

## Nitrogen Removal Coefficients as a Pathway to Regulatory Compliance

Andre Biscaro

Irrigation and Water Resources Advisor, UC ANR

Jodi Switzer

Water Program Director, Farm Bureau of Ventura County

Farming in California hasn't become any easier over the last few years. With skyrocketing labor costs, decreased water availability and increased regulations of different natures, additional layers of work are now required to stay afloat. One recent significant regulatory change came with the adoption of the Ag Order by the Los Angeles Regional Water Control Board last September. The Ag Order mandates that Ventura County growers begin tracking nitrogen and irrigation through the development of certified Irrigation and Nutrient Management Plans starting in 2025. Additionally, they will need to submit Irrigation and Nutrient Management Reports annually beginning in 2026. The Regional Board has two main objectives with these data reporting requirements. First, the collected data will be used to develop formulas and target that protect groundwater. Second, it will be used to identify "outlier" operations – those applying significantly higher amounts of nitrogen per unit of harvest than their peers growing the same crop type. The process for identifying outliers will involve reporting total nitrogen applied per acre (mostly through fertilizers) and subtracting the total nitrogen removed per acre, which is the nitrogen content in produce that leaves the field. Comparing the discrepancy between applied vs removed nitrogen across similar crops will highlight operations with higher nitrogen application per unit of harvest yield. With that in mind, it would be wise for growers and consultants to familiarize themselves with the process now and consider opportunities to adjust their nitrogen fertilization programs accordingly. While many operations can safely decrease the gap between applied and removed nitrogen, some will face challenges and consequent yield losses. The understanding of crop nitrogen needs (amount and timing) associated with using efficient fertilizer sources and irrigation practices are key for minimizing this gap.

The methodology adopted by the State Water Resources Control Board to determine how much nitrogen is removed from a field involves multiplying crop specific removal coefficients by crop yield (e.g.: for a fresh market celery crop with a removal coefficient of 0.00106 and yield of 75,000 lb/acre, the N removed is 79.5 lb N/acre). While coefficients of several crops have already been created over the years, many are outdated and not representative of regional and current production systems. It is important that these coefficients accurately reflect the range of vegetable and berry cultivars, growing conditions and production practices used by the industry.

The University of California Cooperative Extension undertook an extensive CDFA-funded project to create nitrogen removal coefficients for 55 vegetable and berry crops in the central coast over the last four years, including Ventura County. These crops and crop products were sampled at commercial production fields at the time of harvest for each commodity represented in different soil types and production seasons. An average of 15 fields were sampled per commodity and commodity type, with four samples collected per field at different locations throughout the field to account for site variability. Each sample consisted of six to eight subsamples collected from the harvested produce. In cases of certain crops of relatively large unit size such as cabbage and celery, between 1/6 and 1/8 of each head was used to compose a sample, along with other subsamples. Each subsample included proportional parts of the sampled produce (e.g., leaves and petioles in the case of celery). The fresh weight of each sample was taken in the field, and each sample oven-dried and sent to the UC Davis Analytical Lab for total nitrogen analysis. Dry matter content and total nitrogen for each sample were used to calculate the removal coefficient. Mean removal coefficients varied from as low as 0.00078 for blueberry to 0.00668 for baby kale, accounting for a difference of 8.5 times. Although there was also variability in removal values within the same crop type, major differences in nitrogen removal coefficients were observed among crop types. For instance, leafy and flowering vegetables tended to have higher removal coefficients (e.g. 0.00465 and 0.00434, respectively) than bulb or heading vegetables (e.g. 0.00186 and 0.00205, respectively). As expected, higher nitrogen concentrations and dry matter content in the tissue resulted in higher removal coefficients.

With the adoption of the Ag Order, the Ventura County Agricultural Irrigated Lands Group (VCAILG) was tasked with compiling a comprehensive list of nitrogen removal coefficients for crops representing over 82% of the irrigated acreage in Ventura County. This compilation involved an extensive literature review to gather the latest research on predominant crop types in the county, incorporating findings from the University of California Cooperative Extension's vegetable and berry project. The proposed list of nitrogen removal coefficients for Ventura County crops was submitted to the Regional Board in May of this year and is currently awaiting approval. As new research emerges, Ventura County growers will have the opportunity to request revisions to the adopted nitrogen removal coefficient list. Growers and consultants are also encouraged to reach out to the University of California Cooperative Extension office in Ventura and work with Farm Advisors in case there are questions about these coefficients, including how they were created and their relevance to different production systems. These proposed coefficients are available on VCAILG's Irrigation and Nutrient Management Plan webpage, with updates continuing to be shared at various educational meetings. This ongoing process ensures that growers have access to the most accurate and up-to-date information, aiding them in achieving regulatory compliance and optimizing their nutrient management practices.