Opportunities and Challenges in Integrated Crop-Livestock Systems

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Introduction

Modern California agriculture is dominated by specialized, large-scale production of commodities. However, farmers and ranchers are increasingly challenged by climate change, increasing overhead costs, and pests and diseases. When agriculture first evolved, livestock and crops were raised together, and they are still integrated in many countries today.

What might happen if we re-integrate animals into cropping systems in California?

Benefits and Opportunities

- Ecological intensification: harnessing biological processes for agroecosystem functions (Titus-Weiger 2014)
- Reduced fuel use for mowing, herbicide, and fertilization
- Enhanced soil nutrient cycling, availability (Lemaire et al. 2014)
- Increased water retention and availability, reduced irrigation needs (Garrett et al. 2017) and reduced dust production
- Carbon sequestration (Bremer et al. 2020)
- Product Diversification for farm income
- Agritourism (Jęczymk et al. 2021)
- Animal and crop products
- Grazing as a service
- Increased resilience to climatic and market shifts

Challenges to Adoption

- Many possible permutations (different animal species, different crops) with no thoroughly vetted best practices
- More examples in orchards/vineyards/affafa, with sheep/goats
- Fewer examples in annual cropping systems
- Food safety unknowns
- Organic policy is interpreted to require 90-120 days of no animals in a field/orchard/vineyard before harvest
- Reduces potential integration time by up to 1/3 of every year!
- Economic unknowns: net cost or benefit at the farm gate
- Expertise for day-to-day management
- Requires new partnerships and/or steep learning curve
- May require increased staffing or contracting to implement and monitor
- Infrastructure needs differ between and among crop and livestock systems: fences, water systems, equipment accessibility
- Unknown impacts of animals: to crops, soils, and infrastructure, positive or negative

What is ANR Doing?

NEW Livestock-Crop Integration Workgroup - Join us! Part of the Diversified Farming & Food Systems Program Team.

ANR extension and outreach in 2022

- Focus group
- The Art and Science of Vineyard Grazing (webinar)
- Integrating Livestock with Organic Crops and its Impacts on Food Safety and Soil Health (virtual field day)
- Orchard Grazing (webinar) - Scan QR code to view recording
- Contract Grazing (webinar) - Scan QR code to view recording
- Integrated Livestock Cropping Systems (half-day symposium)

Example ANR research projects active in 2023 addressing challenges listed at left

- Food Safety Risks in Certified Organic Integrated-Crop Livestock Farm Spinach Fields in California and Minnesota (Contact: Alida Pres)
- Learn more through this QR code!
- Shedding Light on the Economics of Livestock-Crop Integration in California (Contact: Morgan Doran) - to develop and disseminate an understanding of livestock-crop integration economics in California
- Integrating Cover Crops and Sheep Grazing in Almond Orchards (Contact: Julie Finzel) - testing for fecal pathogens in the soil after sheep grazing in almond orchards; exploring economics of cover crops and sheep in almon orchards
- Impacts of Sheep Grazing on Pistachio Orchard Sanitation (Contact: Houston Wilson, and Joel Siegel with USDA-ARS) - sheep grazing in winter/spring to reduce remnant “mummy” nuts, a key winter host of navel orangeworm, which is the most important pest in pistachio.
- Sustainability Outcomes of Integrated Sheep Vineyard Systems (Contact: Tommy Fenster, Amelie Gaudin) - impacts of sheep grazing on socio-ecological drivers of sustainability: soil quality and health; plant, microbial, invertebrate, and avian communities; grape yield and quality; and the economics of the different systems, in 45 commercial vineyards.
- Soil Health and Nutrient Cycling of Grazing Cover Crops in Organic Tomato Systems (Contact: Sequoia Williams, Amelie Gaudin) – impacts of cover crops and cover crop grazing on soil health, soil carbon pools, and soil nutrient cycling in an organic vegetable system (tomato, maiz, spinach, cucumber). Sheep grazing cover crops suppressed weeds and increased soil nitrate availability early in the season, without negatively impacting soil.

References Cited