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Economic viability of regenerative viticulture in Sonoma County, California

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We present the main outcomes of a comprehensive cost-benefit analysis at the vineyard level of regenerative viticulture in Sonoma County, California. Across four commercial vineyards and a 30-year horizon, regenerative management based on no-till, compost, cover crops, and sheep grazing delivered financial performance close to conventional management when yields were maintained. The results show that the economic success of transition depends mainly on site conditions, planning and operating strategy, and the ability to avoid yield losses or capture added grape value.

Scope and objective

Regenerative viticulture is increasingly promoted for its potential to improve soil health, biodiversity, and resilience to climate extremes. However, its adoption depends not only on the environmental benefits but also on whether growers can justify the transition economically[1 2 3].

The study addressed this gap by quantifying the key costs and revenue trade-offs between regenerative agriculture and conventional viticulture across four Sonoma County vineyards. This study is valuable for its comprehensive cost-benefit analysis of local commercial vineyards, offering a practical framework to discuss transition costs, indirect benefits, and the financial significance of maintaining yield.

Study approach

The economic comparison was conducted across four Sonoma County vineyards representing different cultivars (i.e., Pinot Noir, Chardonnay, and Cabernet Sauvignon), vine ages, planting densities, and vineyard layouts. Conventional management included alternate tillage, herbicides, and mowing, whereas the regenerative scenario combined no-till alley management, annual compost application, a sheep forage cover crop mix, and two sheep grazing events per year.

The analysis used data from vineyard manager interviews, company records, UC Davis cost studies[4], and published literature to estimate establishment and operating costs, revenues, and selected indirect benefits over a 30-year vineyard lifespan. Economic performance was assessed using net present value with a 2.5 % discount rate, and the study also compared outsourced regenerative services with in-house composting and livestock integration. To capture uncertainties around yield and price changes during a regenerative transition, scenarios ranging from optimistic to pessimistic were analyzed, with yield variations up to -40 % and price variations of ± 20 %[1].

Main findings

The main finding is that regenerative viticulture can provide comparable profitability to conventional management under Sonoma conditions if yields are similar between systems. Assuming no long-term yield difference between systems, regenerative management averaged about 5 % lower in net present value (NPV) across the four vineyards, with single vineyard differences ranging from 1.9 % to 8.4 % (Table 1).

Establishment costs were broadly similar between systems, although regenerative scenarios were slightly lower because less tillage and mowing equipment was required. Annual operating costs were slightly higher under regenerative management, mainly because compost and sheep integration added recurring costs that exceeded direct savings from reduced mowing, tillage, and herbicide use.

According to the annual operating cost distribution, most costs are from general labor, particularly canopy management. Regenerative practices accounted for a small share of costs (7-8 %; see Figure 1). The transition is less about shifting costs and more about integrating regenerative practices into an already labor-intensive system.

The analysis also showed that indirect benefits helped reduce the gap between systems. Benefits such as nutrient recycling, erosion control, and weed management reduced the annual cost difference between regenerative and conventional systems, despite accounting for only a small portion of the overall returns[5 6 7].

Relevance for growers

The paper does not suggest that regenerative viticulture is unprofitable. Instead, it shows that regenerative systems can be economically viable when integration is tailored to site conditions, yields are maintained during and after the transition, and price premiums for regeneratively grown grapes are achieved. This is reinforced by the sensitivity analysis. In optimistic scenarios, moderate yield losses (-10 %) might be offset by higher grape prices (+20 %). However, greater yield declines cause regenerative outcomes to fall below the conventional baseline, emphasizing that successfully aligning regenerative practices with site conditions to maintain yields and reduce transition losses is key to their economic viability.

Another relevant finding concerns the management strategy. Despite its up-front costs, in-house regenerative implementation outperformed outsourced services because it enabled growers to capture more value from compost production, waste reuse, and sheep integration (e.g., meat production). Outsourcing was easier to operate but less profitable over the long term.

TABLE 1. Comparative economic impact of one hectare under conventional (CV) and regenerative (RA) management over 30 years across four vineyards, assuming identical revenue (yield per price) for both scenarios.

Vineyard N°: Cultivar	Planted (year)	Density (Vines/ha)	Yield (Mg/ha)	Price per Mg	Scenario	Annual Operating Costs	NPV[a, b]	NPV Difference (%)[c]
1: Pinot noir	2012	5,382	11.6	$3,750	1CV	$23,573	$134,372	-4.6
					1RA	$23,908	$128,130	
2: Chardonnay	2017	3,588	19.3	$2,500	2CV	$19,370	$312,724	-1.9
					2RA	$19,705	$306,630	
3: Cabernet-Sauvignon	2000	3,076	7.03	$3,000	3CV	$17,919	-$140,605	-4.9
					3RA	$18,237	-$147,441	
4: Chardonnay	1989	1,122	9.7	$2,500	4CV	$11,530	$60,731	-8.4
					4RA	$11,768	$55,622	

[a] Net Present Value (NPV) over 30 years; [b] Calculation of NPV for RA scenarios assumes composting, and the sheep flock is outsourced; [c] Percentage difference in NPV between conventional (CV) and regenerative (RA) scenarios, calculated as the relative change relative to CV as the baseline.

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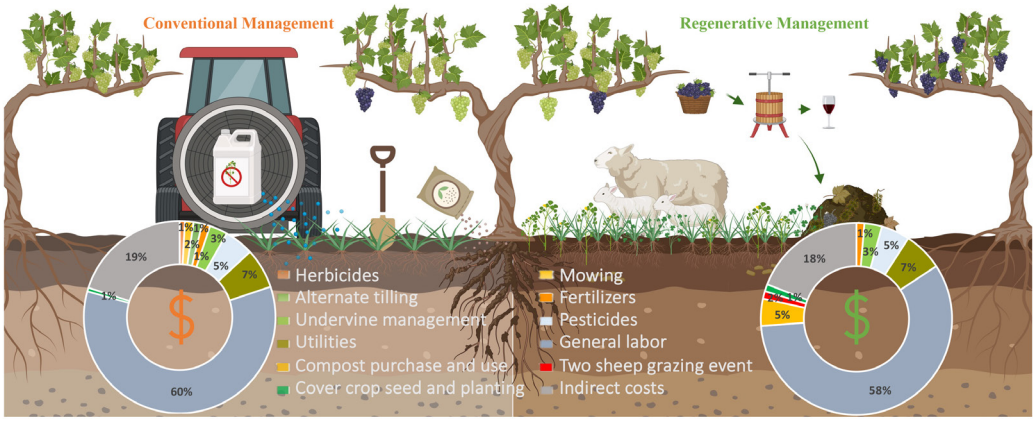


FIGURE 1. General percentage cost distribution of the annual operating costs for the conventional (left, orange) and regenerative (right, green) management. Adapted from Herrera *et al.*, 2026[1].

TABLE 2. Comparison of conventional and regenerative (outsourced) vineyard systems in Sonoma County. Adapted from Herrera *et al.*, 2026[1].

Aspect	Conventional Viticulture[a]	Regenerative viticulture (Outsourced)
Soil management	Alternate tillage	No-till alley management
Weed control	Herbicides and mechanical control	Mechanical control only
Nutrient management	Synthetic fertilizers	Compost (9.8 Mg/ha), plus synthetic fertilizers[b]
Cover cropping	Forage mix[c]	Sheep forage mix[d]
Livestock integration	None	Sheep grazing (2 events per year)
Establishment Cost	Baseline system; slightly higher due to full equipment set (Disk implement and mower)	Slightly lower due to fewer implements
Operating Cost	Baseline system; there is not any integration of regenerative practices aside the forage mix cover crop	Slightly higher due to compost acquisition, cover cropping and grazing events
Net present value (over 30 years)	Baseline system	Lower from 1.9 % to 8.4 % compared with the conventional system

[a] Conventional management (CV), which employs practices that support soil health in line with California Sustainable Winegrowing Alliance (CSWA) certification requirements; [b] Synthetic fertilizers were used in the same amount and form as in the conventional scenarios; [c] Forage mix seed: generally white clover, annual barley, and rye applied at a rate of 67 kg/ha; [d] Sheep forage mix seed: 1 % Campeda Subclover, 2 % Hykon Rose Clover, 2 % Dwarf Essex Rape, 23 % Austrian Winter Peas, 35 % Winter Ryegrain, and 35 % Triticale, all applied at a rate of 112 kg/ha.

However, outsourcing can be used as a first step to gain skills and determine what fits best in the vineyard, with in-house implementation later.

Limitations

The results should be interpreted as site-specific rather than general. The four vineyards differed in cultivar, age, density, and productivity, and the study shows that these variables strongly influence economic performance under both conventional and regenerative management[1] (Table 2).

The work also highlights a broader issue in vineyard sustainability assessments: several benefits of regenerative systems are real but difficult to fully quantify economically. Improvements in soil health, resilience, biodiversity, and ecosystem functioning may matter substantially in practice, yet they remain only partially captured in standard vineyard farm budget models[1 8].

Conclusions

Under the conditions evaluated in Sonoma County, regenerative viticulture was financially comparable to conventional management over a 30-year horizon, particularly when yields were maintained. While regenerative practices can be economically viable, their success depends on site-specific design, strategic implementation, and a transition approach that prevents grape yield losses or captures additional price value in grapes.

For growers, the key takeaway is that regenerative viticulture can be a viable long-term management strategy when ecological benefits, operational efficiency, and market outcomes are economically aligned. For researchers and advisors, the study provides a foundation for future research on yield transition responses, grape value, labor demands, and the valuation of ecosystem services in vineyard systems. ■

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