

## CHAPTER THREE

---

### Direct Drivers of California's Nitrogen Cycle

#### Appendix 3.2 Are University N Rate Guidelines Current?

*Lead Authors:*

T.S. ROSENSTOCK AND T.P. TOMICH

*Contributing Authors:*

H. LEVERENZ, D. LIPTZIN, D. MEYER, D. MUNK,  
P.L. PHELAN, AND J. SIX

This is an appendix to Chapter 3 of *The California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment*. Additional information about the California Nitrogen Assessment (CNA) and appendices for other chapters are available at the Agricultural Sustainability Institute website: [asi.ucdavis.edu/nitrogen](http://asi.ucdavis.edu/nitrogen)

Suggested citation:

TS Rosenstock, TP Tomich, H Leverenz, D Liptzin, D Meyer, D Munk, PL Phelan, and J Six. "Appendix 3.2: Are University N Rate Guidelines Current?" Online appendices for California Nitrogen Assessment: Challenges and Solutions for People, Agriculture, and the Environment. TP Tomich, SB Brodt, RA Dahlgren, and KM Scow, eds. Agricultural Sustainability Institute at UC Davis. (2016). [asi.ucdavis.edu/nitrogen](http://asi.ucdavis.edu/nitrogen).

## Appendix 3.2 Are University N Rate Guidelines Current?

Since World War II and continuing to the present day, University of California (UC) research has established crop-specific “N rate guidelines” (Proebsting, 1948; Hartz and Bottoms, 2009). An N rate guideline is a range of N application rates expressed as a unit of weight area<sup>-1</sup> (e.g., kg ha<sup>-1</sup>) that are generally able to achieve maximum yield. Most often, N application rate guidelines are printed in University of California Department of Agriculture and Natural Resources (UC DANR) publications and are extended to producers through information channels including: bulletins, production manuals, and field days.

The California Nitrogen Assessment analyzed the current status of N rate guidelines for 33 major commodities grown in California and found publications from UC DANR with N guidelines published within the last 25 years for 28 of the 33 crops (Appendix 3.3). Guidelines for 58, 64, and 86% of the 28 commodities had been published within the last 5, 10, and 15 years, respectively. In most cases, more recent publications were revisions of previous guidelines to incorporate new research, changes in management practices, and crop genetics.

Current N guidelines vary widely between their lowest and highest values (Table 3.2.1.). The minimum suggested application rate is often almost 100% less than the maximum rate for any single commodity. The large range can be justified by the diversity of cropping systems, technologies, and growing conditions for any one commodity. The combination of which can create large differentials in crop demand, system efficiency, and the amount of fertilizer demand. When comparing current estimated N application rates with the guidelines, the estimated current rates were above the guidelines for 45% of the 33 crops, and within the guidelines for 55% of the crops. For those estimates that were within the guidelines, 31% were in the top quartile of the guideline. These findings suggest either the guidelines underestimate the N required or average producers over-apply N fertilizer for a considerable number of crops in California.

**Table 3.2.1. Comparison of average 2005 fertilizer N application rates to University guidelines.** The comparison provides a measure to determine if average N application rates are within that suggested by research results. Application rates that exceed the maximum in the guidelines suggest that either the guidelines do not reflect cropping conditions or growers over-apply N.

Crop type	N	Range of guideline (% ± SD)	Within <sup>1</sup> (%)	Over <sup>2</sup> (%)	Mean surplus <sup>3</sup> (lbs. N per acre ± SD)
Field crops	4	73 ± 46	100	-	-
Perennials	12	88 ± 54	50	33	14 ± 12
Vegetables and annual fruits	12	101 ± 83	58	42	53 ± 47
All crops	28	90 ± 65	57	36	36 ± 39

<sup>1</sup>The percentage of crops with an average N application rate within the UC guidelines.

<sup>2</sup>The percentage of crops with an average N application rate exceeding the maximum listed in the UC guidelines.

<sup>3</sup>The amount of N applied above the maximum rate in the guidelines.

## References

- Hartz, T.K., Bottoms, T.G., 2009. Nitrogen Requirements of Drip-irrigated Processing Tomatoes. HortScience 44, 1988–1993.
- Proebsting, E., 1948. Nitrogen fertilizer: Usually beneficial to soils of California. California Agriculture 2, 10–10.