CHAPTER THREE

Direct Drivers of California's Nitrogen Cycle

Appendix 3.5 Methods for Estimating NUE

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Appendix 3.5 Methods for Estimating NUE

Two of the most common methods for estimating NUE are the difference method (zero-N) and the isotope dilution method (^{15}N). They are calculated with equations 1 and 2, respectively:

(1) $$NUE_{zero-N} = \frac{U_F - U_0}{N} \; x100$$

where U_F is the amount of N in aboveground biomass measured in a fertilized plot, U_O is the N in aboveground biomass in an unfertilized plot, and N is the amount of fertilizer applied. The isotope dilution method applies labeled radioactive N isotopes to determine the amount of plant uptake by the following:

(2) $$NUE_{^{15}N} = \frac{^{15}N_{recovered}}{^{15}N_{applied}} \times 100$$

where the proportion of ^{15}N in the plant (over background levels) is relative to the ^{15}N fertilizer applied. The principal benefit of utilizing these methods is that they differentiate between N sources - fertilizer or soil reserves. The major limitation is their requirement of controlled experimental plots that may not reflect field-scale N dynamics. The representativeness of prior research to current practices is further suspect because much of the work utilizing these methods in California were performed long in the past (1970s), recent work on rice being an exception. Regardless, these methods provide the most accurate characterization available of fertilizer N recovery efficiency in the state's crops. In general, zero-N methods tend to overestimate the inorganic N fertilizer recovery and the ^{15}N approach underestimates it (Broadbent et al., 1980).

Reference

Broadbent, F.E., Tyler, K.B., May, D.M., Moore, C.V., 1980. Tomatoes make efficient use of applied nitrogen. California Agriculture 6, 24–25.