CHAPTER THREE

Direct Drivers of California's Nitrogen Cycle

Appendix 3.4 Trends in Crop, Soil, and Water Management

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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

Suggested citation:

TS Rosenstock, TP Tomich, H Leverenz, D Liptzin, D Meyer, D Munk, PL Phelan, and J Six. "Appendix 3.4: Trends in Crop, Soil, and Water Management." 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.

Appendix 3.4 Trends in Crop, Soil, and Water Management

Virtually every management practice changes N dynamics in croplands. Few surveys of current management practices are available (i.e., (Lopus et al. 2010; Joe Dillon, Edinger-Marshall, and Letey 1999)). Information compiled here provides some indication of major changes in management practices.

+ = increasing, - = decreasing, -> = shift to new practice, ? = unknown, * = unchanged

Soil management decision	Trend	Description	Source
N application rate	+	The amount of synthetic N fertilizer applied per ha has increased an average of 25% (1973-2005).	Rosenstock et al. (2013)
Source of N (including organic production)	* / ?	Synthetic N fertilizer remains the dominant source of N. Between 1996 and 2007, the distribution of use of synthetic fertilizer products was relatively unchanged, except calcium nitrate increased from 9 to 15% of N sales. The extent of organic N use is unknown. Indirect evidence suggests greater use of organic N.	CDFA (2009), USDA (2010), Klonsky and Richter (2005), Dillon et al. (1999), Expert opinion
Fertilizer placement	?	Shift from broadcast to band placement closer plants' roots. Trends are not quantified.	Expert opinion
Timing of N application	->	Between 1986 and 1996, producers significantly increased the number of N applications per crop. Nitrogen guidelines almost universally suggest split N applications, except rice.	Dillon et al. (1999), Linquist et al. (2009)
Irrigation technology	->	The use of low-volume irrigation technologies has increased by 30% between 1972 and 2001, largely as a result of changes in crop mix. There has been an undocumented increase in the delivery of fertilizer via irrigation (fertigation).	Orang et al. (2008), Expert opinion
Soil drainage	?	The extent and location of tile drainage is unknown. As much as 1.5 million ha of cropland may be drained throughout the major agricultural valleys.	Pavelis et al. (1987)
Tillage	->	The use of reduced tillage and conservation tillage techniques has increased. As much as 17.4% of row crop area may be under conservation tillage in some regions. These numbers may not represent tillage patterns because the intensity of tillage in many crops has been reduced, but the tillage systems may not fit within these categories	Conservation Tillage and Cropping Systems Workgroup (2009)

Agro-biodiversity and crop genetic diversity	?	The number of breeds or varieties that dominated California production for top 20 commodities in 1993 ranged between 1-30 with a median of 6.5. Conventional scientific wisdom suggests agrobiodiversity and crop genetic diversity are declining in California but the trend is not yet quantified.	Qualset et al. (1995), Expert opinion, Smukler et al. (2010), Brodt et al. (2008).
Field edge / landscape management	?	Installation and management of wetlands, riparian areas, and buffer strips is unknown.	

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