Summary Evaluation of Halvorson et al. 2013: Consideration for Potential Expansion of NMPP

In Fall 2013, the Reserve evaluated a data set of N_2O fluxes from fertilizer management on irrigated corn in Colorado (Halvorson et al., 2013)[1] against the Reserve's Minimum Data Standard; this data set was proposed for the development of an emission factor model, which would then be used to expand the applicability of the protocol to include irrigated corn.

The assessment of the Colorado data set was very positive overall and the Reserve found that the data set met or exceeded most criteria in the Minimum Data Standard. However, the Colorado data set failed to meet Reserve criteria in one critical area: replication of the study in other study sites (i.e. other sites within the county, other counties, other states, or other regions). Replication of the study (or at least a similar study) at multiple sites across a region is important for understanding the variability of emission fluxes across the landscape due to sensitivity of fluxes to various soil and climate parameters and thus, how far a data set and methodology might be extrapolated. Independent similar or replicate studies also provide crucial validation data, which enables the quantification of uncertainty with the methodology and the associated emission factor model. While the Halvorson et al. (2013) data set is a good candidate for developing into a quantification methodology, the lack of data from additional sites to assist in extrapolation and/or validation is problematic.

There has been a CDFA-sponsored study on N_2O emissions from irrigated corn from a range of N application rates in California underway since 2011, which the Reserve hoped could be used for validating the Halvorson data set. The results of this study had originally been anticipated in Spring 2013, but after some unexpected hurdles with the original principal investigator, the study was reassigned to Martin Burger and William Horwath at UC Davis, who have been taking flux measurements over the 2013 and 2014 growing seasons at multiple sites in at least two counties, with final results expected in Spring 2015. The Reserve continues to believe that this California study could provide data appropriate for use in validation and/or extrapolation of the Colorado corn data and plans to review the final results of the California study when it becomes available.

[1] Halvorson, A.D., Snyder, C.S., Blaylock, A.D., Del Grosso, S.J. (2013). Enhanced-efficiency nitrogen fertilizers: Potential role in nitrous oxide emission mitigation. *Agronomy Journal, 10*.