



SHEEP ARE HELPING BUILD HEALTHIER SOILS ON AGRICULTURAL LANDSCAPES

In recent years, studies at UC Davis have shown that vineyards where sheep mow and fertilize the soil will improve long-term soil health. This practice is called Integrated Sheep-Vineyard (ISV) management, and interest in this practice has greatly increased. A long-term study found that vineyards using sheep to manage cover crops had healthier soils, better nutrient cycling, and increased carbon storage. Here's how it works and what it means for growers like you.

BENEFITS OF ISV

Sheep can be more than just weed eaters. With the right planning and management, integrating sheep into your land can greatly improve the quality of your crops and landscapes.

Sheep play significant and various roles in agriculture. While ISV is not a new idea in agriculture, it has been growing in popularity in the US. Some of the driving factors for implementing ISV in orchards include:

- Ability to replace machines and herbicides for mowing and weed control
- Improved nutrient cycling through their manure and urine
- Increase microbial activity and life, which builds up long-term soil organic carbon (SOC)

Overall, sheep do a ton of the work while improving your soil.

HEALTHIER SOILS

Studies have shown that integrating sheep could improve your soil quality. Vineyards using sheep (ISV) had higher levels of carbon than those that relied on mowing or herbicides.

- Carbon was stored at a higher rate of 59%
- Long-term carbon was stored at a deeper level of about 30-45cm deep
- Microbial biomass increased about 85-114%

The carbon increase is valuable because it indicates the improvement of quality and health of the soil. Increased carbon will improve many functions like nutrient cycling, water retention, and temperature regulation.

NUTRIENT AVAILABILITY

As carbon was found to increase, so was the nutrient availability in the soil.

- Phosphorus was found to be 72% higher in grazed soils
- Nitrogen became more available, especially in deeper layers
- The natural enzyme activity that helps cycle nitrogen was also higher under grazed soils



ISV



CONV

Figure 2. Integrated Sheep-Vineyard vs Non-Integrated Sheep-Vineyard
K.M. Brewer et al.

SOIL STRUCTURE

The grazed land showed minimal impact on soil structure. There was no significant change in compaction or aggregate stability. The CEC, pH, and moisture also remained constant.



A common concern is soil compaction and fluctuations of soil properties, but the research done shows how sheep have minimal impact on the physical properties of the soil they graze on.

CONSIDERATIONS

While this practice is seasonal, there are still costs associated with ISV that may pose a financial burden on a grower.

Implementing ISV is recommended to be seasonal, but the upfront costs of ISV vary on location, number of sheep, and whether you are buying or renting. The overall cost of ISV for a 1-acre plot looks like:

- \$1,254-10,890 depending on the company and type of fence
- Buying a sheep will run about \$55 while renting could run \$0.25-0.45 each sheep
 - There have been instances where growers were able to collaborate with local shepherds for grazing at a low-to-no cost
- Water setups can run between \$200-\$500 depending on the season

IS THIS FOR YOU?

Integrating sheep can be extremely beneficial to your land but you should consider if it is right for you. You should consider ISV if you're:

- Wanting to reduce herbicide or mowing costs
- Are working toward organic or regenerative practices
- Have winter cover crops or understory vegetation
- Are looking to build long-term soil health and carbon

GETTING STARTED

If you decide to integrate sheep into your land, you should plan on integrating them at the right time. Timing is key. The recommended timeline for integrating sheep is between November and April. Other recommendations for integrating sheep are:

- Graze when understory cover crops are growing
- Divide your space into paddocks to use rotational grazing.
 - Paddocks should be 1-acre, if you have 1 acre or less, you should still divide into quadrants to rotate grazing.
- ~200 sheep can graze one paddock for 1-2 days.
- Temporary electric fencing is recommended for quick and flexible setups
- You want to limit grazing to about 80%
 - This leaves vegetation that prevents erosion, overgrazing, and encourages regrowth
- During wet years, grazing can be done more than once if the biomass allows.

These recommendations reflect the steps taken that showed the positive effects of sheep integration.

CONCLUSION

Integrating sheep into your land is not just about saving money, but it is about building resilience. Healthier soils mean improved nutrient and water retention, and potentially higher-quality crops over time. Sheep create an opportunity for growers who are looking to build sustainability into their operations.

REFERENCES

- Brewer, Kelsey M, et al. “Long-term integrated crop-livestock grazing stimulates soil ecosystem carbon flux, increasing subsoil carbon storage in California perennial agroecosystems.” *Geoderma*, vol. 438, Oct. 2023, p. 116598, <https://doi.org/10.1016/j.geoderma.2023.116598>.
- Schoof, Nicolas & Kirmer, Anita & Hörl, Jakob & Luick, Rainer & Tischew, Sabine & Breuer, Michael & Fischer, Frank & Mueller, Sandra & von Königslöw, Vivien. (2021). “Sheep in the Vineyard: First Insights into a New Integrated Crop–Livestock System in Central Europe”. *Sustainability*. 13. 12340. 10.3390/su132212340.
- Niles, Meredith & Walsh, Drew. (2018). “Ecological and Economic Benefits of Integrating Sheep into Viticulture Production.” *Agronomy for Sustainable Development*. 38. 10.1007/s13593-017-0478-y.
- Drollette, Ryan. “Estimated Costs for Livestock Fencing: Ag Decision Maker.” Iowa State University Extension and Outreach, Dec. 2024
www.extension.iastate.edu/agdm/livestock/html/b1-75.html.