS/m (September-March). Seven south Delta alfalfa fields were selected for this study based on soil type and irrigation source water. Over the course of the study period (2013-2015), spring average root zone salinity (EC_e) from the 150-cm soil profile ranged from 0.67-10.36dS/m across the seven sites, and the fall average ranged from 0.81-10.66dS/m. Average irrigation water salinity (EC_w) ranged from 0.36-1.96dS/m. The LF at the base of the root zone ranged from 3-25%. These data show that salts are building in the soil during the irrigation season, irrigation water salinity can exceed the objective, and the LF is often inadequate to leach salts in the south Delta.

Keywords: salinity, alfalfa, leaching fraction, irrigation, water quality, south Delta

Poster Topic: Agriculture and Water Quality

The AFRI Rice Project: Benefits of Nitrogen Fertilizer Treatment in Rice Planting on the Sacramento–San Joaquin Delta to Encourage Subsidence Prevention, Sustainability of Soil Conditions and Water Management Affects on GHG Emissions

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About two thirds of the Sacramento-San Joaquin Delta (Delta) islands are agriculture lands. The drained peat soils of the Delta have provided fertile soils for agriculture since the late 1800s. Unfortunately during that time, the environment in the Delta island region has dramatically deteriorated as evidenced by subsidence. On many of the Delta islands peat soil has oxidized causing subsidence of up to 20 feet, or more, below sea level. Subsidence is responsible for severe consequences including extensive greenhouse gas emissions, construction of a 110-mile levee network, risks to California's water supply and the degradation of water quality. If current agricultural practices remain unchanged, things will only get worse. As a partner in a UC Davis and UC Berkeley study, East Contra Costa County high school students are participating in the AFRI Rice Culture Mitigation Study to determine if growing rice, as opposed to other Delta crops, would help in mitigating subsidence and concurrently mitigating GHG emissions and soil loss; reducing risks to California water supply, including the agricultural users throughout the San Joaquin Valley downstream of the Delta; and protecting water quality. In this study, conducted in a Learning Lab rice field on Jersey Island, the main focus is the effect of fertilizers on rice as related to yield and environmental effects. A number of hypotheses will be tested: nitrogen is a limiting nutrient in the Delta for rice; soil under treatments with nitrogen fertilizer additions will contain higher concentrations of extractable NO_3 during the growing season compared to treatments lacking nitrogen; GHG emissions are affected by water management and rice developmental stages; rice fields are sources of NO_3 and PO_4 in water. Through soil, water and air quality samplings students hope to use examples of soil nitrogen levels, N_2O and CH_4 emissions and chloride changes to prove hypotheses.

Keywords: Island Subsidence, Levee, GHG, Greenhouse Gas, Carbon Emissions, Rice, Peat

Poster Topic: Agriculture and Water Quality

The AFRI Rice Project: Benefits of Nitrogen Fertilizer Treatment in Rice Planting on the Sacramento-San Joaquin Delta to Encourage Subsidence Prevention, Sustainability of Soil Conditions and Water Management Affects on GHG Emissions Public Education Project

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Local high school students are getting the opportunity to work on a hands-on, real-time research project on the Sacramento–San Joaquin Delta along the San Joaquin River. The project is being run as an outreach educational program through the Delta Science Center. Students are working on taking air, soil and water samples, as well as building a rice field to run the experiments on.

Project description: About two thirds of the Sacramento-San Joaquin Delta (Delta) islands are agriculture lands. The drained peat soils of the Delta have provided fertile soils for agriculture since the late 1800s. Unfortunately during that time, the environment in the Delta island region has dramatically deteriorated as evidenced by subsidence. On many of the Delta islands peat soil has oxidized causing subsidence of up to 20 feet, or more, below sea level. Subsidence is responsible for severe consequences including extensive greenhouse gas emissions, construction of a 110-mile levee network, risks to California’s water supply and the degradation of water quality. If current agricultural practices remain unchanged, things will only get worse.

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In this study, conducted in a Learning Lab rice field on Jersey Island, the main focus is the effect of during the study the students will also be creating a series of videos about the project, share data through posters with their peers and others and producing a winter science fair.

Keywords: Island Subsidence, Levee, Greenhouse Gas, Carbon Emissions, Public Education, Outreach

Poster Topic: Agriculture and Water Quality
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