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Agriculture and Natural Resources | California Institute for Water Resources

Evaluation of Surface Water Quality on Soil Leaching Fraction and Alfalfa Yield in the Delta

Principal Investigators:

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Project Summary

The Sacramento-San Joaquin River Delta region is a unique agricultural region of California. While the region is named for its waterway configuration, the Delta region is also unique for its fertile soils, and of the 738,000 total acres, approximately 500,000 acres of the Delta are farmed. As the Delta Crops Resource Management Advisor for the University of California Division of Agriculture and Natural Resources (UC ANR), my role is to do research and outreach on topics of local concern. My program is shaped by themes of sustainable crop production and soil resource management. In that vein, I am evaluating the effect of surface water quality on soil salinity in Delta alfalfa fields. In 2012, alfalfa was the second most widely grown crop in the Delta at approximately 72,000 acres.

Delta farming is challenged by soil salinity, which can stress crops and reduce yields. In general, plants are stressed by saline conditions because they must expend more energy to take up water, leaving less energy for plant growth. This trade-off is challenging for alfalfa growers because the marketed crop is the vegetative growth, and extra energy to take up water reduces hay yields. To prevent this trade-off, Delta soils should be leached of salts by applying water in excess of that used by evapotranspiration, or the amount of water evaporated by the soil and transpired by the plant during photosynthesis. The leaching fraction is defined as the minimum fraction of the total applied water that must pass through the soil root zone to prevent a reduction in crop yield from excess salts.

Two factors establish the leaching fraction: the salt concentration of the applied water and the salt sensitivity of the crop. Alfalfa is moderately sensitive to salinity and is irrigated with surface water in the Delta; thus, the quality of surface water in the Delta affects growers' ability to leach salts. Currently, state water policy salinity standards for the south Delta – an area southwest of Stockton, CA – are set at levels meant to sustain agricultural yields, based on crop tolerances of salt-sensitive crops. Salinity levels, however, vary over space and time, and sometimes the salinity exceeds the standards.

The reporting period marked the first year of this project. The objective of the work was to gain knowledge on the current leaching fraction being achieved in south Delta alfalfa soils and update the state of knowledge on how surface water quality and rainfall affect the leaching fraction. Seven south Delta alfalfa fields were selected based on similar soil characteristics but differing irrigation source water. Measured parameters included soil salinity in the spring and fall of 2013, groundwater salinity, surface water salinity with each irrigation, alfalfa yield, and winter rainfall over the 2013-14 season. Anticipated outcomes of the proposed work will be to update the state of knowledge on the achievable leaching fraction, to inform future policy on south Delta salinity standards and assist growers with irrigation strategies for effective salinity management.

Information Transfer/Outreach Program

Information transfer has occurred through written and online publications and personal consultations. As a new project, it was important to communicate effectively with growers in

order to gain their support for the project. The project is relevant for growers because the information gained will be translated into strategies for salinity management. Through personal consultations, I found seven growers who were interested in cooperating. I maintained frequent communication with these growers to discuss the protocols and data. I have written about the project in newsletter articles. The Field Notes newsletter is published and sent out of our local UC Cooperative Extension office and reaches 1,787 people. I have also written about the project for the UC ANR Alfalfa and Forage News blog, to which 168 people are subscribed.

Additionally, my information transfer program reaches non-government and government agencies. I have been in communication with the manager of the South Delta Water Agency and a senior water resources control engineer of the State Water Resources Control Board. I provided a field tour, including demonstrations of protocols, to these individuals who have interest in surface water quality in the Delta.

Notable Achievements

After receiving the federal funds, the South Delta Water Agency supported my program in the amount of \$15,000.

Student Support

No students are supported by these funds.

Publications

Other publications:

Leinfelder-Miles, M.M., 2013. Delta research overview. Field Notes. University of California Cooperative Extension, San Joaquin County, Stockton, CA. p.7-8.

Leinfelder-Miles, M.M., 2013. Alfalfa, salinity, and soil leaching. Alfalfa and Forage News. University of California, Agriculture and Natural Resources. Retrieved from <http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=9529>.

Leinfelder-Miles, M.M. and Prichard, T., 2013. Soil leaching requirement of alfalfa. Field Notes. University of California Cooperative Extension, San Joaquin County, Stockton, CA. p. 3.