Conservation and Regenerative Agriculture in Sonoma County:

Climate Resiliency and Support for Small-Scale Farmers

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December 6, 2025

Introduction

As climate impacts intensify across California, understanding how agricultural land conservation, on-farm regenerative practices, and government programs collectively shape climate resilience has become a critical area of inquiry. This case study focuses on Sonoma County, California because it is both agriculturally rich and environmentally vulnerable, facing recurring climate-related disasters such as flooding, drought, and wildfires, while also contending with long-standing development pressures that threaten working lands and open space (Perit Sonoma, 2024). These overlapping stressors place farmers at the center of decisions about land stewardship, resource management, and adaptation. Understanding how farmers navigate these combined environmental and policy challenges provides insight into the broader role that agriculture plays in building community-level climate resilience.

Small-scale farmers in particular occupy a unique position within the landscape. Their operations often rely on intimate knowledge of local ecosystems, diversified cropping systems, and flexible management approaches that differ from larger industrial models. By centering the experiences and strategies of these farmers, this case study investigates interrelated questions: *How do regenerative practices and the conservation of agricultural land contribute to climate resilience? How do local and state government programs support or constrain these conservation efforts?*

To address these questions, I employed a qualitative case-study design grounded in field-based and interpretive methods. Data collection included semi-structured interviews with small-scale farmers and site visits to local small farms, alongside a review of academic literature on environmental conservation, regenerative agriculture, climate resilience, and Sonoma County's regional context, supplemented by discourse analysis of interview transcripts and relevant local and state agricultural policies and programs. Together, these methods examine how ecological practices, farmer-led innovation, and policy frameworks converge to shape the future of agriculture in Sonoma County.

Ultimately, this research aims to illuminate the interconnected ways that land-use decisions, conservation tools, and adaptive management contribute to building climate resilience at the local scale. By foregrounding the lived experiences of small-scale farmers, the project highlights both the opportunities and limitations embedded within current environmental policies and agricultural support programs. In doing so, I position Sonoma County as a case for examining how agricultural landscapes can play an active and essential role in responding to climate change.

Background

Historical land-use analyses demonstrate that Sonoma County's agricultural landscape has been shaped for decades by competing priorities of growth and conservation. Jerabek (1996) documented that despite efforts to preserve open space, Sonoma County was losing more than 900 acres of farmland annually to urbanization in the 1990s. This persistent tension between economic expansion and environmental protection forms a structural backdrop for present-day agricultural vulnerabilities. As climate pressures intensify, the stakes of farmland conservation and sustainable land management have only grown, making Sonoma County a critical context for examining how agricultural systems adapt within overlapping ecological and policy constraints.

These pressures are compounded by the region's rapidly changing climate. Over the past two decades, Sonoma County has experienced increasingly severe drought cycles and water scarcity in the Russian River watershed due to extreme heat events. Consistently large-scale wildfires, such as the 2017 Tubbs Fire, 2019 Kincade Fire, and 2020 Glass Fire, have reshaped ecosystems, damaged agricultural infrastructure, and elevated insurance and operating costs for farmers. Additionally, seasonal flooding along the Laguna de Santa Rosa and Russian River floodplain disrupts planting schedules and threatens soil health. These intersecting climate hazards highlight the urgent need for conservation strategies and regenerative approaches that enhance resilience.

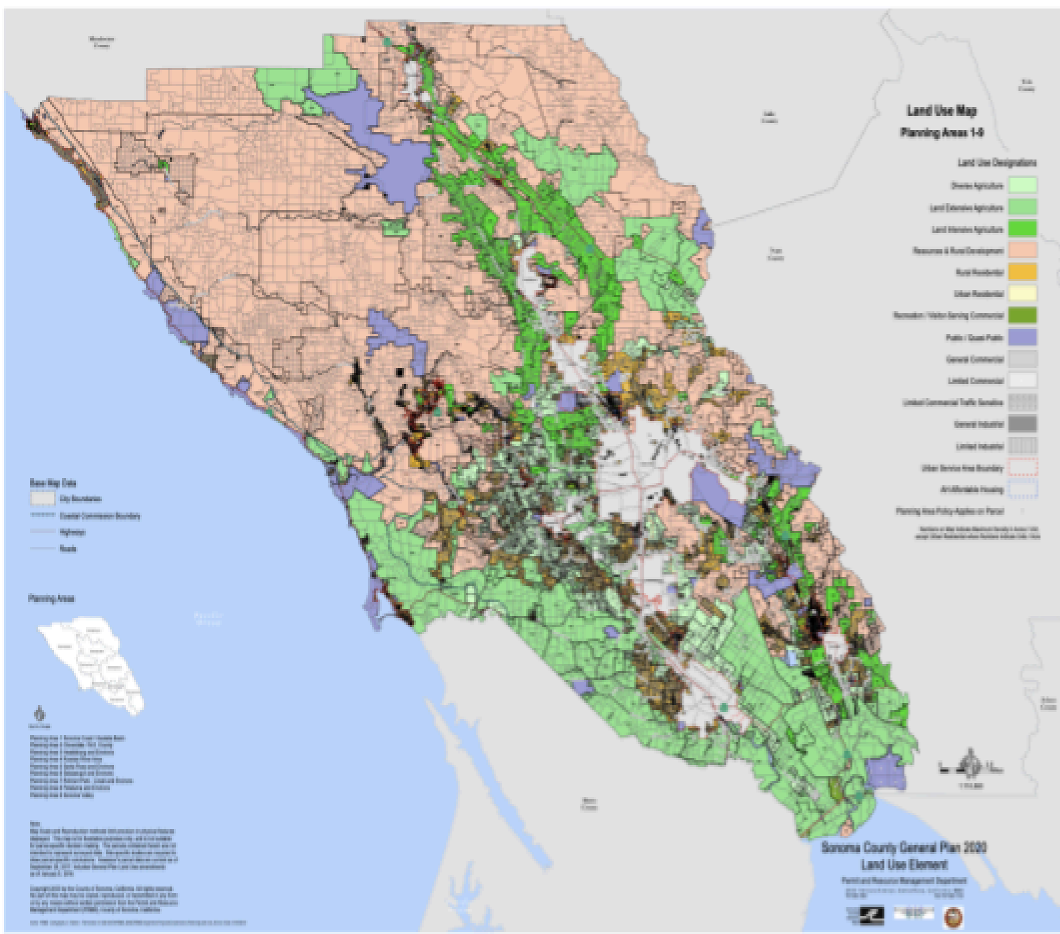

Figure 1 - Sonoma County General Plan Land Use Map for agriculture, development, residential, commercial and industrial areas.
Permit and Resource Management Department, 2020

Within this context, the structure of Sonoma County's agricultural landscape – dominated by small-scale farms – plays an important role. For context, Figure 1 shows the most recent (2020) land use map for Sonoma County, with agricultural land shown in shades of green.

According to the 2022 USDA Census of Agriculture, 95% of farms in Sonoma County are 1 to 500 acres, known as small-scale farms. This predominance of small farms, such as McEvoy Ranch in Petaluma (Fig. 2), inspired this study to focus on the collective impact of small-scale operations rather than the comparatively few large farms that often dominate existing academic research.

Figure 2 - McEvoy Ranch, sustainable small-scale farm that produces olive oil, wine, and beauty products in Petaluma, CA.
Cali Carter, November 2, 2025

Smaller farms are also more likely to contribute conservation and regenerative practices such as cover cropping, reduced tillage, water retention strategies, and habitat restoration due to their direct connection to the land's long term health and greater management attention (Grass Roots Farmers Coop, 2025). Despite these ecological contributions, small farms face substantial barriers to implementing regenerative practices and participating in conservation initiatives. These barriers include: cuts to federal agricultural programs under the Trump administration, reducing funding streams intended to support sustainable land management; public and private grants often involving complex applications, limited technical support, and high competition, making them difficult for smaller operations to access; and organic certification presenting similar financial and administrative burdens that restrict market access and the adoption of conservation-oriented practices (Cornell College of Agriculture and Life Sciences, 2025; Peters, 2025; Jones, 2021).

The region's conservation landscape is also shaped by local policies and institutions that reinforce or constrain agricultural protections. Since its establishment in 1990, the Sonoma County Agricultural Preservation and Open Space District has played a central role in safeguarding farmland and natural resources through conservation easements, agricultural zoning, and open-space acquisitions funded by voter-approved sales tax measures. Local planning tools such as community separators and clustered development models have further limited suburban sprawl and preserved working lands that might otherwise convert to residential or commercial development. These local mechanisms interact with state-level frameworks to influence farmers' land-use decisions (Ag+ Open Space, 2021).

Most present-day agricultural conservation policy and programming is modeled off of the California Conservation Act, better known as the Williamson Act of 1965. This bill was established in the post WWII period, when agricultural and open spaces faced increasing conversion pressures from population growth and expanding enterprises. As valuable farmland began to disappear at alarming rates, this bill proposed the use of contracts between land owners and the government, in order to voluntarily restrict development on parcels of land for a minimum of ten years. This program grew substantially when Article 13 – declaring the interest of the state in preserving open-space land – was added to California's constitution. Critical aspects of the evolution of this bill included financial incentives such as tax savings for landowners and government funded financial support for the program. The Williamson Act has remained a stable and effective mechanism for protecting agricultural and open-space from urban development, protecting around one third of all private land in California (California Department of Conservation, 2025). Its longevity and influence continue to shape Sonoma County's land use landscape and the policy environment in which farmers operate.

Literature Review

As the impacts of climate change accelerate globally, identifying sustainable strategies to manage land and improve ecological resilience has become increasingly urgent. Environmental conservation and regenerative practices have emerged as promising approaches for mitigating the effects of climate change (Carvalho, 2023). In California, where agriculture represents both an economic cornerstone and a major environmental pressure point, these practices play a critical role in shaping the state's future climate resilience and agricultural productivity. Sonoma County, a predominantly agricultural region, faces severe climate-related disasters such as flooding, drought and fires each year, making it a valuable case for examining how conservation initiatives are implemented on the ground. This literature review synthesizes current research on environmental conservation and regenerative agriculture, with particular attention to their intersecting roles in climate mitigation and agricultural resilience. It first explores the foundations and policy implementation of environmental conservation, then examines conservation programs and on-the-ground participation by farmers, and lastly reviews regenerative agriculture and land use in California, emphasizing its relevance to Sonoma County's climate resilience.

Environmental Conservation

Carvalho (2023) emphasizes that environmental conservation and resource efficiency are foundational to sustainable development, particularly amid escalating climate change, biodiversity loss, and resource depletion. In his study he defines environmental conservation as the protection and restoration of natural ecosystems to maintain biodiversity, mitigate climate change, and ensure long-term ecological stability, and argues that conservation efforts not only preserve habitats and endangered species but also reduce pollution and promote sustainable growth. The paper presents resource efficiency as a core principle of sustainability – optimizing resource use to minimize waste, lowering greenhouse gas emissions, and balancing environmental, social and economic benefits. This approach ensures that present needs are met without compromising future generations' capacity to meet theirs, forming the conceptual basis for applied conservation strategies at regional and local scales (Carvalho, 2023).

However, Carvalho identifies persistent challenges to the implementation of conservation practices such as limited public awareness, policy conflicts between economic development and environmental goals, weak enforcement of regulations, and insufficient funding and coordination across sectors. To overcome these barriers, he advocates for a multi-faceted strategy involving education, improved governance, sustainable land management and economic incentives (2023).

Conservation Programs and Farmer Participation

Farmer et al., (2016) argues that while U.S. policy establishes the framework for conservation, success ultimately depends on the participation and stewardship of landowners. Research on private land conservation underscores the importance of engaging landowners in protecting ecological resources. For example, analysis of Indiana's long-standing forest and wildland conservation program found that landowners motivated by environmental and residential values were significantly more likely to implement practices such as invasive species control, habitat improvement, and erosion management. These landowners also reported improvements in biodiversity and ecological functioning, suggesting that conservation efforts can generate tangible ecological benefits on private lands (Farmer et al., 2016). Such findings highlight that conservation programs not only protect biodiversity but also enhance ecological functioning, strengthening the case for policies that support landowner participation. This broader context underscores why conservation practices matter for climate resilience. In regions like California, and particularly Sonoma County, where small farms face pressures from development, climate change, and shifting agricultural markets, similar questions arise about how conservation programs influence land use decisions, ecological health, and farmers' ability to adapt to environmental challenges (Farmer et al., 2016).

Expanding on the role of participation, Ayoub (2025) emphasizes that farmers and ranchers are inherently motivated to care for the land that sustains their livelihoods and future generations. Their on-the-ground conservation efforts – such as protecting soil health, retaining water, and attracting pollinators – reflect both stewardship ethics and practical necessity. However, these practices often require financial aid or support provided through programming. The Natural Resource Conservation Service (NRCS) allocates $3.7 billion dollars per year in financial assistance to farmers, providing technical consultation to help install conservation practices on over 53 million acres nationwide. As Ayoub (2025) notes, conservation remains the heart of farming, but continued success depends on adequate institutional and financial support.

Prominent conservation programs designed to provide support are California's Healthy Soils Initiative and the State Water Efficiency and Enhancement Program (SWEEP). Desai (2018) explains that The Healthy Soils Initiative pursues five key goals: to protect and restore organic matter in the soil; to identify financing opportunities to facilitate healthy soils, conduct research and provide technical and educational support; and to enhance soil health on public and private lands. Although modeled off of existing federal soil conservation programs, a distinguishing feature of this program is the recognition of soil as an ecosystem – one that must be proactively managed to build and maintain health rather than treated after degradation occurs (Desai, 2018). The program's success has been attributed to strong farmer participation and collaboration with Resource Conservation Districts (RCDs) at the local level. This coordination allows the Healthy Soils Initiative to identify areas that need the most help, receive feedback from expertise organizations, and support all scales of farming (Desai, 2018).

Similarly, the California Department of Food and Agriculture administers SWEEP, a conservation program that provides grants to agricultural operations to improve irrigation systems and adopt technologies that conserve water and reduce greenhouse gas emissions. Funded projects include soil moisture monitoring, micro-irrigation systems, low-pressure irrigation conversions, pump retrofits, and the integration of renewable energy sources such as solar power. These initiatives have reportedly saved more than 101,000 acre-feet of water annually and reduced emissions by over 75,000 metric tons of CO2, demonstrating significant progress toward climate adaptation and mitigation goals (Climate Chance, n.d.). Yet, like many conservation programs, SWEEP faces several limitations such as demand for funding exceeding availability, and the program's scale remains small compared to California's vast agricultural sector. Additionally, smaller or under-resourced farms may face barriers to participation due to matching fund requirements or the complexity of the grant process (Climate Chance, n.d.).

These program barriers are not unique to SWEEP. The Cornell College of Agriculture and Life Sciences (2025) found that many conservation programs struggle to support small scale farms due to the time, expertise, and resources required to apply for competitive grants. Farmers may lack the technical ability to complete applications or cannot afford to wait for reimbursement-based funding, which is often impractical for operations that need financial support upfront (Cornell CALS, 2025). Collectively, these findings underscore that while farmer participation is essential for the success of conservation initiatives, equitable program design and accessible funding mechanisms are equally critical to ensuring that conservation benefits extend across all scales of agriculture.

Regenerative Agriculture and Climate Resilience

As conservation programs evolve to address the dual challenges of climate change and agricultural sustainability, regenerative agriculture has emerged as an approach that integrates ecological restoration with productivity. Conservation aims to preserve resources by minimizing disturbances, while regenerative agriculture aims to actively restore and improve ecosystems.

At the global scale, Khangura et al. (2023) provide a comprehensive review of the current state of knowledge surrounding regenerative agriculture worldwide. Their analysis identifies common practices – including minimum tillage, residue retention, cover cropping, and livestock integration – as core components that enhance soil structure, biodiversity, and carbon sequestration. However, the authors also emphasize that the ecological and economic outcomes of these practices vary significantly by agroecosystem, management intensity, and local context. They note that long-term, region-specific studies remain limited, and that more empirical research is needed to quantify the cumulative impacts of regenerative systems on greenhouse-gas mitigation and farm resilience. This global review situates regenerative agriculture as a promising but still evolving framework for sustainable land management, underscoring the importance of localized research and adaptive policy design to ensure its effectiveness across diverse agricultural landscapes.

Building on this global evidence base, Holsether and Reid (2023) argue that regenerative agriculture is essential to decarbonizing the global food system and building resilience to climate shocks. This is a nature-based approach that enhances rather than depletes farm ecosystems through regenerative agriculture's proven benefits including improved soil fertility, increased biodiversity, greater resource efficiency, and more stable farmer livelihoods. The authors estimate that expanding regenerative practices from 15% to 40% of global cropland by 2030 could avoid approximately 600 million tons of annual emissions (2023). Despite potential though, Holsether and Reid contend that regenerative agriculture is not scaling quickly enough due to a lack of short-term commercial incentives and the high transition costs carried by farmers. They propose five key actions to accelerate the adoption of regenerative practices: develop standardized environmental metrics, establish credible markets for ecosystem services such as carbon removal, share transition costs across the value chain; reform government policies to reward regenerative practices, and create new sourcing models to support farms in transition. The authors conclude that soil health lies at the heart of both climate mitigation and food security, emphasizing that farmers must be recognized and compensated as central stewards of the planet's ecosystems (Holsether & Reid, 2023).

Translating these global and policy-level insights into regional contexts highlights how regenerative agriculture can intersect with climate resilience. Studies on agricultural policy's impact on fire reduction in Southern Europe can provide crucial insights for California's fire disaster preparedness. Research examining the intersection of agricultural management and wildfire prevention across Mediterranean Europe highlights how policy-driven land use change has shaped fire dynamics in rural landscapes. The study by Lecina-Diaz et al., (2023) finds that the decline of traditional agricultural practices – such as grazing, crop rotation, and small-scale mosaic farming – have led to increased fuel accumulation and landscape homogenization, both of which heighten wildfire risk. Conversely, policies that incentivize active land management, maintain agroforestry systems, and integrate ecological restoration have been shown to reduce fire frequency and intensity. The authors argue that effective agricultural policy must balance rural economic sustainability with ecological resilience by supporting regenerative and low-intensity land uses that limit combustible biomass buildup. In this way, agriculture becomes a tool for climate adaptation as well as mitigation, demonstrating that landscape-level stewardship can simultaneously sustain livelihoods, enhance biodiversity, and prevent catastrophic fires (Lecina-Diaz et al., 2023). While these findings highlight how regenerative practices influence fire resilience in Mediterranean regions, similar climate pressures are reshaping agricultural systems in California.

Pathak et al., (2018) provide a comprehensive assessment of how climate change is reshaping California's agricultural systems. The authors document rising temperatures, more frequent heat waves, declining snowpack, and prolonged droughts that collectively threaten crop yields, water availability, and farm viability across the state. These shifts are expected to reduce productivity in key perennial and specialty crops by altering chill-hour accumulation, increasing evapotranspiration and intensifying pest and disease pressures. The study underscores that such climate-driven disruptions heighten the need for adaptive management strategies, particularly those that improve soil health and water retention. Regenerative practices such as cover cropping, reduced tillage, and residue management are identified as critical tools to buffer farms against temperature and moisture extremes. Overall, the authors conclude that California agriculture's future resilience depends on integrating climate adaptation into land management – an approach that aligns closely with the principles of regenerative agriculture (Pathak et al., 2018).

Farmland Conservation and Land Use in California

Despite mounting evidence that conservation and regenerative practices can enhance climate resilience and ecological health, California's agricultural landscapes continue to face significant threats from urban expansion and policy gaps. Smith et al., (2006) address these challenges in their analysis of Humboldt County, illustrating how zoning and planning mechanisms often fail to prevent farmland conversion even under strong preservation frameworks such as the Williamson Act of 1965. Nationally, farmland conversion has accelerated due to population growth and urban expansions, with California experiencing some of the highest rates of farmland loss – up to 100,000 acres annually. Although California has a strong agricultural heritage and legislature such as the Williamson Act, farmland remains under significant development pressure. The authors review a range of land preservation tools used in the U.S., including comprehensive plans, agricultural zoning, preferential tax assessment, right-to-farm laws, purchase of development rights, and transfer to development rights. While zoning and tax relief programs are widespread, the paper emphasizes that these mechanisms alone are insufficient for long-term farmland preservation because of political flexibility, voluntary participation, and limited financial capacity relative to development pressures (Smith et al., 2006).

Through a case study of Humboldt County, neighboring Sonoma County, the authors analyze planning files to assess the extent of agricultural land conversion through rezoning, conditional use permits, and subdivision processes. Humboldt County, while less urbanized, still faces farmland conversion pressures from housing demand, low-density subdivisions, and inconsistent zoning enforcement. This study highlights the structural weakness of zoning as farmland preservation strategy, especially when political flexibility allows frequent rezoning approvals. Farmland conversion is occurring at levels that threaten agricultural sustainability, particularly in prime soil areas. The findings align with broader scholarship strategies and stronger enforcement mechanisms rather than reliance on zoning or voluntary programs alone (Smith et al., 2006).

Sonoma County Relevance

Collectively, these studies illustrate how Sonoma County's patterns of land use, climate vulnerability, and ecological risk make it a critical setting for examining conservation and regenerative practices.

Maizlich et al. (2017) reveal how these land management dynamics now intersect with intensifying climate and health vulnerabilities. The *Climate Change and Health Profile Report: Sonoma County* (Maizlish et al., 2017) identifies the county as highly vulnerable to the combined impacts of rising temperatures, intensifying wildfires, prolonged drought, and land-use pressures that threaten both environmental and community resilience. The report projects a 1-2.3°F temperature increase by mid-century and highlights that over 11% of Sonoma County residents already live in moderate to very high fire hazard zones – risks that are amplified by expanding development into rural landscapes. The environmental stressors intersect with social inequities and agricultural exposure, as many of the county's outdoor workers and rural residents face heightened health risks from extreme heat, poor air quality, and water scarcity. Drought conditions not only increase wildfire risk but also jeopardize water supplies critical for farming and ecosystem health, directly linking land management practices to public health outcomes (Maizlish et al., 2017).

The growing climatic and social vulnerabilities identified by Maizlish et al. (2017) are further compounded by the region's heightened wildfire risk, a challenge analyzed in depth by Howlett (2018) through her study of Sonoma County's fire ecology and management strategies. Howlett conducts a regional analysis of wildfire dynamics and management in Sonoma County, California, identifying causal relationships among environmental factors that contribute to fire occurrence, severity, and post-fire ecological recovery. Using a synthesis of peer-reviewed literature, historical fire data, and regional environmental assessments, the study examines how climate, vegetation, topography, soil composition, and land use interact to influence wildfire behavior. The analysis centers on the county's ecosystem and its expanding wildland-urban interface, where nearly one-third of residents live in high-risk fire zones.

The study's comparative assessment of major California fires, including the 2017 North Bay Fires, reveals that elevation and elevational range correlate strongly with burned area, while precipitation shows no significant relationship. The findings emphasize that unmanaged understory growth and historical fire suppression have exacerbated fire intensity and frequency. Howlett concludes that Sonoma County's ecological and demographic profile makes it highly vulnerable to reoccurring, high severity fires, underscoring the need for adaptive management strategies. The author's recommended approaches include community education programs, integration of wildland fire use and prescribed burns, and improved monitoring of post-fire vegetation recovery. These recommendations position Sonoma County as a valuable case for understanding how climate risk, land management, and community resilience interact in California's fire-prone regions (Howlett, 2018).

Conclusion

Across the literature, a central theme emerges: the effectiveness of conservation and climate resilience efforts depend not only on the strength of policy design but also farmer participation and the accessibility of implementation mechanisms. National and state-level frameworks provide the necessary structure for sustainability goals, yet their outcomes are determined by how well they engage and support the individuals who manage the land. As Farmer et al. (2016) demonstrate, landowners motivated by stewardship values generate measurable ecological benefits through voluntary conservation practices, highlighting participation as a decisive factor in program success.

Building on this understanding, recent research underscores that successful conservation also depends on institutional capacity and equitable access. Programs such as California's Healthy Soil Initiative and the State Water Efficiency and Enhancement Program (SWEEP) illustrate how targeted and technical assistance can translate policy objectives into tangible environmental outcomes, including improved soil health, water efficiency, and reduced greenhouse gas emissions (Desaid, 2018: Climate Chance, n.d.). However, these same programs reveal persistent structural barriers – limited funding, complex application procedures, and reimbursement-based models – that often exclude small and under-resourced farms (Cornell

CALS, 2025). Such inequities constrain the broader potential of conservation programs to deliver climate resilience across diverse agricultural landscapes.

Within Sonoma County, these dynamics carry particular significance. The region's agricultural community faces intersecting pressures from drought, wildfire, and the economic instability driven by shifting land use and climate conditions. Conservation programs that improve water efficiency, rebuild soil health, and reduce emissions are therefore essential tools for sustaining both environmental and economic resilience. Partnerships with local Resource Conservation Districts have been especially effective in bridging the gap between state-level policy and on-the-ground implementation, ensuring that conservation measures are responsive to the needs of local producers. Expanding these collaborative models can help ensure that even small and mid-scale farms have access to the technical and financial resources necessary to adapt to increasingly volatile environmental conditions.

Collectively, the literature suggests that effective conservation and resilience strategies depend on aligning policy intent with local participation, particularly in regions like Sonoma County that sit at the core of agricultural productivity and climate vulnerability. Strengthening participatory mechanisms, expanding financial accessibility, and investing in long-term program evaluation will be critical in ensuring that conservation initiatives not only protect ecological systems but also sustain the livelihoods and adaptive capacities of the farmers who manage them. This integrated approach – linking policy, participation, and place – offers a promising path towards building climate-resilient agricultural landscapes across California.

Research Design and Methodology

In this project, I conducted semi structured interviews with two small-scale farmers, visited three farm sites, and conducted discourse analysis of interview transcripts, field notes, and local and state agricultural policy.

Recruitment and Participants

I identified farms as eligible participants if they managed less than or equal to 500 acres in Sonoma County and their public materials (websites or outreach) referenced sustainability, regenerative agriculture, or conservation goals. I contacted eligible farms directly by email, with recruitment messages that briefly described the study purpose, estimated interview length, and confidentiality procedures. In total, three farmers/farm managers participated.

Ethical Considerations and Consent

All participants received an information sheet and provided informed consent prior to interview. Interviews were audio-recorded only with permission. Participants were given the option to have a pseudonym, and if chosen, identifying information was removed. Study procedures followed institutional ethical guidelines and data protection practices.

Interview Procedure

Semi-structured Interviews were conducted by the researcher for approximately thirty minutes, either in person or via Zoom according to participant preference. The interview guide covered topics such as the implementation of regenerative practices, observed on-farm outcomes, barriers and challenges, and interactions with agricultural and conservation policy. Interviews allowed for follow-up questions to elicit depth and informative examples. Field notes were taken during farm tours to capture details specific to the land, or information not provided during interviews.

Analytic Approach – Discourse Analysis

Discourse Analysis is the key method of analysis for this case study because it provides a "linguistic approach to an understanding of the relationship between language and ideology," which can be applied to understand the relationship and themes of the data in this study (Lupton, 1992). Analysis was conducted through thematic coding of interview data to capture farmers' experiences and practices, and discourse analysis of policy texts to examine how language and definitions shape opportunities and constraints.

Transcripts were initially open-coded using an inductive approach, identifying in-vivo and analytic codes that represented practices, perceived outcomes, and barriers. Coding of policy texts drew on Saldana's approaches to coding for interpretation and theory building (Saldana, 2016). Codes were grouped into categories and higher-level themes using comparison. Qualitative analysis software (Dedoose) was used to organize codes, retrieve coded segments, and visualize relationships.

To connect farmer narratives with institutional framing, I systematically coded relevant policy texts (state agricultural program and assembly bill descriptions and CDFA's definition of "regenerative agriculture") alongside interviews data. The discourse analysis focused on definitions, what is excluded, and the prescriptive implications of policy language.

Where possible, analytic moves linked themes from farmer interviews to specific policy framings. Throughout analysis I used triangulation across data sources to increase credibility.

Limitations

Key limitations include my non-random sampling strategy and the regional focus on farms that self-identify with sustainability language, which creates sample bias toward more conservation oriented operators, and the limited responses by farmers due to constraints of email-only recruitment – for example some farms do not access their emails frequently. These limitations are addressed by triangulating with policy documents and by providing rich, contextualized quotations to support claims.

Data Analysis and Findings

In my analysis, I trace how small-scale farmers in Sonoma County understand, implement, and experience regenerative and conservation-oriented agriculture within the broader context of state policy and climate change. The analysis begins by examining how farmers' everyday practices align with the California Department of Food and Agriculture's definition of regenerative agriculture, followed by a discussion of the ecological and economic improvements farmers attribute to these practices. I then situate these on-the-ground experiences alongside recent state policy developments, highlighting areas where legislative goals support – or fail to reach – small-scale farms. Finally, the last sections outline the policy navigation challenges and climate-related pressures farmers face, illustrating how ecological change, administrative barriers, and resource limitations converge to shape the realities of farming in the region.

I have five key findings from my research:

1. The CDFA's definition of regenerative agriculture successfully highlights the tension between statewide standardization and local realities.
2. The statewide framework of regenerative agriculture overlooks the immediate climate pressures that shape farmer's decisions, and fails to acknowledge climate adaptation as an outcome of regenerative practice.
3. All participants emphasized environmental and ecological improvements using conservation and regenerative practices.
4. State-level policy frameworks have strong commitments to regenerative agriculture, and highlight institutional recognition that regenerative practices yield long-term ecological

and economic benefits when farmers are provided with stable accessible funding and technical assistance.

5. Although these policy frameworks demonstrate a policy shift toward more inclusive and equity-oriented agricultural support systems, interviews and site visits revealed that the methods of support remain inaccessible to many small-scale farmers.

Defining Regenerative Agriculture for Statewide Policy

In the process of defining regenerative agriculture, The California Department of Food and Agriculture (CDFA) created a “Regenerative Definition Subcommittee" that engaged hundreds of people over the course of two and a half years to formulate a definition for reference by state agencies and departments. The finalized definition for regenerative agriculture is “an integrated approach to farming and ranching rooted in principles of soil health, biodiversity and ecosystem resiliency leading to improved targeted outcomes” (CDFA, 2025). A key follow up to this definition is the recognition that regenerative agriculture is a continuous process that provides benefits over time, it is not an endpoint.

This definition provides an important policy framework for evaluating the regenerative practices used by small-scale farmers in Sonoma County. By emphasizing soil health, biodiversity, and ecosystem resilience, the CDFA’s framing aligns closely with the practices many farmers in this study identified as central to coping with drought, heat, and declining soil quality. However, the definition is intentionally broad, positioning regeneration as a continuous process rather than a fixed set of practices. While this flexibility allows the definition to accommodate diverse production systems, it also creates ambiguity around implementation, verification, and eligibility for state-funded conservation programs. For the farmers in my case study, all of whom already engage in soil-building, low-input, or biodiversity-focused practices, this breadth can be both empowering and limiting – empowering because it legitimatizes their existing work, but limiting because broad definitions often translate into administrative requirements that small farms struggle to meet. The CDFA's framing highlights a central tension in regenerative agriculture policy – balancing statewide standardization with the local realities and resource constraints of small-scale farms (Finding 1).

Regenerative Practices and Climate Pressures

The practices used by the farmers in this study reflect many of the core principles outlined in the CDFA's definition. Across the sample, farmers reported using a range of soil-building, biodiversity-supporting, and waste reducing practices, including cover cropping, drip irrigation, mulching, compost application, using extra crops as animal feed, using grazing livestock for land management, diversified cropping systems, hedgerows, and reduced-tillage or no-till management. Examples of these practices in action include McEvoy Ranch's use of goats for brush control on their land (Figure 3) and a small farm in Penngrove, California using drip irrigation to reduce water waste (Figure 4). All farmers also emphasized limiting synthetic inputs and adopting low-input or biological pest management approaches. These practices collectively align with the CDFA's emphasis on soil health, biodiversity, and ecosystem resilience, illustrating how regenerative frameworks are already embedded in the everyday management decisions of many small-scale farmers in Sonoma County.

Figure 3 - Goats grazing to clear brush at McEvoy Ranch in Petaluma, CA
Cali Carter, November 2, 2025

Figure 4 - Drip irrigation system for growing crops at a small farm in Penngrove, CA
Cali Carter, November 2, 2025

While these practices align closely with the principles outlined in the CDFA definition, the policy framework does not address the outcomes of regenerative practices in terms of climate resiliency. For Sonoma County farmers, regenerative practices such as mulching, cover cropping, rotational grazing, and water retentive soil management are used primarily as climate adaptation strategies.

Throughout interviews and site visits, participants emphasized that climate change has become an immediate pressure shaping their operations. The farmers consistently described these as challenges that affect production, overall farm resilience, and local environmental health.

At Santa Rosa Junior College's Shone Farm, Program Coordinator and Instructor Johnny Campbell noted that the most prevalent climate issues are with frequent and severe wildfires and flooding. He explained that common climate issues they face throughout the year include "serious fires in the area" affecting the "air quality, people, and community" and that "access to the farm can be flooded" (Johnny Campbell, personal communication, November 3, 2025). These overlapping stressors illustrate how climate impacts are no longer isolated events but cumulative disruptions that strain both ecological systems and human capacity.

At McEvoy Ranch, the most significant climate-related challenge is with pests linked to warmer and less predictable winters. Agricultural Analyst and Compliance Coordinator Nicole Tracy noted that "the population of the olive fruit fly is directly related to not getting frost over winter," meaning that "rising climate conditions" directly enable pest population expansion (N. Tracy, personal communication, October 27, 2025). The olive fruit fly causes significant damage to olive crops, resulting in premature fruit drop, rot and increased spoilage. Additionally, as pest related climate challenges accelerate, regenerative pest management methods might lose their efficacy. This concern exemplifies the need for practices and policy that aim to slow the effects of climate change.

Together these experiences show how farmers in the region are navigating climate change not as a single issue but as an interconnected set of ecological shifts – from extreme weather events to changing pest ecologies – that complicate agricultural processes. These climate pressures highlight another gap between the policy language and on-the-ground motivations or goals, suggesting that the CDFA’s framing may overlook the immediate climate pressures shaping small-scale agricultural decision-making (Finding 2).

Ecological and Economic Improvements from Regenerative and Conservation Practices

Farmers in this study identified a range of ecological and economic improvements that emerged as they adopted or deepened regenerative and conservation-oriented practices. These improvements were not framed as abstract environmental ideals but as tangible, farm-level outcomes that increased their resiliency to drought, extreme heat, flooding, and rising production costs. Across interviews, participants consistently emphasized that regenerative approaches produced cumulative benefits over time, reinforcing the CDFA’s assertion that regeneration is an ongoing process rather than a fixed endpoint. At McEvoy Ranch, for example, Nicole observed that regenerative and conservation measures have kept their crop yields “constant and steady,” and even “slightly increased year over year,” contributing to “a higher yield overall” (N. Tracy, personal communication, October 27, 2025). This reflects a broader trend in which soil-focused regenerative strategies bolster both productivity and resilience.

The farmers in this study described noticeable enhancements in soil structure, organic matter, and water-holding capacity as a result of practices such as cover cropping, mulching, compost application, rotational grazing, and reduced tillage. At Shone Farm, Johnny explained that the no-till beds had "definitely more visible life" – including fungal hyphae, earthworm burrows, and darker soil color indicating higher organic matter – compared to more disturbed areas of the farm (J. Campbell, personal communication, November 3, 2025). Improved soil moisture retention was especially significant in the context of recurring droughts; participants reported that fields managed regeneratively required less frequent irrigation and were more resilient during extended dry periods. Farmers also noted increases in pollinator activity and beneficial insect populations after incorporating hedgerows and diversified plantings, contributing to more stable on-farm ecological interactions. An example of these diversified plantings to increase pollinators can be seen at a small farm in Penngrove, CA (Figure 5). These ecological changes were viewed as foundational, creating conditions that helped buffer crops against increasingly variable climate patterns.

Figure 5 - Floral diversity planting to promote pollinator populations at a small farm in Penngrove, CA
Cali Carter, November 1, 2025

The ecological gains described by participants translated into several economic benefits. Farmers reported reduced or eradicated need for soil inputs, such as fertilizers and pesticides, due to increased soil fertility and more balanced on-farm ecosystems. While regenerative practices often required upfront labor or investments, many farmers noted that these costs decreased over time as soils became more productive and systems became more self-sustaining. Some participants also connected regenerative practices to improved market positioning as customers increasingly seek out environmentally responsible producers, creating modest but meaningful economic advantages. For farmers operating on thin margins, even small reductions in input costs or small increases in customer demand were experienced as significant improvements (Finding 3).

Although not always articulated in explicitly economic terms, participants emphasized that greater climate resilience was itself a major improvement. Practices that enhanced soil moisture retention, moderated soil temperatures, and diversified production, or reduced reliance on external inputs collectively lowered the risks associated with extreme weather events. This lowered risk has economic implications – protecting yields, reducing losses during heatwaves, and providing greater operational predictability in a changing climate. For many farmers, this increased resilience was the most important outcome, even if harder to quantify than reduced input costs or improved soil metrics.

Local and State Agricultural Policy

Analysis of recent policy developments reveals a growing legislative commitment in California to support the expansion of regenerative and conservation-oriented agriculture, aligning closely with the experiences and needs expressed by farmers in this study. Assembly Bill 2734 (2024) significantly broadens the Healthy Soils Program by introducing multi-year grants for on-farm demonstration projects, enabling equipment sharing, and streamlining access to Climate Smart Agriculture programs through a unified application system. These reforms signal an institutional recognition that regenerative practices yield long-term ecological and economic benefits when farmers are provided with stable accessible funding and technical assistance. The policy movement mirrors the perspectives shared by participants, many of whom emphasized the need for more flexible grants, regionally accessible equipment, and support for scaling soil-health practices that mitigate drought stress, heat exposure, and rising production costs (Finding 4).

Further legislative action in 2025 – particularly the introduction of AB 937 and AB 947 – reinforced this trajectory by explicitly addressing structural barriers that small-scale growers face when pursuing organic certification or applying for state incentive programs. AB 937 proposed a centralized Organic Transition Program that consolidates financial support and planning resources for farmers preparing land for organic production, directly responding to the administrative fragmentation participants described when navigating state programs. Similarly, AB 947 strengthens the Healthy Soils Program by expanding eligible technical assistance to include training, conservation planning, grant writing support, and regionally shared equipment networks. These provisions echo farmers' calls for more hands-on assistance, especially for operations with limited labor capacity or specialized machinery needs, and demonstrate a policy shift toward more inclusive, equity-oriented agricultural support systems.

Together, these bills illustrate a rapidly evolving policy landscape that both reflects and reinforces farmer-led transitions already underway in Sonoma County. The emphasis on demonstration projects, technical assistance, planning support, and equipment sharing aligns with the cumulative benefits farmers attributed to regenerative and conservation practices in their interviews. By situating farmers experiences alongside these legislative developments, the findings show that state policy is increasing their focus on on-the-ground innovation, underscoring a key argument of this case study: meaningful climate-resilient agriculture requires not only farmer initiative but also sustained institutional investment capable of amplifying and stabilizing regenerative practices across diverse farm scales.

Farmer Interaction with Policy

Although these policies aim to support farms of all scales and promote regenerative practices, the farmers in this study reported receiving minimal support from these programs, illuminating persistent challenges with implementation. Across interviews, participants described policy engagement as confusing, time-consuming, and often inaccessible, especially for small-scale operations that lack dedicated administrative staff. These experiences stood in contrast to the policy goals outlined by California's climate-smart agriculture programs, revealing a gap between intended benefits and on-the-ground realities (Finding 5).

A core issue raised by both farms was the difficulty of navigating state and federal grant programs. Farmers consistently pointed to the absence of a unified application system, inconsistent communication about available opportunities, and a lack of accessible grant-writing assistance. Johnny at Shone Farm shared that "it's a lot of work to apply for these grants, a lot, often more work than its worth" (J. Campbell, personal communication, November 3, 2025). As a result, even when funding streams technically exist to support regenerative practices, farmers struggle to identify, apply for, and secure them. The long approval timelines for required permitting and mandated processes further compound these barriers, slowing the adoption of conservation practices and discouraging farmers from initiating grant applications in the first place.

Given these obstacles, farmers overwhelmingly described local-level institutions – not state or federal programs – as their most reliable source of support. This assistance often substitutes for grants rather than supplements them. Nicole observed that McEvoy Ranch receives significantly more “local scale” support than anything originating from state or federal agencies (N. Tracy, personal communication, October 27, 2025). Johnny at Shone Farm offered a practical example of this: Sonoma County’s compost incentive program. By purchasing compost from regional producers and distributing it to local farms, the county provides a form of material support that bypasses the burdensome administrative processes farmers associate with higher-level policy programs. “[The county] offers to buy a certain amount from them and they give it to local farms,” he explained, highlighting how streamlined, county-led programs can fill critical gaps left by state and federal initiatives (J. Campbell, personal communication, November 3, 2025). Although Shone Farm produces some of its own compost, this program supplements their additional need. Figure 6 shows a small-scale compost making process, with a rotating/churning machine at Shone Farm.

Figure 6 - Compost making system with compost rotator machine at Shone Farm in Santa Rosa, CA
Cali Carter, November 3, 2025

Together, these insights illustrate that while policy frameworks may signal strong commitments to regenerative agriculture, the mechanisms through which support is delivered remain inaccessible to many small-scale farmers. Their experiences point to an implementation landscape defined less by the absence of policy and more by the absence of usable, navigable, and timely support – an issue that becomes especially salient in the transition to the next section on structural challenges and policy recommendations.

Recommendations

The findings of this case study point to several policy actions that could strengthen the effectiveness, accessibility, and climate relevance of regenerative agriculture programs in California. While recent legislative efforts reflect meaningful progress, farmers' on-the-ground experiences reveal persistent gaps in implementation, administrative usability, and climate preparedness. The following recommendations address these gaps and aim to better align state policy with the needs of small-scale agriculture.

First, I recommend the development of an improved unified application system for all climate-smart programs. Although AB 2734 included the development of a unified application system, farmers described current grant systems as fragmented, inaccessible, and time-consuming, often requiring more labor than small farms can realistically spare. This centralized application portal, inadequately implemented after AB 2734, should be prioritized and implemented with simplified forms, clear timelines, technical support and accessible communication. Streamlining the process would reduce administrative burdens that currently prevent small-scale farms from accessing available funds.

Building upon this first recommendation, state programs should expand their technical assistance and regionally based support services. Participants frequently relied on county-level programs because state and federal resources were inaccessible or required specialized administrative knowledge. Expanding technical assistance – especially grant writing support, conservation planning, resource-sharing programs and implementation guidance – would close the gap between policy availability and actual uptake. Policies such as AB 947 already move in this direction, but farmers' experiences suggest a need for deeper investment and more assistance.

My third recommendation is the strengthening of climate-resilience components within regenerative agriculture policy. Farmers in this study adopted regenerative practices primarily as climate adaptation strategies, yet state definitions and programs often emphasize soil outcome over climate resilience as the result of these practices. Revising agricultural frameworks to explicitly integrate climate impacts – such as fire risk, flooding, and climate-driven pest pressures – would make policy more reflective of farmers' lived experiences.

Lastly, the findings in this case study support that the alignment between state standards and the realities of small-scale agriculture should be improved. Because broad definitions and rigid administrative requirements can disadvantage small farms, policy should incorporate more flexibility in eligibility, verification, and practice implementation. This transition would reduce structural barriers and ensure that regenerative agricultural programs serve the diverse farm sizes they aim to support.

Conclusion

The findings of this case study demonstrate that small-scale farmers in Sonoma County are already engaging deeply with regenerative and conservation-oriented agriculture, often out of necessity rather than compliance. Their practices – rooted in soil building, biodiversity enhancement, and low input management – reflect the core principles outlined in the CDFA's definition of regenerative agriculture, yet they exceed policy framing by functioning primarily as climate adaptation strategies. Farmers' accounts show that regenerative agriculture is an everyday, ongoing process that sustains productivity, strengthens resilience, and mitigates ecological pressures in a rapidly changing climate. These grounds highlight the practical, cumulative benefits of regenerative systems while also revealing critical gaps between policy intent and lived agricultural realities.

State policy developments such as AB 2734, AB 937, and AB 947 signal growing institutional recognition of the importance of soil health, climate resilience, and equitable access to conservation resources. However, farmers in this study reported that these commitments have not been matched with accessible implementation pathways. Administrative fragmentation, limited technical assistance, and slow permitting processes continue to hinder farmers' ability to participate in programs designed to support them. As a result, local institutions – rather than state or federal agencies – often provide the most meaningful and timely assistance. This mismatch underscores a central finding of the case study: effective policy is not only a matter of legislative design, but of usability, clarity, and the capacity to reduce rather than reproduce administrative burden.

Taken together, the findings affirm that California's regenerative agriculture policies hold significant promise, but that their potential will remain limited without targeted improvements in administrative accessibility, technical assistance, climate responsiveness, and alignment with small-scale farm realities. Implementing a functional unified application system, expanding regional technical support, strengthening the climate relevance of regenerative frameworks, and increasing flexibility in program design would collectively move state policy closer to the experiences and needs documented in this study. Ultimately, supporting regenerative agriculture in practice requires an approach that recognizes farmers as partners in climate resilience – whose knowledge, labor, and localized ecological expertise form the foundation of sustainable agricultural systems. Ultimately, this case study shows that climate resilience grows through the interaction of ecological stewardship and public commitment – and that effective policy must recognize farmers not simply as program recipients, but as essential partners in sustaining California's agricultural and environmental future.

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