

**STATE OF CALIFORNIA  
REGIONAL WATER QUALITY CONTROL BOARD  
CENTRAL COAST REGION**

**STAFF REPORT FOR REGULAR MEETING OF DECEMBER 5 –6, 2013**

Prepared on November 5, 2013

**ITEM NUMBER:** 19

**SUBJECT:** **Optimizing Irrigation and Nitrogen Management in Strawberries for Improved Water Quality; Results of PG&E Grants #2010-0084 and #2011-0676**

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**KEY INFORMATION:**

Location: Salinas  
Type of Discharge: Irrigated Lands leaching to groundwater

**THIS ACTION:** **Informational**

**SUMMARY**

In 2010 and 2011, the Central Coast Water Board awarded approximately \$100,000 from the PG&E Settlement Fund to the University of California Cooperative Extension (UCCE) in Salinas to complete a two-phase grant project related to irrigation and nitrogen management in strawberries. Michael Cahn, UCCE Farm Advisor, will present the results of this project to the Board.

Phase 1 of this project gathered base-line data to determine current water-use and nitrogen management practices in commercial strawberry fields during the drip irrigation (spring and summer) portion of the crop growing season, also known as the production season. The project also estimated nitrate leaching losses, developed nitrogen uptake guidelines, and a water use model for strawberries. Results of the initial year of study included the following conclusions regarding nitrogen management in strawberry production: 1) Strawberry nitrogen uptake rate is relatively slow, much lower than vegetable crops; 2) Given this low nitrogen uptake rate, strawberries can thrive with relatively low soil nitrate reserves; and 3) With careful irrigation, nitrate leaching losses from strawberry fields can be relatively low.

The results of Phase 1 of the project demonstrated that many growers under-irrigated during the production season (typically, between May and October). Because only two fields (14% of total) were irrigated with more than 150% of crop evapo-transpiration (ET) during the production season, the potential to conserve water may be limited during this period. In addition, nitrate leaching may not be a significant issue during the production season. The volume of water applied per irrigation was generally small (averaging 0.27 inches), and would be unlikely to exceed the water holding capacity of the soil. A previous study has shown that soil nitrate levels are often less than 10 ppm nitrate-N between May and October. The combination of minimal drainage and low soil nitrate levels during the production season may suggest that a majority of

growers are unlikely to leach significant amounts of nitrate beyond the root zone. However, a combination of high nitrogen fertilization rates and inefficient irrigation could still represent a nitrate leaching hazard.

The objective of Phase 2 of this project was 1) to estimate the nitrate leaching risk during establishment of strawberry plants and 2) to focus on the contribution of fall applied fertilizer to nitrate leaching, during the winter months and usually when the young plants are sprinkler irrigated.

The greatest opportunity to conserve water appeared to be during the winter months, when applied water amounts greatly exceeded crop ET. Approximately one third of the irrigation water was applied during the winter and early spring when ET demand of the crop was minimal. Water applied during post-establishment of strawberries (January – March) was excessive for the majority of the fields monitored and would likely result in substantial drainage that would cause leaching of nitrate-N. Data for this season demonstrate that the majority of fields received an average of 256% of estimated crop ET, and average of approximately 11 inches of water from rainfall. Although ET is low during the winter, growers may be challenged to reduce water applications because they irrigate to maintain sufficient soil moisture to establish young transplants and to leach salts out of the soils. They may also need to irrigate for fertigation, and to maintain sufficient moisture in beds to protect the crop from frost damage. However the combination of monitoring soil moisture status and following the crop ET demand are useful ways to determine if applied water can be reduced.

The greatest risk of nitrate leaching occurred during establishment of the strawberries and in the winter months (December – March). The total applied water and rainfall during this period greatly exceeded crop ET and would be likely to cause substantial drainage. Controlled released pre-plant fertilizers released a majority of the nitrogen during the winter months when the crop uptake of nitrogen was minimal and the potential for leaching was high due to rainfall and water applied for crop establishment. Estimates of nitrate leaching for two fields monitored ranged from 167 to 239 lbs nitrogen/acre. Better matching fertilizer release rates with crop uptake patterns could potentially reduce nitrate leaching losses.

For more information about these projects and other PG&E grants, including a copy of the final reports, please go the Water Board's website at:  
[http://www.waterboards.ca.gov/centralcoast/water\\_issues/programs/grants/pge\\_grants.shtml](http://www.waterboards.ca.gov/centralcoast/water_issues/programs/grants/pge_grants.shtml)