

Impacts of soil health focused nutrient management strategies on crop nitrogen uptake and nitrous oxide emissions in leafy green agroecosystems

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Production of leafy greens requires high inputs, frequent cultivation, and intensive overhead and/or surface irrigation. These extensive management requirements make achieving soil health improvements a challenge. Enhancing soil health in lettuce production has many potential co-benefits, such as increasing soil organic nitrogen (N) availability, reducing fertilizer N input, and improving crop and fertilizer N use efficiency, and reducing the greenhouse gas, nitrous oxide (N₂O). In partnership with a large-scale commercial producer in Salinas, CA, we implemented a split-plot designed field experiment with treatments receiving N applications at grower's standard (GS) rate (290 lbs N ac⁻¹), NRCS Nutrient Management Conservation Practice Standard (CPS) 590 rate (232 lbs N ac⁻¹), and no N (control). In split fertilizer plots, compost was applied at a rate of 5 d.w.t./acre and a no compost plot. Soil, crop, and greenhouse gas data were collected over a period of 12 months. Results show that crop N uptake was only significantly different (p=0.03) between the GS rate and the no N treatments, while no difference was found between GS and CPS N rates. Regardless of N application rates, the addition of compost did not significantly increase crop N uptake. Cumulative N₂O emissions were highest in the GS treatment (36.3 mg N₂O-N m⁻²) and lowest in the No N with compost treatment (9.9 mg N₂O-N m⁻²). All the treatments that received compost had lower N₂O emissions compared to those without compost (N application alone). Our work will continue for another two years, with broccoli included in crop rotations.