

# Soil Health & Biological Benefits of Alfalfa Rotations

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Nicole Tautges is an Agroecologist with the Michael Fields Agricultural Institute in East Troy, WI, a local/small farm food and farms research and policy organization. She grew up in Wisconsin and studied Agronomy at UW-Madison before obtaining her PhD from Washington State University, where she developed fertility and weed management recommendations for semiarid organic wheat production. She performed this research at UC Davis where she worked as a research coordinator for the Russell Ranch long-term cropping systems trial. Her work at the Michael Fields Agricultural Institute focuses on food-grade small grain production and post-harvest handling, perennial crops including alfalfa and Kernza, and developing educational materials for small- and mid-size farms and women farmers.

Although alfalfa (*Medicago sativa* L.) has long been recognized as an important rotation crop that improves soil 'tilth' and health, these benefits are often not well documented. We conducted a series of field studies monitoring alfalfa impacts on soil health changes over 3 years in annual/perennial crop rotations in northern California, in both conventional and transition to organic systems. In a conventional alfalfa-corn system, alfalfa grown for three years provided a significant nitrogen credit (100 kg N ha<sup>-1</sup>) to the following corn crop, as well as enhancing soil aggregation and tilth. Alfalfa impacts on soil structure and nitrogen cycling were identified as drivers of rotational benefits in alfalfa-tomato rotations. In an organic transition study, there were indications that alfalfa increased soil organic carbon (C) after only three years of measurements, mostly from root-C inputs, although grazing alfalfa limited soil C increase compared to no grazing. Nitrogen mineralization was also greater after alfalfa compared to annual cover crops, which contributed to greater corn yields following alfalfa (20-25% yield gain). Soils following alfalfa also have more connected macropores than soils cropped only to annuals, suggesting that alfalfa can create healthier soil habitats that support greater biodiversity and also enhance soil water infiltration. We will present a menu of soil health results across three studies to show that alfalfa benefits soil and environmental health, and to motivate further research into alfalfa effects on soil biogeochemical cycles.