Regenerative Agriculture Needs Assessment

A Participatory Action Plan for Advancing Regenerative Agriculture through Research and Extension

Abstract

This living document aims to support the development of the UCCE Regenerative Agriculture program. Through a combination of interviews, listening sessions, and on farm site visits, a regional assessment was conducted to evaluate how farming communities perceive and understand regenerative agriculture, understand the types are regenerative farms and regenerative practices that exist in the regions, and determine different limitations and barriers for successfully transitioning to regenerative practices. Through a community engagement lens, we identify key extension and research topics to focus on, with the aim to support successful, farmer centered, agroecological transitions in Northern San Joaquin Counties and Central Sierra Foothills. This document is meant to be a guiding ship for program development, as well as provide insight into how farming communities in these regions are experiencing, thinking about, and managing for different agronomic, economic, and ecological priorities.

Sara Rosenberg, PhD. Regenerative Agriculture Advisor
Stanislaus Merced, Mariposa County, UCCE

Srabani Das, PhD. Regenerative Agriculture Extension Specialist, UC Merced

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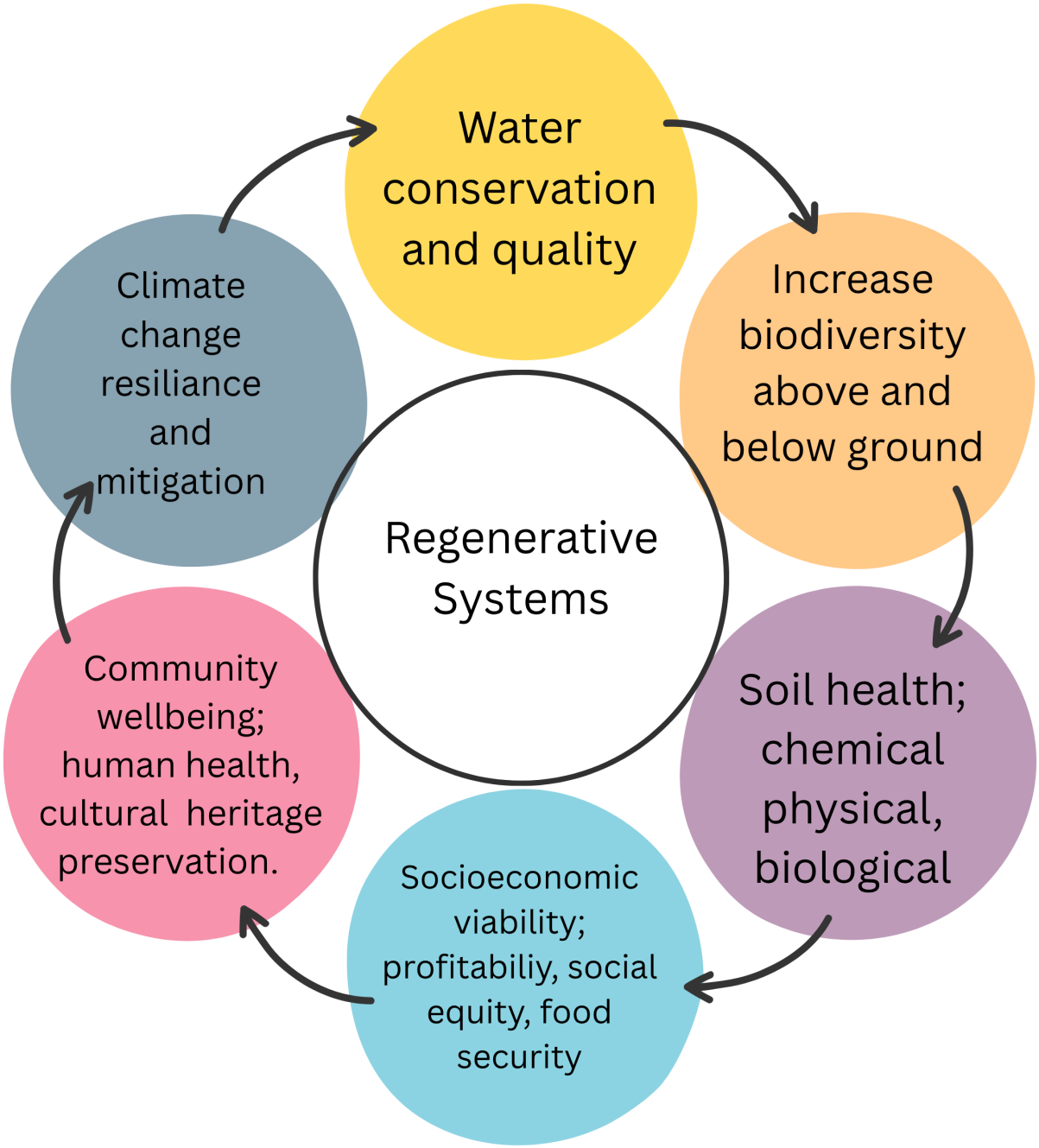
Defining Regenerative Agriculture

Regenerative Agriculture as a term is currently getting a lot of attention in respect to its respective propensity to bring about sustainable solutions to complex problems our societies are facing. However, a clear definition of regenerative agriculture is still up for debate. As readers of this document will discover, agriculture producers and land stewards have different views on what regenerative agriculture looks like and how it is defined, based on region, agriculture scale, and agroecological goals and motivations. However, at the root of all these differences, we will see overlapping aspects to perceptions, and a pedagogy of farming centered around principles which are grounded in soil health and biology. The California Department of Food and Agriculture (CDFA) definition, which was developed in 2024 for

state programmatic purposes, defines Regenerative Agriculture is “an integrated approach to farming and ranching rooted in principles of soil health leading to improved targeted outcomes. This approach is informed by the traditions and innovations from the original Indigenous stewards of the land.” The Definition reflects that “Regenerative agriculture is not an endpoint, but a continuous implementation of practices that over time minimize inputs and environmental impacts and further enhances the ecosystem while maintaining or improving productivity, economic contributions and community benefits” (*CDFA, 2025*). While this definition may not satisfy everyone, it resonates with many of the participants perceptions and understanding of regenerative agriculture as well. Jayasinghe et al., 2023 notes in their literature review of regenerative agriculture that definitions for regenerative agriculture should continue to remain flexible and adapted to different community of practice context and sustainability goals. However, what should be appreciated is that there are overarching agroecological goals that every group shares.

Regenerative agriculture follows five basic principles mirrored from ecological theory: Reduced disturbance, optimize photosynthesis and living roots, maximize biodiversity, support animal integration and wellbeing, and understanding the context in which you practice. These principles are used in practice to achieve five interrelated goals: Climate mitigation, soil restoration, biodiversity enhancement, water resource protection, and socio-economic viability, and community wellbeing (Al-Kaisi & Lal, 2020;Sher et al., 2024). Research has shown that when promoting nature-based management practices which can be

adapted to different cropping systems and environments, agriculture can provide win-win scenarios for agronomic, environmental and economic goals (Nwaogu et el., 2024; Power, 2010).



Schematic showing improvement and conservation outcomes as they relate to soil, biodiversity, water, climate, community wellbeing and socioeconomic viability.

Regenerative systems strive to manage a holistic set of practices which achieves natural resource conservation and increases the capacity for ecosystem services to support agronomic and economic needs. Management practices are chosen for their ability to improving soil health, as it relates to chemical, physical and biological properties; increase biodiversity both above ground and below ground, restore habitat, suppor water quality as well as water conservation, and increasing resilience to climate change while also mitigating climate greenhouse gas emissions. Furthermore, regenerative agriculture strives to maintain socio-economic viability. Economic benefits can be experienced by cost savings, increased or stable yields, and can extend beyond the market value of agricultural commodities, such as supporting rural economies and creating jobs, providing food security, or diversifying on-farm income (Dey et al., 2024; Jayasinghe et al., 2023). Importantly regenerative agriculture stives to understand economic potential beyond yield and looks at all aspects of direct and indirect costs and benefits effecting short term and long-term profitability. Finaly, regenerative systems may provide socio-cultural functions, such as maintaining the social cohesion and capital among communities, offering agritourism, educational activities, preserving cultural heritage, traditions, and traditional food systems, and a sense of regional identity (Buckton et al., 2023; Loring, 2022).

Multifunctionality

Multifunctionality is the concept that agriculture can provide multiple services beyond producing food and fiber, including broader environmental functions, as well as contributions to socioeconomic and socio-cultural welfare (Renting et al., 2009). Multifunctionality is the lens in which we measure and understand how agricultural systems are achieving the five interrelated goals discussed above. Concepts of multifunctionality are key for evaluating regenerative systems by measuring multiple outcomes across space and time. These frameworks are often situated in using ecological theory and ecosystem services to organize outcomes and metrics. They often delineate four categories: Provisioning, Supporting, Regulating, and Cultural services. Provisioning services are understood as products of ecosystems that provide water, food and raw materials. Supporting ecosystem services are services that maintain fundamental ecosystem processes. These services underpin all other services such as soil formation, nutrient cycling, water cycling and biodiversity (Rosenberg et al., 2025). Regulating services are benefits obtained through moderation or control of ecosystem processes, including regulation of climate, air, or soil; carbon sequestration; flood, erosion, or disease control; and pollination. Cultural services are non-material benefits that result from our interaction with the natural environment and places our existence and experience in the agricultural space as an important outcome indicator (Romanazzi et al., 2023).

While literature differs in the exact services under each category, these frameworks allow us to decipher different ways to monitor outcomes, changes, and measure resilience at the farm level and landscape level. Furthermore, these assessments can reveal correlations and synergies among different indicators, which can help us finetune strategies to achieve win-win scenarios.

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The importance of advancing regenerative farming systems in California

Regenerative agriculture has shown an ability to increase agriculture resilience and help farmers cope with increasing challenges related to climate, soil degradation, water scarcity, economic instability, and increased regulatory pressures. These wicked challenges are encroaching on producers and threaten Californias agriculture sector and food systems sustainability. According to recent analyses, between 500,000 and 900,000 acres of irrigated farmland in California's Central Valley could be permanently taken out of production due to long-term water scarcity challenges Public Policy Institute of California, 2023). The state's enacted law, Sustainable Groundwater Management Act (SGMA), a law enacted in response to the continued over drafting of groundwater basins across California, is a major driver of this decline (Hanak et al., 2019). Water scarcity issues in California are shaping a future where farm production and economic revenues will fall, and many growers may be forced out of agriculture. Land values in areas with reduced water access have continued to drop up to 50% (Penny et al., 2025). Farmers have experienced a considerable increase in costs of production, while crop prices remain volatile. Aggregate statistics on fertilizer costs show prices soared between 2020 and 2022 and stabilized at higher- than-average levels in 2024 (USDA, Economic Research Service, 2025). The American Farm Bureau reported that some fertilizer prices increased by as much as 300% in certain areas (Ag information network, 2025). Price changes for nitrogen, phosphorus, and potash illustrate the volatility farmers face for high dependency on external inputs (USDA, Economic Research Service, 2025). At the same time, commodity prices are subject to volatility based on production yields, inventory levels, and global market dynamics.

Climate modeling shows that the climate in California has changed significantly and is expected to continue changing in the future, justifying the urgency and importance of enhancing the adaptive capacity of agriculture to reduce vulnerability to climate change (Pathak et al., 2018). The snow accumulation in the winter and spring months on the Sierra Nevada historically provides almost 80% of the state’s precipitation in an average year. Hydro-climatic changes are attributed to the decreases in the snow-to-precipitation ratio resulting from the increasing temperature trends across the state (California Department of Water Resources, 2024). Daytime heat waves in the Central Valley are increasing in number. Extreme heat waves and later season shifts have extraordinary impacts on crop productivity. Individual crops have specific optimum temperature ranges (temperature thresholds) at which vegetative and reproductive growth thrive and exposure to extremely high temperatures during these growth stages can affect growth and yield. Many fruit and nut crops require cold temperatures in winter to break dormancy. Furthermore, climate change may have impact on pathogen development and survival rates and modify host susceptibility. Plant diseases, insects, and invasive weeds are mostly caused by temperature-related climate factors, with the invasion of previously uninhabitable areas. The San Joaquin Valley is identified as one of the most vulnerable agricultural regions (Pathak et al., 2017). Particularly, agriculture in the Imperial Valley and the corridor between Fresno and Merced are found to be very vulnerable to climate change (Pathak et al., 2017).

Considerable research and implementation of regenerative transitions exist but thus far these efforts are insufficient to meet the needs of California state sustainability goals, as well as historically underserved and dispossessed communities. The Farmer Equity Act, states that CDFA shall provide resources, outreach, technical assistance, and decision-making power to "Socially Disadvantaged Farmers and Ranchers" defined as groups whose members have been subjected to racial, ethnic, or gender prejudice these growers (*Farmer Equity Act*, 2025).

By advancing regenerative agriculture, California can build resilience, enhance ecosystems, and ensure the long-term viability of its farmlands and farming communities. To support socially and ecologically accountable agricultural transitions, regionally specific action plans involving research, extension, education and policy changes need to be made. By socially and ecologically accountable, we mean supporting the integration of a suite of principles, practices, and processes such as cover cropping, crop-livestock integration, regional composting, beneficial uses of fire, water conservation, biodiversity conservation and circular economies, while developing programs with an equitable lenses to understand and overcome systemic challenges related to economic, racial, social justice, land access and food sovereignty and food access issues.

Regenerative agriculture action plan

Regenerative practices are critical for safeguarding communities and building resilient food systems. Yet, adoption of practices considered regenerative remains low across California's complex agroecosystems, and multiple barriers limit the advancement of equitable food systems. Regional climatic, cultural differences, and the diversity among types of crops and operations across the state, makes transitions towards integrated systems challenging. Successful adoption requires targeted approaches with regional distinctions in mind. Successful transitions also require involvement from communities of practice in the decision making of action plans at the state and regional level.

University of California's Cooperative Extensions (UCCE) has decades of pioneering research, leadership, development, extension and education within California. UCCE was developed to connect research and education from the universities to communities. Yet historical models of technology and knowledge transfer were dominantly one way. Current models now seek farmers and farming communities at the center of the research and education development phase as well as incorporating their feedback, experiences and knowledge throughout programs. Putting farmers at the center of agricultural research and extension efforts has many benefits. Participatory methods can promote co-learning, knowledge exchange, and the co-development of targeted solutions to overcome challenges identified by communities of practice.

At the same time, University of California has evolved in understanding and moving interdisciplinary research into the field, particularly the intersection between agriculture, natural resource conservation, and healthy communities. The California Organic Agroecological Regenerative group (COAR), an example of these interdisciplinary initiatives, is a research, education, and policy initiative across UC & UC ANR that seeks to support social and ecological transitions to just and sustainable regional food systems (*COAR*

Transitions, 2025). Interdisciplinary work can leverage community-engaged, policy-relevant research and action-oriented educational programming to enact change. COAR uses agroecology as a transdisciplinary framework to build on ongoing transition efforts, including organic and regenerative agriculture, and to synthesize and extend transition opportunities in collaboration with local, regional, and statewide partners.

The UCCE Regenerative Agriculture Action Plan dispels new knowledge around what the current baseline and understanding of regenerative agriculture is in distinct regions of California, including Northern San Joaquin Valley, and Central Sierra Foothills, and articulates crucial and achievable extension and research goals. This action plan therefore is rooted in a regional context of what works and what knowledge gaps exists, as well as what resources are needed to support successful transitions.

UCCE recently instated two Regenerative Agriculture advisory roles to develop and implement an extensive and interdisciplinary program to meet these needs. The regional Farm Advisory roles cover services for Mariposa, Merced and Stanislaus Counties. While Specialist role housed at UC Merced, provides statewide support. Program development for these positions requires a comprehensive and rigorous needs assessment to inform the UCCE Regenerative Agriculture Program in achieving the goal of supporting successful adoption and transition to regenerative agriculture systems. To this end, in 2024 and 2025 the UCCE's first embedded regenerative agriculture program, implemented a comprehensive regenerative agriculture needs assessment throughout the Northern San Joaquin, and Central Sierra Foothills regions. The objectives of this assessment were to 1) learn how growers perceive and understand Regenerative Agriculture 2) determine what regenerative agriculture looks like, what regenerative practices are being used, and how farmers are experiencing benefits. 3) Determine agronomic, economic and ecological challenges and barriers limiting successful regenerative transitions, and 4) identify opportunities for future research and extension goals for these selected regions.

For Objectives 1-3, data is provided revealing outcomes for both the San Joaquin Valley and Mariposa County to demonstrate differences across agroecozones. However, this document summarizes research and extension opportunities (Objective 4) for the San Joaquin Valley only. A full needs assessment document can be found here (need to add link), which summarizes research and extension needs in both San Joaquin and the Central Sierra Foothills.

Methods

Mariposa	8	Interviews
	5	Field/ home visits

SJV	20	Interviews
	8	Field visits
Total	41	

to achieve our objectives, a mixed method approach was implemented including semi structured interviews and listening sessions, as well as field visits. Thus far the needs assessment has conducted 28 interviews, 10 field tours, and organized four listening sessions. Qualitative coding software (Nvivo14) was used to explore semi structured interviews and uploaded summary notes of the listening session responses by analyzing themes and relationships using deductive methods.

Interview questions covered topics related to three themes: Perceptions and attitudes, what farming regeneratively looks like in the region, and what challenges exist. The analysis process was iterative. Interviews were analyzed and preliminary results were shared back to community members at the listening sessions, then discussions were facilitated to gain feedback on current outcomes and expand on findings. Questions were posed such as what if anything does you feel is missing? How can we successfully support regenerative agriculture transitions? What resources and information are needed?

Listening sessions

Four listening sessions were organized by UCCE with 12- 50 participants attending. Sessions were held in Merced, Modesto, and Cathey's Valley. One session was aimed at tree nut producers, one was aimed at annual cropping systems, one was for small farms, and one for the Mariposa region specific. A fifth listening session, not organized by UCCE, was held in Fresno, with similar objectives. For the small farms listening session, the topic of SGMA and water conservation were selected as topics to learn about and discussions arose around what types of water conservation practices were used on small farms, what knowledge and experiences exists about SGMA regulations, and what may be needed to increase knowledge flow of SGMA for small farmers. A sixth listening was facilitated at the 2025 Rural Justice Summit in Collaboration with COAR group members. Outcomes of this session were geared towards understanding how different stakeholders were engaging with agroecological transitions, what work has been successful in supporting transitions and what further research was needed to support this work.

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Listening sessions held at Burroughs Family Farm, and Cathays Valley Winter and Spring of 2024.

Needs assessment interview participation

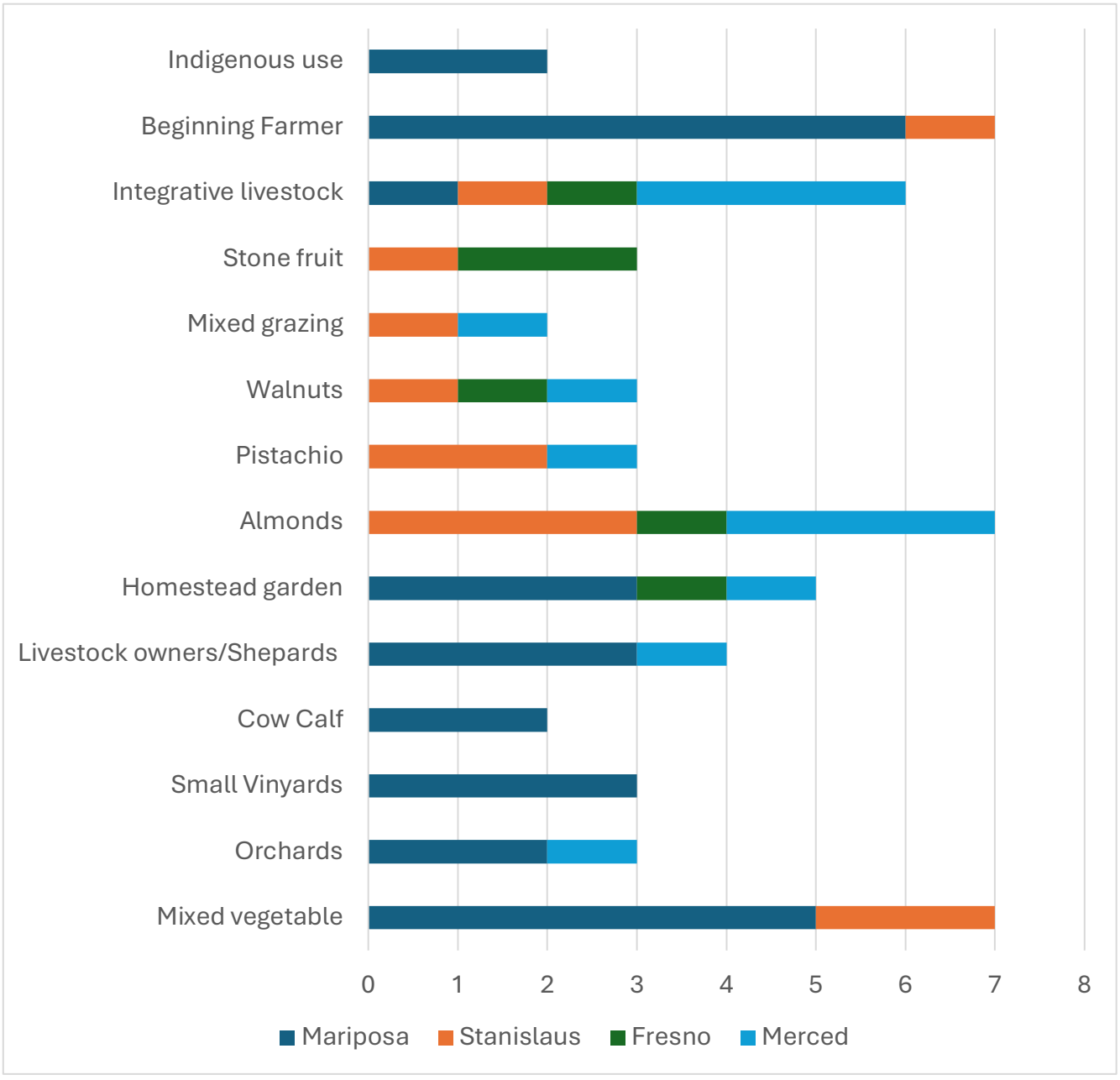

Figure 1: Types of production and land stewardship that interviewers identified with by county. Some producers had more than one type of system then managed.

Of the interviews that took place some farmers managed more than one crop or production system type (Figure 1). In Merced and Stanislaus, interviews tended to focus on tree nut producers and livestock operations, while Mariposa County focused on small scale farms, mixed vegetable crops, and beginning farmers. Fresno had the fewest farmers interviewed.

Site Visits

Site visits were included with every grower who participated in the interviews, as well as 8 small farm site visits in Merced and Stanislaus County, and 5 homestead/new landowners from Mariposa County. Most small farmers in the SJV did not participate in the interviews due to language barriers. At each site visit, the farmer/landowner and advisor walked parts of the fields and discussed over-all production practices, and issues experienced, as well as overall sustainability goals. Observations were taken via notes and photos by the advisor.

Small poultry farmer in Merced County

Regional typology

Regenerative farms, and how growers place themselves on the regenerative spectrum is highly diverse, context and cropping system specific, and motivated by a number of both cultural, marketing, social, and agroeconomic factors. These differences are important to acknowledge because they are factors that enable or disable adoption, and they help us to understand motivations for and perceptions of regenerative practices. Being able to meet growers where they are and work with them to support sustainability goals will improve adoption potential.

San Joaquin Valley

The San Joaquin valley regions (SJV), Merced, Stanislaus, and Fresno are dominated by medium sized farms, over 85% are 300 acres or less (Fresno County Crop Report, 2023; Merced County Crop Report; Stanislaus County Crop Report, 2023; USDA-NASS, 2025). Furthermore, the landscape is also dominated by mono-cropped orchard systems. The top crops in the counties are fruit and nut orchards at 465,282 acres and field and forage crops covering 716,330 acres, and the livestock and poultry sector which brought in over $662,659,000 in 2023. Beyond these medium sized farms, Merced Stanislaus and Fresno have a large population of small, diversified farms, that are managed by Hmong and Hispanic communities.

"In my area of Merced, we have a lot of almond trees. We have a lot of row crops from the Hmong small farming communities, and they do a lot of farmers markets. As well as dairies where they're raising mainly corn and silage."

Fresno county top crops are also fruit and nut orchards with a focus on stone fruit and fresh fruit production, totaling 773,780 acres Merced County ranks fifth in the state and sixth nationally in market value of farm products according to the USDA-NASS. Current trends show orchards are coming out, due to water shortages, and increased financial burdens from SGMA groundwater fees. At the same time, many orchards are surpassing their peak production ages. Some fields are transitioning back into trees, but many are being removed permanently due to water challenges and market decline. Those removed permanently are faced with the challenge of knowing what to plant next, if anything at all and many farmers are at a standstill.

"In my area there are a lot of almonds going out because of SGMA, not enough water."

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Mariposa County

Mariposa county is nestled in the Central Sierra Foothills and is made up largely of grasslands, oak woodlands, and mountain environments. Here we have a rising population of beginning farmers, and new rural landowners in the region. Most agricultural products are direct to market. Furthermore, the region continues to struggle with food-insecurity. Ranked second highest in CA for child food insecurity, with some reports suggesting over 70% of households faced food insecurity at times. Mariposa (and Merced) counties have higher food insecurity rates than many urban areas, often due to fewer resources and isolation (CMCAA, 2025). Many land stewardship practices in the area include indigenous land use, fire and grazing. As private land ownership expands in the Sierra foothills, there is a lot of parceling of property. For example, what used to be large rangeland holdings, are now 5–20-acre parcels, which makes land management more challenging. Demographics in the region suggest rural landowners are often elderly in age, and unable to maintain homesteads(*Mariposa County*, 2025). There is a need to balance multiple goals here including habitat, wildlife, landowner goals and agriculture goals, as well as Forest Service, National Park, BLM goals (Mariposa County Report, 2023).

"You can own an acre and completely self-sustain your family, doing Market Garden, right? That's the whole premise of, like, high intensity vegetable farming, and there's unlimited need in this community"

Sierra foothill regions fostered mostly ranches and small diversified specialty crop farms that focus on direct to market and support local food systems (Mariposa County Report, 2023). Specialty crops grown in Mariposa County are also growing and include organic fruit and vegetables, apple orchards, flower farms, and vineyards. In recent years, there has been a greater interest in growing new crops and new methods such as hydroponics and aquaculture techniques. The County's diverse soils and microclimates provide opportunities for increasing the number of specialty crops. Furthermore, these small farms provide opportunities to attract investors to the County and provide opportunities for agritourism. With over three million visitors to Yosemite National Park annually, agritourism can provide benefits that farm through extra income, diversify county economic streams from the park and provide a reason for tourists to stay longer, and provide educational opportunities for the public (Mariposa County Report, 2023).

Categorizing regenerative systems

Practices used considered regenerative

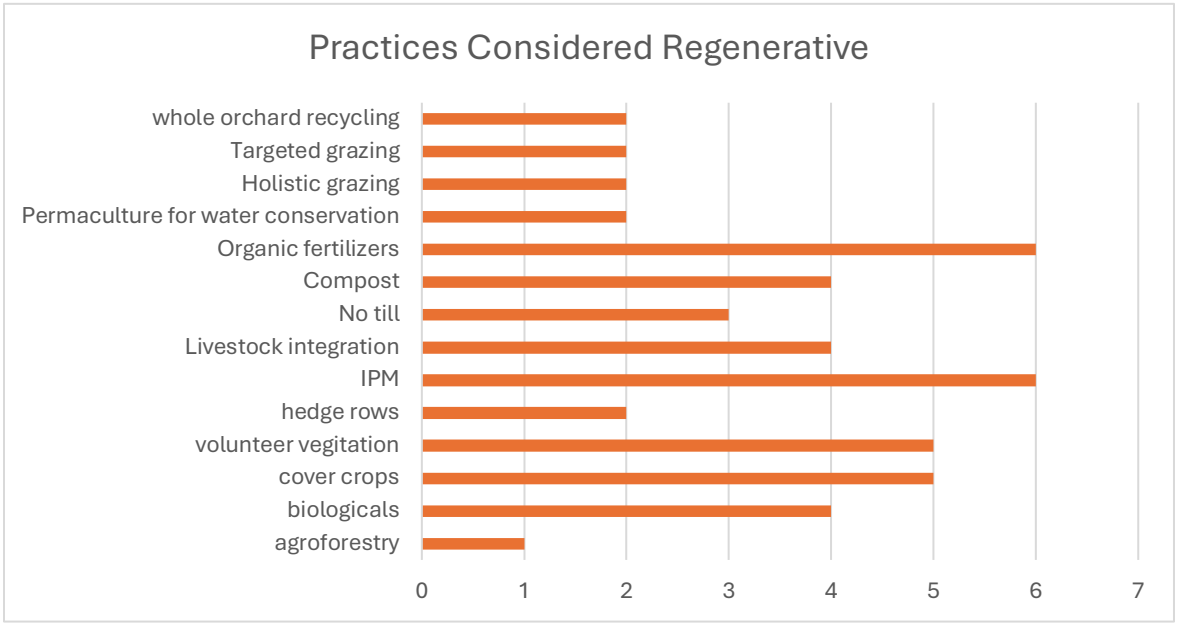

Figure 2: Regenerative practices growers reported using in the interviews. Count is based on the number of growers that mentioned using this practice.

Interviews revealed which practices were most common, and what regenerative farms looked like. Organic fertilizers, compost, IPM, volunteer vegetation, cover crops, livestock integration, and the use of biologicals were practices most often used in farming systems. Other practices that came up in conversation include hedge rows, no-till, permaculture design for water conservation, whole orchard recycling, agroforestry and types of rangeland management such as targeted

grazing or holistic grazing. While regenerative is often understood as a spectrum, where growers are continuously improving towards a full integrated system redesign, interviews revealed a slightly different paradigm. While there were degrees of integration, which ranged from being fully integrated and organic, to a lesser integrated more conventional system, growers were not

internally understanding their systems on a progressive scale, rather were entering into regenerative practices based on their motivations, values, and sustainability goals.

Conventional regenerative

The largest group that was interviewed would fall in the conventional regenerative space, where they identify themselves as regenerative, but still use the conventional toolbox, such as synthetic nutrient inputs, pesticides, and herbicides. This group tends to integrate practices such as maintaining soil coverage, integrating cover crops or volunteer grasses, integrating livestock, integrating IPM practices and integrating biological sprays. The hybrid approach and use of these practices have reduced their dependencies on inputs greatly, though they still use them sparingly in their management system when needed. In this same group, many growers had more than one crop they managed, and they tended to own and/or operate on the medium to large scale. Furthermore, how and when they integrated practices depended on the crop, and the current year's production needs and circumstances. They would make choices to integrate practices when it makes sense for the crop management needs, this includes harvest time, labor demand, certain requirements like frost needs, and marketability. For example, sometimes growers took breaks from planting cover crops. If cover cropping did not fit with the cropping system protocol for harvest timeline, or they had poor experiences in the past, or the cost and timing of planting the cover crop was not feasible, they would not use this practice.

Food safety was the biggest limitation for considering integrating livestock in certain crops. There were several orchard almond producers and walnut growers or pistachio producers who were use sheep. Some small orchard growers were integrating chicken tractors, or mixed livestock heard. but most did not feel it fit with food safety regulations, particularly stone fruit producers felt they were at the highest risk factor. Many felt even if there was adequate data to show that the food safety risk was negligible, it wouldn't matter to the packers or consumers.

"We have chickens at our house, I brought the chickens out and cherries fell, and it was the best day of the chicken's life, chickens and cherries. In a perfect world I would have 500 chickens, and I would run them out there after harvest, they would eat all the cherries. But if I told the marketer, packer or retailer that we have chickens, it's not a fanciful story of closing the loop for nature, it's a huge food risk."

Small pistachio farm in Merced maintains soil coverage in the alley ways with mostly volunteer grass and clover.

Cover crops and compost were the two practices that most producers discussed "trying out" when they began integrating regenerative practices to their fields. While some of the participants interviewed were classifying themselves as trying to transition, many other conventional regenerative growers did not think of themselves as in the process of transitioning. Rather they are pragmatically picking practices that will be feasible, and adaptable to their current conventional systems guidelines. Furthermore, implementation of practices is motivated by their goals to reduce dependencies on inputs and increase crop health, rather than more extraneous biodiversity or habitat conservation goals.

Organic, regenerative, or organic regenerative

Generally, when regenerative farms are advertised, they are the face of farms that identify under these highly integrated levels. These farms were often practicing organic protocols, and often certified either as organic, regenerative, or a hybrid of regenerative and organic. Though these farms are in the minority- they distinguish themselves by integrating most of the commonly used practices considered regenerative and organic together.

Fully integrated farms tended to have an external motivation beyond the crop that led them to maximize efforts for biodiversity. For example, these growers were also concerned about building habitat, using hedge rows or managing wildland or wildlife corridors, to some degree, and valued external ecosystem services directly. In contrast, those who were still transitioning or considering themselves conventional still took a crop centric approach and focused on applications that could target building crop health. Both groups acknowledged the need to support soil health, microbial function, and water conservation, and encouraged high levels of biology on the farm.

Small farms and local food systems

Small diversified farms that defined themselves as regenerative generally manage their sites for hotspots of diversification and try to solve social equity issues. These small farms intentionally manage their farms for ecological health. They implore high diversity

techniques, including hedgerows, and habitat, as well as soil health practices. Beyond this, they are focused on regional sales, utilizing CSA farmers markets, and farm stands, and integrating agrotourism. These farms tend to believe in their impact at the local level and are interested in issues around food access, social justice, and land equity issues.

Regenerative rangeland

Regenerative ranching was not as prevalent in interviews, but these systems also existed separately from the traditional concept of the regenerative spectrum and may even have their own spectrum. Most practices for these land management operations centered around grazing practices, with a concentration on density and duration of grazing to regenerate grasslands, as well as land conservation practices to reintroduce habitat, restore riparian zones, and increase Silvo-pasture. A related branch is targeted grazing for fire mitigation efforts. This is becoming a popular option in the foothills both with cattle and goats. Most rangeland involved in these interviews are used for cow calf operations, or stocker operations.

Regional distinctions

“a blueberry patch next door doesn’t spray anything, but they are not organic. Another farmer nearby is trying to make their own fertilizer, with organic walnuts. Pistachio grower running sheep in his pistachios. Most growers felt that the initial motivation was financial. One neighbor here has nothing to do with regenerative. He's just like I’m not putting inputs anymore, I’m just going to put water in and that’s it. So, um the joke on my podcast is being accidentally regenerative.”

There were regional distinctions for how communities identified themselves. In the foothills most farms that identified as regenerative to some degrees were small diversified market gardens. There was also an interest in exploring regenerative practices from an agrotourism standpoint. In the foothills, there is a lot of "unused farmland.”

“There's a lot of previously cultivated farmland that was orchard or ranching, and then it turned residential… and we just keep meeting community members who know they live on former ag land want to do something about it, but don't know what to do.”

In the San Joaquin Valley regions growers were described as trying to transition through multiple avenues and innovative ways. There are many medium to small-scale farms that are involved in a farmer led network, trying new practices on their own. For example, Merced and Stanislaus have a large, yet often underrepresented small farms community, dominated by Hmong and Hispanic farm communities with a focus on diversified vegetable production on small farmland parcels, often with short term leases. These farms depend on farm stands and often have contracts in other regions like the bay area and the California coast. These farms generally do not identify themselves as regenerative and may not be implementing practices particularly focused on ecological sustainability. They are dominantly managed using hand labor and have low to minimal access to equipment. While

the use of the terminology for regenerative practices is not as common in these communities, they still practice crop diversification strategies and have a wealth of knowledge around growing culturally relevant food for their regions.

Small Hmung farm in Merced County growing Taro.

Perspectives on regenerative agriculture

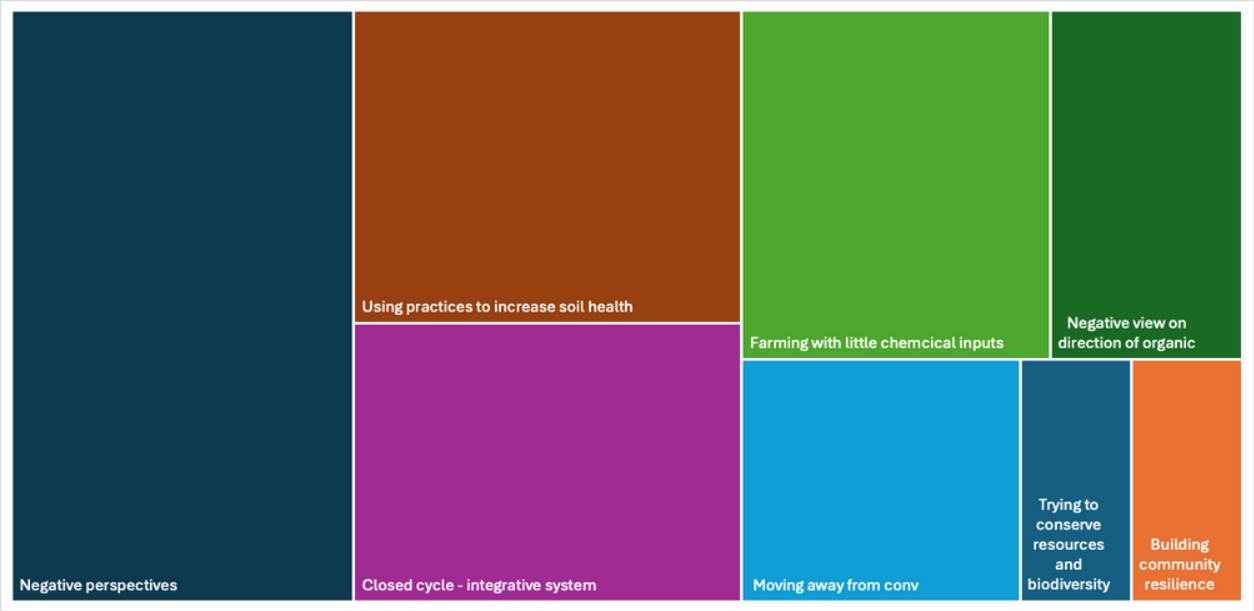

Figure 3: Perspectives of RA. The size of each square is based on the number of references from the interviews coded to each theme.

"It seems to mean, farming in a way that allows the ecosystem to develop more fully the ecosystem to more and more act like an ecosystem um rather than just being simplified down to a very like a strict manageable level… something like that."

There is agreement among growers about the goals that regenerative farms are trying to achieve. Most comments described regenerative practices as a "holistic approach to farming" that integrated practice to achieve soil health, water conservation and biodiversity goals. The four major themes that growers brought up in conversation include *using practices that increase soil health, developing a closed cycle approach to farming that is integrative, farming with little chemical inputs, and moving away from conventional methods*. While most growers described regenerative as more than just soil health, most of the statements shared perspectives that soil health was the central principle for a regenerative system, and that if you could attain soil health then you were achieving regenerative outcomes. "[Soil health] ...It corrects everything. It's true it corrects whatever problem you're having." But just as many statements connected this sentiment to a broader understanding that a regenerative system replicates nature or mimics an ecological closed system that reduces waste or inputs. Growers agreed that a regenerative system was not just one new practice but an integration of many practices that produced a holistic approach to

farming.

There were significant distinctions between regions. In the San Joaquin Valley, there were many opinions that regenerative was synonymous with moving away from conventional systems, largely aimed at reducing input dependency of herbicides, miticides, pesticides and fertilizers. Mariposa County prioritized the goal of helping communities become healthier and likened regenerative farming to "good backyard gardening practices". This is in alignment with the overall attributes of the region struggling with food insecurity and focused on direct to market farm sales, and small diversified farms.

"I think it's all about community resilience. If you have a community that's supporting you, you can trade produce. You don't have to grow everything you want to eat. You can do one thing and trade with your neighbor for this or that for resources and all that"

Many farmers presented with negative attitudes of the term regenerative, suggesting that it was overall meaningless. They worried about the greenwashing from larger companies, or farms and organizations taking advantage of the term for marketing purposes. Some felt it was just another evolution of the term sustainable or organic. All of them agreed it was a marketing term.

There was some contention in the San Joaquin Valley community between growers who aligned regenerative with an organic system and those who felt it was a separate effort. Those who diverged from the organic title felt like regenerative was a movement in reaction to the strict certification processes that organic had evolved into. The sentiment was that organic farms no longer foster the environmental and sustainable goals that it used to. Rather, it has become another version of a conventional system that just replaces synthetic inputs with organic certified inputs. Farmers also felt like there was no incentive to move into an organic certification because the organic markets were saturated in their regions and therefore premium prices were no better or finding contracts were limited. Generally, rather than situating themselves as organic or not organic, farmers who were interviewed in the San Joaquin Valley preferred to discuss regenerative as "farming with little chemicals". This was a key component behind adoption and this mentality allowed for the inclusion of conventional growers to start "coming to the table".

"It's just another buzzword. First, we were organic …so then we started saying we're sustainable farmers, and now we say we're regenerative farmers and it's all the same thing"

Benefits experienced by growers

Figure 4: Benefits growers experience with RA practices.

"I saw increased water holding capacity. The year of all those rains really, really did a number on our pasture at the time because we were also subleasing out to a man who had cattle and he did not adhere to the amount of cattle I told him was allowed on property. He didn't rotational graze. So, like half of our pasture was just sitting water during all that those storms"

All growers interviewed considered themselves regenerative to a degree. But some had been practicing much longer than others, and in general they were integrating more practices than newer adopters. Most farmers interviewed had been integrating practices for 3 years or less. Those that have been practicing for over five years started farming this way rather than transitioning the farm from a conventional or input heavy system. Growers defined several outcomes they were experiencing under three main categories: ecological, economic and agronomic. Water retention and soil health were the two biggest benefits that growers mentioned under ecological benefits. There was an emphasis throughout the interviews on how soil has been

improving in its water holding abilities as well as its infiltration ability. All farmers that are implementing principles for soil health had a comparison story about their fields and the fields next door and how their fields were more resilient to heavy rains and flooding events.

"And we are using half as much chemistry as other people. Fertilizers I am using is sparingly and effectively".

Pest management was a dominant benefit for small, diversified farms in the foothills as they discussed their focus on habitat and biodiversity. However, for the orchards, their discussions around pest management were focused on the limited need for chemical inputs to control mites and fungus, and they associated this with their crops having a better natural defense system through fine tuning the crops nutritional needs. Biological inputs such as foliar applications and increasing soil biology were two ways that they were achieving this. These two dichotomies were relevant among the ways in which regenerative agriculture was implemented and talked about.

Organically certified almond orchard. Second year trying out cover crops, compost, and livestock

The two economic benefits experienced included cost savings, and social impact on community health and food access. Majority of growers who experienced economic benefits directly to their farm discussed reducing operational costs in the form of inputs, and labor for tractor passes. However, there was some conflicting stories about labor reduction. Particularly those who were using biologicals and still experienced similar if not more labor demands as before they started managing the farm using regenerative practices, and they did not express similar cost reduction experiences. Small farms, particularly in the foothills expressed the benefit they felt with regards to how their operation was able to feed the community more, using less expenses they could reduce the cost of food for their customer base in the community. Economics is a complex issue which every participant touched on as either a barrier or a benefit for regenerative transitions in some capacity.

Motivations for becoming regenerative

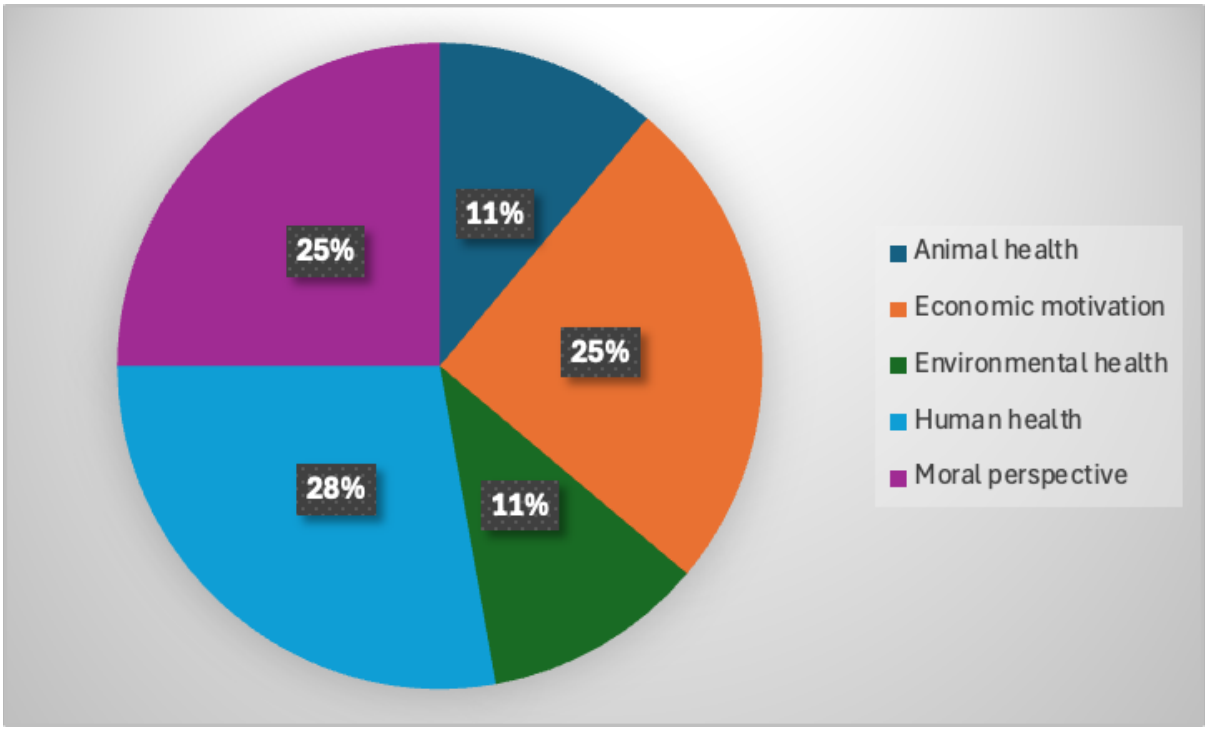

Figure 5: Motivations for adopting regenerative practices. Percentages based on number of growers. Some growers fell into multiple categories.

"My dad was spraying all this crap when I was younger, and I had to spray it too. You have this consideration that this isn't good. You have systems in place where, you're buying everyone from a chemical company, you have a system in place you are fighting a system and having a life revelation that you are doing something wrong. It's easier to keep doing something wrong than to acknowledge it and change. My friend's dad died of cancer at 69 but we don't connect it to that."

Understanding what motivates farmers to adopt practices is important for how we may start to communicate benefits and how we may start to target our research focus. Farmers fell under five main categories for what motivated them to use regenerative practices in their farms. Three major motivations stood out as motivations for transitioning over to regenerative practices. 1) the value of human health and wanting to maintain a healthy work environment for their families, workers, and consumers, 2) an economic perspective that correlates regen farming to higher economic outcomes-adapting/ integrating principles for water, nutrient management, and pest management. 3) A moral perspective, to improve the land that they are stewarding.

Nearly every farm in the SJV that had some origin story in conventional agriculture and had a story to tell about their family's direct impact with

health issues related to chemical exposure and low food nutrition. They were proud of reducing the need for inputs in their farms and supporting systems that they believed increased crop nutrition.

Participants discussed a moral sense of responsibility which motivated them to manage their farms using regenerative practices. They mentioned feeling like they had a duty and a connection to the area because they were born there, or because there was a moral perspective of managing the land in a way that improved the health of their system.

"For me it has a lot to do with the fact that almost all my friends have an autistic kid. I almost feel embarrassed that our kids are not. I could name of 15 closest finds 8 of them have autistic kids."

"People cut corners, you must have your own moral code, want it and believe it. I have met a lot of regen farmers. It's rare to meet someone on the cusp of being regenerative. You must have a life event, enate curiosity perhaps. A financial breakdown, a horrible disease in family. Something that says I am going to reevaluate the system."

Motivations for regenerative farming practices in the foothills were often closely tied with wanting to support food access issues, increase agrotourism opportunities with proximity to Yosemite National Park, and support self-sustaining systems for homesteaders and new landowners. This region also tended to connect field site practices with a motivation to improve land stewardship practices that will help reduce wildfire and support healthy oak woodland ecosystems. They were very conscious about applying land management practices suitable for their regional agroecozones.

"Whether you believe its inherently better for the soil, inherently better for animals, or for human health, or higher nutrition product side of things, the motivation to change cannot be purely economic."

Barriers to adoption

SJV Barriers

The barriers for adoption fell into seven major categories for SJV. This includes transitioning barriers which presented as agronomic tradeoffs, followed by economic barriers, challenges with incentive programs, challenges with integrating livestock, barriers due to SGMA regulations, marketing barriers, and land ownership barriers (mostly for small farms). Below, percentages are reflecting the number of references coded to each theme.

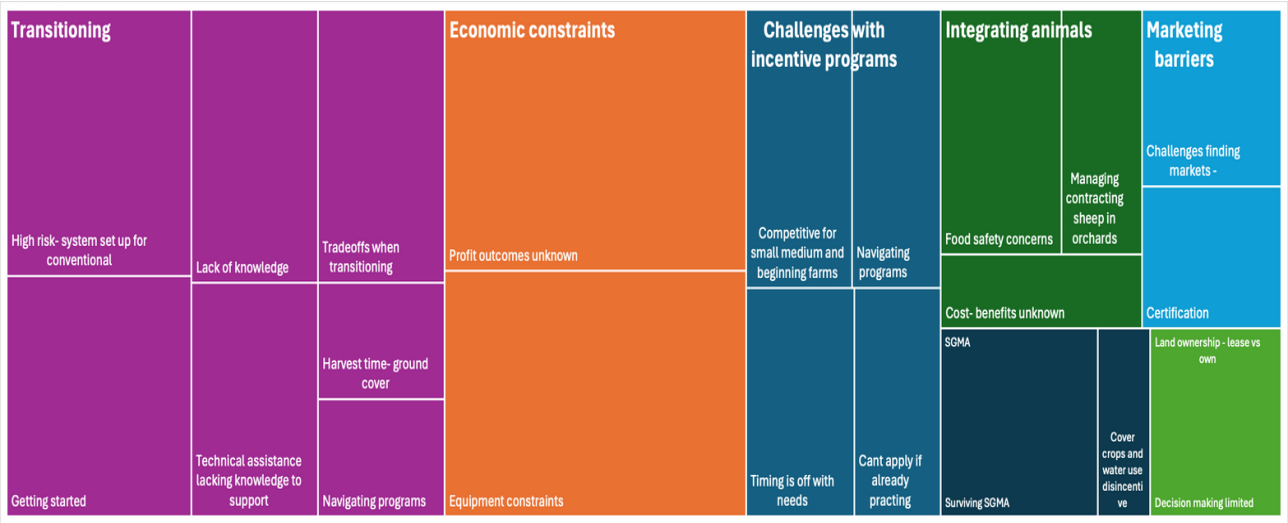

Figure 7: Barriers to adoption for successful integration of regenerative practices in SJV. The size of each square is based on the number of references from the interviews coded to each theme.

Agronomic Transitioning Challenges 38%: Interviews revealed that growers experienced exceptionally high risk to their operations when trying to change the system. Growers continually discussed that their farm systems were set up for a conventional model such as their pest management and nutrient management regimes, the equipment used for harvest, and irrigation design. Adapting new practices came with what was described as "domino effects" of tradeoffs that disrupted everything else. Some examples of these challenges included irrigation damage due to an increase in rodent pressure, a lack of proper equipment to manage biomass from ground cover growth, increased fungal pressure, or needing to adapt new nutrient management regimes. This was compounded by limited guidance, lack of knowledge and inability to get started or know where to start. Growers are still struggling to know when to terminate cover crops and how based on the different cropping systems. Many farmers have adapted to using volunteer vegetation growth rather than cover crop growth due to the management ease and this raises more questions around differences in optimizing ground cover benefits.

"Yeah, I had massive gopher problems with the cover crops, so I'm realizing I can't do that again…we had a cover crop go to seed, and it returned the next year/ and it was the year we had a lot of rain. We mowed it for crop protection, and we got smoked by frost. I put them in baby trees, but then we had gopher city in the cherries."

"Those weeds will grow up above the irrigation lines, and you won't get good cover with the water."

Economic constraints 26%: Related to the transitioning challenges that risk disrupting the system, are the economic constraints. There is a lot of hesitation to invest in management

"Okay It's hard to correlate less fertilizer. I feel like I do a lot of soil and tissue analysis, but I'm always putting on something because I'm trying to try to have the soil do as much work as it can for me but I'm always deficient in Nitrogen or potash."

changes due to limited understanding on when profitability would be realized. This data gap continues to limit farmers ability to transition and take risk. Current low returns of crops, high debt, and high costs of labor and investment in conventionally oriented equipment limit farmers' ability to take the chance to adopt new strategies. At the same time, property values have decreased due to an inability to pump ground water. Economic constraints are directly related to the costs of switching technology and equipment to support new regenerative management regimes. There is a need to support mechanisms to transition over to relevant equipment and technology that fits with regenerative systems such as off ground harvest equipment, moving irrigation off the ground, mowing equipment suitable for berms and high biomass loads, equipment to help move biomass around and different spraying options for biological applications.

Challenges working with technical advisors and navigating incentive programs 17%: Challenges with incentive programs continue to arise in conversations. While incentive programs have helped, there were a lot of comments regarding how the execution and program structures are difficult to navigate. Some comments included a need to increase competitiveness for small and medium scale farmers, provide better support in navigating the programs that are suitable to different growers needs, improve timing of the programs so that they link up with grower needs, and expand on eligibility to those who may already have implemented certain practices but are trying to improve or expand on them. There was a concern for how incentive programs were providing support. Growers described sentiments that programs tend to home in on conventional farms who have never done these practices before, trying to get scale rather than support successful adoption on a farm that is on the journey of regenerative integration and needs to build their capacity. Furthermore, discussions arose about the lack of knowledge PCAs and CCAs and other advisors have regarding RA systems. Related to this, there are many challenges growers have when working directly with the UC system. There is contention with researchers due to historic power dynamics, and a lack of inviting growers to the table when discussing research questions or outcomes. While growers were interested in furthering research in the field, they felt like they wanted to be given a voice in the direction of that research, and program development. This also directly relates with how growers receive research that may be relevant to them, but due to the lack of trust, or desinence in communication of findings in a way that connects with them, they are unlikely to seek out this

"Then navigate all these programs, and these programs take twelve months to apply, and you're like; I need this next week."

"There's a lot of debt and prices are low, new equipment has just gone through the roof; we don't have that kind of money"

"I'm not seeing any fertilizer benefit with the sheep yet, and I still end up coming in and mowing after they graze."

work. Finally, stakeholders admitted that there is often lack of programmatic funding for continuous support- the lack of follow through on project timelines limits successful adoption in the long term.

Small farm in Merced County using mulching techniques and growing lemon grass.

Integrative livestock challenges 11%: The SJV offers an agroecological landscape that can support integrative livestock due to the large amount of orchard crops and livestock. Furthermore, there is an interest from orchard producers in integrative livestock, however the concerns with food safety, management, and unknown economic benefits, remain the leading barriers for coupling livestock and crops in the region. At the same time limited research has focused on the impacts of ICL on livestock wellness and contract grazing economic considerations.

Marketing limitations 8%: Finally, and not surprisingly, respondent are interested in certifications and transitioning to regenerative but feel that there is little market incentive for wholesale and this remains a barrier. Surprisingly this was not a topic of conversation that came up often. Weather because it is expected and already known as an issue, or because it wasn't a priority concern for farmers is unknown.

Challenges for SJV small farms in SGMA era

The small-farm listening session divulged that these farms encounter multiple challenges related to water conservation efforts and irrigation technology, information flow and policy dynamics with SGMA, and lack resources to support implementing and adapting regenerative practices for a small farm context.

Water technology adoption challenges: Farmers expressed they had limited options for irrigation technology that was affordable for their size of operations. Related to this, they requested better support for setting up irrigation technology which would help increase water use

efficiency and limit water waste. Often small farms are turning off and on water by hand. Some farmers suggested they use flow meters for the whole farm or have multiple small flow meters for each farm plot, but maintenance and accuracy challenges exist with both. Interestingly, while industry representatives expressed that farmers did not trust new technology, farmer groups discussions showed that they were craving new technology but at affordable prices and that would fit their farming scale and context.

Livestock owner in San Joaquin Valley shows his heard he contracts out for grazing.

Water conservation practices used: Small farmers shared what type of farm conservation practices they used which included the use of plastic or mulch, shad structure and using drip irrigation rather than furrow irrigation. They mentioned an interest in moving drip underground, but they did not possess the proper equipment to help with this as well as an interest in expanding shade structure in summer months. Fallowing sections of their land during the summer to lower water needs was another practice being used. There were limited practices with a focus on ecological strategies, such as supporting soil's ability to cycle water better, increasing micro habitat, hedge rows or cover cropping, increasing soil coverage through living mulches etc.

Regenerative management for water conservation and other co-benefits challenges: There were a few farmers that had experience with soil health practices for water conservation efforts including composting and cover cropping, however, most did not. These farmers described their experiences with cover crops as challenging. Particularly with managing wildlife like squirls and gophers. They had a hard time achieving proper germination. One farmer mentioned integrating chicken tractors to help with biomass control in their orchard which was working well for them, but they they would like to experiment with other ways of managing cover crops like roller crimpers. Those who had experience with cover crops expressed an increase in infiltration as the biggest benefit they experienced.

At this listening session there was a disconnect between stakeholders and TA providers understanding of water conservation efforts being centered on agroecological practices, but farmers conservation practices are centered around technology implementation practices. In general, small farm technology promotion for water conservation dominated the conversation. And there is a need to couple this with regenerative management practices. Furthermore, small famers felt like many regenerative strategies did not work in their fields well due to limited

equipment access, and short-term leases make long term changes difficult with respect to diversification and management practices. Some comments arose around and interest in small farm recharge basins or biochar on small farms, but they didn't know how to get involved.

SGMA Policy and regulatory communication challenges: SGMA challenges mostly fell around communication issues. Although most people in the room said they knew what SGMA was, no one understood their regions SGMA sustainability plan or how they were supposed to comply with regulations. Many didn't know how to contact their district, or which district they were in. There was a big ask to increase communication streams with GSA's and thoughts around how to reduce adversarial relationships between GSA and farmers, by providing more pathways for farmers to provide feedback and communicating across groups equitably. This meant being conscious about language and technology literacy, socioeconomic circumstances, and other resource barriers. For example, while many industry reps and TA providers discussed farmers should not rely on satellite data alone and use soil moister sensors and flow meters, there was a disconnect with small farmers not even knowing how satellite data worked, and how to access it/use it. Furthermore, the group discussed how to shape SGMA in a community protection perspective first and foremost, and a need for more water education showing the impacts on rural communities. For example, how people are experiencing dry wells or no running water. There were questions around how housing development effected water allocation and concerns with water conservation demands having negative impact on crop quality and marketability.

Barriers to adoption for Mariposa County

Mariposa county presented with different challenges then SJV, requiring a different programmatic focus to support regenerative transitions. Percentages presented below are based on the number of references coded to each theme

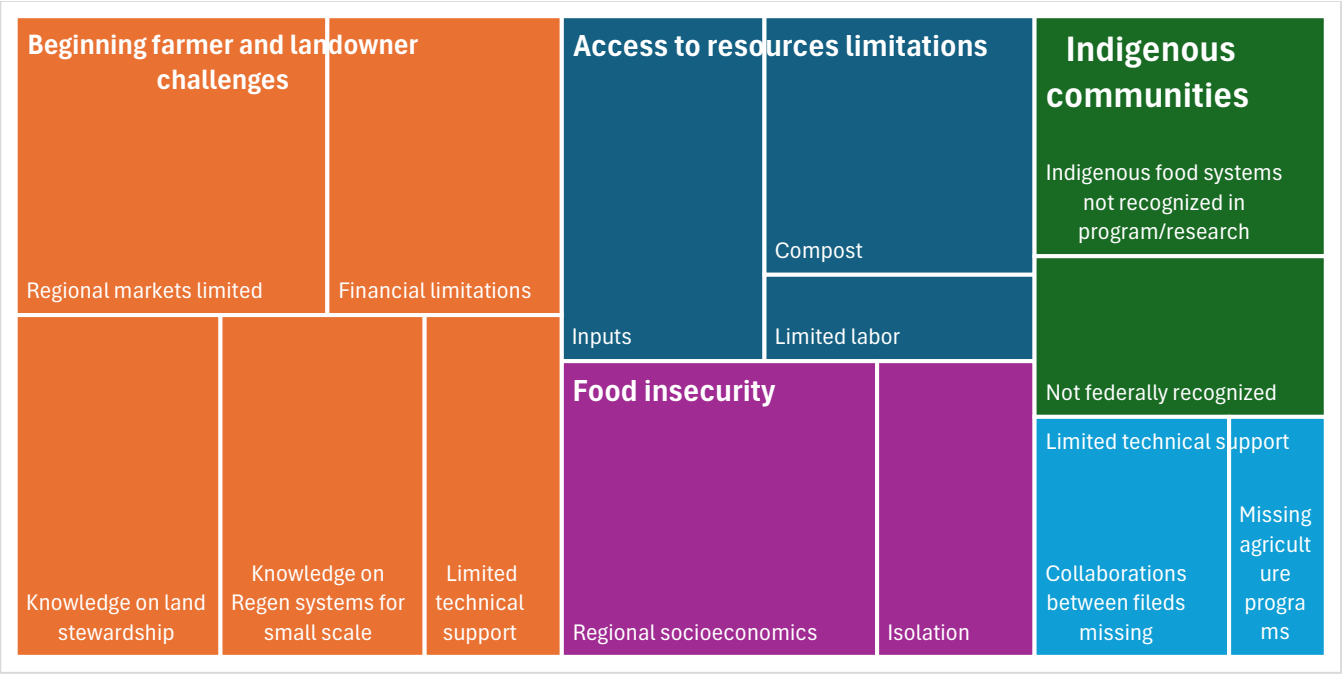

Figure 7: Barriers to adoption for successful integration of regenerative practices in Mariposa. The size of each square is based on the number of references from the interviews coded to each theme.

"Regional markets are limited. Well, we don't have the scale to do a regional market. We don't have enough produce. Yeah, it's uh, It's a tough business. That's, you know, that's why Fouch Farms doesn't do veggies anymore. Like, when I started Fouch Farms, we did everything. Like, everything. We had broilers, we had goats, we had pigs, we had beef, we had eggs."

Beginning farmer and land-owner challenges - 42%: There is an influx of beginning farmers and second career farmers, as well as new landowners in the region. Beginning farmers tended to be in positions where they want to venture into regenerative farming and start a farm from scratch but had financial limitations and knowledge limitations. Knowledge barriers include there being a steep learning curve for beginning farms and overall lack of understanding about what regenerative farming is. Complimenting this is the knowledge required for new landowners. Many new landowners are moving from other parts of California, with limited knowledge about how to manage lands for fire prevention, wildlife habitat, or maintain grazing lands. Other small farms, particularly vineyards are going out of business or changing land ownership structures. Being situated in the Sierra Foothills and mountain regions means having limitations related to marketing as well. Many farms focus on local farmers markets and CSA models. However, there is a concern if more farmers

"…I mean, our biggest challenge is our own stupidity. We're new! we're learning as fast as we possibly can, but we make mistakes."

"It's hard to do something if you've never seen it done before or you don't have anybody to talk to it about and you're like You know. It would have been a lot nicer when I switched over to No Till to have somebody else, I could have talked to instead of just reading a book or watching it on YouTube or something."

move into the area, these markets will be saturated.

Access to resources - 19%: Resource access is a challenge due to the isolation factor in the region. Farmers are expected to drive to the San Joaquin Valley if they need to purchase fertilizers, soil amendments like gypsum or lime, or irrigation supplies. Compost is difficult to access due to the transportation fee to travel up the mountain. This is a concern with cover crop seed as well. The transportation cost for delivery is high, and sourcing for small parcels of land is also difficult. Finally, labor is limited in the region. Finding local full time farm managers or part time labor is a challenge for most farms in the region.

Compost brings it out here or there as needed. And they charge like the transportation fee and then the hourly fee and a diesel price. So it ends up being, you know, then that adds it quick, especially if you're on fixed income or doing anything commercially. Just your little homestead, your land that you're managing. Right.

Socioeconomics - 17%: Food insecurity and isolation are two challenged the region broadly faces and is a motivation for increasing local food systems. There is a lack of capitalizing on social assets in the region, despite the community being close knit, sentiments were that groups did not talk to each other as much as they would like. Economic challenges include financial limitations, ranches and vineyards going out of business or selling land, and some livestock owners complained about increased feed prices during years when fodder was scarce.

So yeah, so that was like the little bit of market research, as you did for her grant, really revealed the food insecurity issue. And then Mariposa County, HSA put out a very similar findings when they did their own internal study that, well, not internally, a study that they published to the Board of Supervisors HSA Health and Human Services. So, yes, so they, they published that, I think, earlier this year or late last year, and is a very similar, you know, insecurity, food insecurity, is a challenge.

Small vineyard in Mariposa County. Ownership recently changed hands to new landowner from bay area.

Indigenous food systems under recognized - 14%: There is a large indigenous presence in the region, and their land stewardship is not recognized as a part of agriculture resource paradigm. The Southern Sierra Miwolk, furthermore, is not federally recognized.

Limited technical support - 8%. Due to the size and isolation of the region, and historical focus

on rangeland and livestock, there is limited technical support in the area. Farm advisors limited.

Extension road map

SJV extension

The integration of the interviews and the listening sessions resolved four major themes required for SJV extension program development. Community engagement through listening sessions and interviews revealed four major extension goals to focus on to support successful regenerative transitions. Under each of these goals, specific strategies are described.

1) Increase knowledge and resources required for regenerative practices and their implementation strategies.

2) Increase social capital for grower communities to improve engagement with other farmers and groups that are also managing regenerative farms and working towards regenerative goals.

3) Support farmer led and farmer co-developed models to affirm that programs are applicable and meaningful to grower circumstances.

4) Reduce risk for farmers and ranchers to implement and experiment with new practices on their operations.

Extension strategies

Develop a Regenerative Agriculture Roadmap/Blueprint decision support tool, which would be helpful for those trying to transition out of conventional systems. The road map would give instruction for integrating practices and management considerations to minimize agronomic tradeoffs. There were comments that these needed to be separated by cropping system and frameworks developed for small vs large scale. There were also considerations for post-harvest management needs.

These decision support tools could support cleaner and more successful transitions, to reduce agronomic tradeoffs. Furthermore, the road map could provide a clearer understanding of the expected agronomic benefits and tradeoffs and delineate specific management changes that may be needed such as when to terminate cover crops, how to manage berms, how to and by how much to reduce fertilizer usage, what to expect for returns etc. related to this is an information hub for RA, whether that was a physical location or a better network and online resources that can be accessed for regional information, resources and networking needs.

Adaptive management trainings: While a roadmap was discussed to support farmers interested in transitioning, the idea of a prescriptive approach is not ideal and may cause more failures if adaptive management training is not also prioritized. IPM and integrative nutrient management trainings are crucial for growers to learn adaptive management principles and practices. Providing adaptive management courses would be useful to move away from this prescriptive approach. This includes ecological literacy, soil health training, and integrative nutrient management and integrative pest management.

First annual Farmer Ag meeting bringing farmers together across San Joaquin Counties to discuss Regenerative agriculture.

Provide education on certification options. Growers are interested in certification processes for regenerative production. But currently there are numerous options all with different requirements, reach, and marketing impact. Certification can be beneficial to connect products to consumers and achieve a higher price. However this is not always the case and benefits of certification programs are often lost on farmers. Providing more cohesive understanding of structure, benefits, and requirements for different certification options for growers would support their decision making if certification was of interest to their sustainability goals.

Provide information on requirements to comply with FISMA and SGMA. These are two regulatory entities that currently impact growers' ability to implement regenerative practices. Beyond wanting more information, there was a major concern with regards to how SGMA is tracking water use and not incentivizing regenerative practices such as cover crops. Looking into

developing more mechanisms for GSA's to incentivize regenerative practices (Turlock GSA as an example), through MLRP program is a priority for many who attended the listening sessions.

Increase access and development of technology for small farms: Farmers expressed an interest in learning about new irrigation technology but also needed better implementation support. Current industry representatives, and TA providers are still unable to offer support for the context of the small-scale farm. Technology needs to fit their farming scale and context – small plots, highly diversified, technology literacy may be low, labor is low.

Increase access and development of equipment share programs were a big topic of interest. Both for small and medium sized farms. Current efforts exist for executing a small farm equipment lending library. Farmers will need trainings for how to access this program.

Regenerative agriculture mentorship program. Social networking among these growers is grower across the entire San Joaquin Valley and needs to be invested in to build social capital. The Farmer Ag Network is an example of a farmer led initiative to support growers in transitioning to regenerative strategies. For increasing social capital, farmers consistently spoke of wanting to develop a regenerative agriculture mentorship program. Though there are organic mentorship programs through the Organic Agriculture Institute and CCOF, none exist for those who do not want to transition to organic and want to maintain the conventional toolbox.

"I think seeing how the other farmer did it and seeing it work on a day-to-day level in person in real time, I think changed everything. And I think that's where your position and your advisors can offer the most support for farmers by, setting up those demonstrations."

On farm demonstrations and experiments: Growers also mentioned an interested in increasing on-farm experiments and field demonstrations to show real-world results which support grower-to-grower learning opportunities. Related to this was the interest in sharing stories that reflect the regenerative journey and can create clarity in practices and encourage the practice.

Increase coordination efforts between stakeholders: Growers are overwhelmed and frustrated with the number of stakeholders and all the different programs being offered. Increasing the coordination and collaboration among all of us would be beneficial for assuring program impacts and limiting competition and redundancy. Other issues that were dominating the conversation

"It was nice to have that invite and space to talk and feel like we could run things as farmers and not have a PhD or whatever."

included supporting building better relationships between researchers, extension, and other technical advisors

Improved communication efforts across stakeholders and groups: Related to improving relationships between growers and other stakeholders was a need to increase the capacity to communicate with growers. Rather than expressing the benefits of certain practices or principles as benefits for the environment, home in on the practices that can be solutions to their specific agronomic challenges. “We should be working with growers to include sustainable practices as solutions to growers’ agronomic challenges instead of focusing on just the environmental benefit.” Usually these go hand in hand, but how we communicate them could be more deliberate for the agronomic side. For example, most programs focus on carbon outcomes. But most growers in SJV are extremely concerned with water and high input resources. Looking at how to articulate benefits in the form of water credits or nutrient saving credits would be helpful.

Field day hosted by Point Blue at organic regenerative farm in Merced County. Community member talks about services they provide for planting cover crops.

Improve communication efforts for SGMA policy and regulation: There are major communication issues with regulatory expectations! Current avenues for communication are causing confusion or not reaching small farm communities. Most small farmers know what SGMA is but do not understand their districts sustainability plan or how they are supposed to comply with regulations. Many didn’t know how to contact their district, or which district they were in. There was an ask to improve communication streams with GSAs and to reduce adversarial relationships between GSA and farmers while providing more pathways for farmers to provide feedback and increase communication across groups equitably.

Increase cooperative farm models: Often certification programs are inaccessible to farmers, especially organic certification programs. Rather, there are interests in cooperative farm models for modes of transitioning. These models can support efforts to increase knowledge in the field of agroecology, increase access to resources and land, support Cooperative food hub and aggregator which small scale BIPOC farmers can engage with, but also, regeneratively grown purveyors could source from.

Rancher to Rancher field day education event on regenerative ranching models with Sierra Foothills Conservancy

Participatory Guarantee Systems/Participatory certification models is a model that could support compliance with the policy, sustainable pest management roadmap, possibly others Certified Naturally Grown has a system like this. Inclusion of participatory guaranteed systems where farmers work together to come up with the standards and to verify compliance with sustainable pest management road map. This is a piece of the procurement effort they are working on. Does not want state to come up with standards. Part of this effort may include expanding on engaging small farm and indigenous communities meaningfully to harness a wider range of community perspectives and develop programs gearing towards increasing local food system demand, and social equity issues.

Farmer driven outcomes and monitoring decision tool to track progress on farm when transitioning. This corresponded with the discussions related to the development of a roadmap for transitioning to regenerative practices. Current efforts with UC Davis exist is developing an outcome based participatory assessment tool to model agroecological transitions. The aim is to create and validate a practical outcome-based framework to assess agroecological practices within mid to large scale perennial production systems in California's SJV. There could be collaboration opportunities here to engage Farmer Ag Network and other growers in co-developing this tool.

Increase toolbox of regenerative practices for small farms: There is still overwhelming desire for access to proper equipment needed to implement new practices. There are also limitations with incentive programs not providing funding incentive programs that fit small scale context. Few farmers involved in the listening session held had experience with soil health practices for water conservation efforts, most identified non nature base solutions for water conservation and irrigation technology solutions. We need to improve promotion of coupling water saving technology with being ecological sustainability, can we promote both? Furthermore, we are

missing an ability to promote regen practices and technology adoption in the context of small. For example, small farmers have trouble with accessing equipment needed for planting or applying practices. leasing land makes long term changes difficult. There is a growing interest in recharge basins on farms but how can small farms get involved? There is a growing interest in biochar in farms, but how can small farms get involved if the product is only sold in bulk at cost?

Free to fail trails. The frustration with the high economic risk of transitioning conventional systems to hybrid approaches was a main topic. Providing a space for farmers to freely experiment, and innovate, to learn how management needs to change when implementing new practices or combinations of practices would alleviate this risk barrier.

Improve incentive program reach and applicability. Related to this, farmers are utilizing the incentive programs such as NRCS programs, HSP, RCD, and research students. These are helpful but incentive programs may not be supporting enough to get farmers to the point of successful adoption stage. Program follow through, and incentive programs that are flexible enough for growers to adapt to their context and needs is still needed.

Economic decision support tools and economic information over short term and long term, and further information on understanding what the timeframe for growers to experience profits is needed.

Research

SJV research needs and interests:

Nine areas were illuminated for future research focuses. This includes research on economic considerations, expanding on multifunctionality research, evaluating nutrient management changes for hybridized systems, evaluating benefits and tradeoffs for integrative livestock, investigating options for transitioning out of orchards, efficacy tests for biological inputs, targeting research on how RA practices effect water dynamics, evaluating the impact of RA

systems on crop nutrient density, and quantifying RA system impact on input reduction streams at the farm and landscape level.

Further research on economic considerations of regenerative systems such as flexible cost-benefit analysis and long-term modeling is needed. Understanding implementation costs of practices, and how direct and indirect benefits affect profitability over time will help growers understand risk better. Analyzing probability of achieving profits would be helpful as well. Targeting where profits and savings can be capitalized will also help growers identify ways to maximize profits with these systems.

Quantifying system benefits and tradeoffs and better understanding them at a regional level is still needed. Much of this work is currently happening with a large focus on almonds through UC Davis but expanding multifunctionality assessments which target farms within selected regions and for other tree crops such as pistachios, stone fruit, and annual systems is needed. More research on how different cover crops affect residue management would help growers with vegetation management. Similarly looking at organic versus conventional systems as well as homing in are scenarios such as cover cropping mixtures versus volunteer grasses. Similarly understanding implications of grazing on tree health, soil health but also on animal health is still needed, to maximize benefits across livestock and crop production. What are the expected thresholds for carbon accrual, water infiltration, and diversification?

Further research on nutrient management dynamics for regenerative farms is needed. Transitioning farms need more data on what the nutrient dynamic changes look like over time. This includes how to measure the reduction needs in synthetic fertilizers when pursuing an organic nutrient management and synthetic nutrient management hybrid approach. At the same time, growers who express the benefits of reduced inputs can provide mentorship and provide farmer - farmer evidence of the expected chemistry reduction, which may help encourage broader adoption.

Livestock integration research. There is a major interest in livestock integration in the region with an opportunity to a capitalize on the large orchard cropping and livestock operations in the regions. Further research on integration Feasibility based on crop/animal, the timing requirements for selected crops to align with management, nutrient, and food safety needs, assessment on Animal health and food safety, and fine-tuning practices to assess density and duration of grazing on different cover crop mixtures or foraging mixtures is necessary.

Investigate possible options for transitioning out of orchards. We are at a turning point where orchards are coming out, new orchards are going in, and growers are unsure when they should be planting based on SGMA and climatic changes, as well as other economic considerations. There is an opportunity to investigate possible options for transitioning orchards. Providing evidence on orchard recycling scenarios such as orchard recycling + manure, compost, and/or biochar. investigate orchard recycling and rotation options for growers further. Before growers invest in re planting orchards back-to-back, we should provide a basket of options on how different crop rotations and land management considerations could support broader environmental and agronomic goals, and how they may fit into MLRP programs. Fallow options with cover crops

as well as years into annual crops or forage crops before retuning back to orchard systems. Integrating orchard rotation options that may support wildlife habitat, increase soil fertility and soil health outcomes, reduce water requirements, and provide economic options for growers should also be investigated in relation with MLRP programs and SGMA policy, and CARB.

Further efficacy tests on biologicals. There was popularity among growers for using biologicals as ways to support micronutrient health through foliar and fertigation applications. Many of these products have limited on farm data to show mechanisms for how they work or efficacy of if they work at all. This booming industry is becoming popular in the regenerative farming arena and needs attention.

Water dynamics with RA systems was a big topic in the SJV region that kept coming up. Conducting more research on over all water budgets with RA systems and understanding which management practices are driving these outcomes. At the same time a lot of research currently exists but are siloed. Mechanisms to bring research together and explore outcomes through a metanalysis and extend findings (preliminary and completed) to grower communities and other stakeholders is greatly needed. Finding ways to incorporate this information into GSA SGMA is crucial for providing credits and advising on management protocol from a water savings perspective. There is concern and misinformation over how cover crops affect water use in regenerative agriculture. Research suggests 30% less water is used but there is still need for water budget research. Cover crops are important for soil health but concerns over management is still active. More research needs to be done on the right species for land and how to best manage the left-over plant material. An additional incentive to transition to regenerative agriculture is the consumer demand for nutrient-dense food. More data is needed to back up claims about regenerative agriculture foods being more nutritious. Conduct more research on water usage. focusing on what management practices drives less water use.

More research on how RA systems affect nutrient density of food. Uutcomes and what this means for consumers is a big data gap. Collect data on nutrient levels in food grown using regenerative practices and tie the finding to consumer education and demand.

Reduction of inputs: we need more quantifying data on how farms imploring regenerative practices are reducing pesticides and fertilizer inputs. We also need more information on how pesticides are harming communities. We don't know the impacts of pesticides on the soil. We don't have the depth of science on the impact of pesticide emissions. A challenge is that Dept of Pesticide regulations is funded by pesticide sales. There is an opportunity to explore this research because of the sate wide sustainable pest management road map. sustainable pest management road map

Mariposa extension needs

1) **Beginning farmer and land manager trainings.** Mariposa county has scene in influx of

new and beginning farmers and landowners since 2019. These clientele are interested and passionate about budling local food systems, supporting land stewardship and sustainable land management, and growing agritourism growth in the regions. But they lack experience of regionally based land management options for central Sierra foothills. This includes soil health management, small farms approaches to support biodiversity, composting, cover cropping and integrative livestock, and marketing education options. Furthermore, being in the central Sierra foothills means understanding indigenous ecological knowledge, culturally appropriate native plants to support wildlife and habitat, such as elderberry, sour berry and more. Supporting wildfire mitigation and managing properties for reducing fuel loads. Providing a toolbox for landowners for how to maintain fire preparedness and mitigate fire risk while also maximizing habitat restoration and food production goals is needed in the foothills.

2) **Engage community in more field days and farmer events**- for example there is a farm tour each fall that should be reignited and other types of education networking activities for both farmers and the public would help build community networking increase knowledge of the local agriculture scene and develop farmer to farmer educational activities. Current cover crop variety trials/demos on farms are taking place but more on farm trials would be useful to be used as demonstrations.

3) **Build capacity for agrotourism industry**. Of particular interest is efforts to revitalize the small winery industry that has dissipated over the years. An annual event called Agrinature Tour, an annual event where locals and Yosemite tourists tour local farms to learn about local food systems, used to occur and there is interest in revitalizing this. Increasing farm to fork events Mariposa and Yosemite.

4) **Community composting cover crop seed bank** Importing amendments and seeds is exceptionally expensive due to the high shipping costs from San Joaquin valley. Furthermore, farm sizes here are normally far to small to make bulk compost or cover crop seed purchases viable. There used to be a composting facility in mariposa county, but this shut down because of high operational costs. The community expressed an interest in problem solving options to increase composting efforts for small farms and home gardeners. Furthermore, seed saving programs for cover crop species have also been identified as an area of interest. The master gardeners have several programs that are aimed at supporting food insecurity and back yard gardening which could be a foundation to build off of for increasing reach and scale.

Mariposa research needs

1) **Legacy effect of no till market** Small diversified, local food systems are growing in the Sierra Foothills of California. Here, small farms, beginning farmers, and homesteaders' makeup these farming communities. Furthermore, limited research has explored this region in respect to how soil responds to management practices, the potential for carbon accrual, and educational resources are lacking. This research will understand the legacy effect of no till market gardening practices on soil health indicators and other co-benefits.

2) **Prescribed fire effect on soil health and vegetation community recover**: Understanding the effect of prescribed fire on soil health is a big black box. Collaborating with prescribed fire program at UCANR can provides a number for sites to assess this area. Furthermore, the interaction between grazing and prescribed fire is unknown, as well as how these management options effect plant diversity changes and recovery. This research could help provide recommendations for prescribed fire regimes coupled with grazing in the foothills to optimize ecological outcomes as well as wildfire mitigation goals.

3) **Cover crop variety trials** to showcase and evaluate suitability of different cover crops and cover crop mixtures for Sierra foothills. Cover crop guidance and use in the region is low. Minimal research has explored proper cover crop species for the region. Regional soil differences, climate differences, and the high volume of livestock integration with crop production are considerations for what to plant and for what purpose. Variety trials can support regional land managers in making decision for cover crop integration.

Credits and Collaborators:

This document would not be possible without the full cooperation and collaboration from the farmers, ranchers, land managers, and communities which this document intends to serve. The report seeks to tell their stories and acts as a mechanism to bring farmer communities to the table for extension and research program development. Those who engaged in the work either through interviews, attending listening sessions, or inviting us to their farms, are the voice of this work.

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