Agricultural Community Needs Assessment

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Prepared for:



Prepared by:



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1. Executive Summary

This report presents research findings from the Agricultural Community Needs Assessment (Assessment) completed for Sonoma Clean Power (SCP). The assessment sought to identify the unique needs of the agricultural community in SCP's service territory through broad outreach to various local stakeholders, including agricultural producers and individuals knowledgeable about local agricultural sector needs. This outreach was accompanied by market research that provides context for the business environment that is helping to shape stakeholder views. The objective of these efforts was to provide SCP with insights into the needs and challenges facing this sector, and to identify opportunities for, and barriers to, energy efficiency improvements, renewable energy deployment, demand management, and end-use electrification. Broadly, the report details the challenges and opportunities identified by stakeholders and presents recommendations for agricultural strategies, programs, and services that help manage electricity use, but also have implications for water and climate change issues.

The Methodology section of this report (Section 2) presents the research approach and data collection methods. Section 3 (Market Segment Profiles) details the research team's insights across various agricultural segments in SCP's territory, including vineyards, dairies, field and specialty crops, and cannabis. The findings for this report are detailed in Section 4 (Needs, Challenges & Opportunities), and the recommendations are presented in Section 5 (Program & Strategy Recommendations).

1.1 Findings

The research began with direct outreach that involved in-depth phone interviews with agricultural producers and other key market actors. This phase of the study identified nine key areas of concern and need. These are summarized below, with greater detail provided in the body of the study. After information from the in-depth interviews was synthesized, a quantitative web-based survey of customers was fielded to provide quantifiable observations on select topics. A literature review and dataset research study was also completed to characterize the agricultural market in SCP's service territory and help add context to stakeholder views. The findings presented here reflect the collective knowledge gathered from this research process.

Finding #1: Agricultural producers face significant time and money constraints. Agricultural producers are typically heavily constrained in time and money. Most producers recognize the benefits of investing in energy efficiency improvements, with 39 out of 52 (or 75%) survey respondents expressing a high interest in rebates for energy efficiency and electrification measures. However, thin margins make it hard to afford investments that have uncertain paybacks or risk interrupting business operations.

Finding #2: Agricultural producers are highly concerned about farm labor availability and farm labor housing costs. Access to farm labor is a huge issue, which varies by segment. Thirty-eight out of 52 (or 73%) survey respondents indicated the cost of farm labor housing as high or extremely high, and 40 out of 52 (or 77%) were concerned or extremely concerned with farm labor availability and cost.

Finding #3: Climate issues were high on the list of concerns among most interviewees and survey respondents. Drought and wildfire risks, in particular, were top concerns for most. Wildfires have already caused major crop damage and put some operators out of business.

Finding #4: Water availability and cost are primary concerns among producers, and relevant local conservation programs are lacking. Water worries are exacerbated by persistent drought conditions, recent excessive rainfall, and a general increase in unpredictability of seasonal moisture

patterns. Water use for irrigation accounts for about 70% of water use across three primary use categories being tracked by the United States Geological Survey (USGS). The 2022 Groundwater Sustainability Plan (GSP) for the Sonoma Valley Groundwater Subbasin forecasts a total cumulative storage loss between 2021 and 2070 of 21,000 acre-feet based on climate change projections and assumed water demand increases.

Finding #5: Energy costs have been rising steadily and reliability issues are causing economic damage during the harvest season. Fuel (diesel) costs have been rising steadily, along with those for propane, natural gas, and electricity. The unpredictability of these cost increases complicates planning and budgeting for agricultural customers. Our research also indicates that the harvest period for high value crops (including grapes) overlaps heavily with Northern California's fire season, and a loss of power before, during, or just following harvest can cause significant economic damage.

Finding #6: There is interest within the agricultural community in solar and electrification opportunities and technology development. Customers expressed a high level of interest in both solar photovoltaics (PV) and agricultural electrification, but cost and performance concerns are high as well. Thirty-five out of 52 (or 67%) survey respondents indicated high to extremely high interest in these improvements. However, agricultural producer investment in solar PV is also limited and highly concentrated among a few customers and segments.

Finding #7: Having a diverse, efficient, and cost-effective set of product delivery channels is a financial and practical necessity for producers, particularly smaller operations. Farmers markets, farm stands, and food hubs are all important sales channels for farm. The loss of local food processors is also leading to more on-farm processing efforts, which presents its own set of end-use specific opportunities.

Finding #8: Challenges related to paperwork and regulatory compliance emerged as recurring issues, especially for smaller farms. Agriculture is a heavily regulated industry in terms of labor standards, pesticide application, water use, and certification requirements, among other aspects. Local cannabis growers have faced particularly significant permitting challenges. Although local Farm Bureaus are actively involved in agriculture-related legislative and advocacy activities, and University of California Cooperative Extension advisors offer some regulatory compliance support, these challenges remain.

Finding #9: SCP brand recognition and awareness of SCP customer programs or service offerings appears high among agencies and associations, but generally low among agricultural producers. Several of the key agencies and market actors identified could provide high value and trusted collaborative support and resources to raise awareness of SCP's presence. For example, the UC Cooperative Extensions and the USDA Natural Resource Service Centers are active across agricultural segments and have valuable insights to offer.

1.2 Recommendations

There is a clear need for SCP to have active, broad spectrum, and durable engagement with the agricultural sector in Sonoma and Mendocino Counties. This need stems largely from the importance of the agricultural sector to the culture and economy of the region, the severe financial stress the sector is currently facing, and the need for reliable and objective technical and financial assistance on energy and climate related issues. Working from this perspective, the project team identified the following set of recommendations to help SCP develop into a trusted, high-value partner promoting a sustainable local agricultural sector. The report recommendations are summarized below and are presented in greater detail in Section 5: Program & Strategy Recommendations.

Recommendation #1: Conduct near-term follow-up research and engagement with key local market actors. SCP should consider building on the insights gathered thus far regarding how SCP can best serve this market through customer-focused services and programs. Follow-up information and idea gathering would be extremely helpful in filling certain knowledge gaps and developing additional indicators to define the best path forward to serve this market in the near term.

Recommendation #2: Develop a strategy for ongoing and long-term engagement with key partners. A detailed plan for engagement with the broad set of contacts and relationships established through this study would help to elevate SCP's market presence with this customer segment. Partnering opportunities exist with local organizations on research, demonstrations and pilot projects, and collaboration on customer energy service programs.

Recommendation #3: Develop technical support resources and establish SCP as the customer's "energy expert" in the marketplace. There is a strong need in the market for objective, unbiased energy expertise around farm energy use, including the benefits and costs of energy efficiency, solar, and electrification measures. Through the development and distribution of agriculture-focused energy information, education, and technical assistance services, SCP can position itself as the local "energy expert" in the marketplace for customer questions regarding these key energy-related issues.

Recommendation #4: Conduct a detailed benefit-cost analysis of agricultural customer demand-side management measures and programs. SCP should conduct an assessment of demand-side management (DSM) measures from the perspectives of energy, climate, water, and societal impacts; customer and utility incremental delivery costs; and a comparison of net benefits to total costs. This analysis should also consider the benefit-cost of onsite energy generation and storage to avoid potential economic losses resulting from wildfire related power shutdowns occurring during harvest season.

Recommendation #5: Prepare a modeling tool for estimating the load shape and cost impacts of an integrated suite of agricultural customer energy measures. This recommendation addresses the need to quantify the overall load shape impacts, benefits, and costs of a program from SCP's load serving entity (LSE) perspective. This modeling effort would result in an aggregate or integrated load analysis that accounts for the sum total of the contributions of individual measures and demand-side management interventions.

Recommendation #6: Develop a comprehensive agricultural sector single point of contact resource program. Provide a single point of contact (SPOC) to help deliver the financial and technical assistance needed by agricultural producers and distribution nodes. This could be a comprehensive resource program that delivers a holistic approach to address water use, energy, and carbon (WEC) concerns. The span of such electricity-related topics would include energy efficiency, conservation,

demand management, renewable generation with storage, and electrification measures in the agricultural sector. It could also include coordination on initiatives related to carbon management such as conservation tillage, planting cover crops, biochar applications, and water use measures like precision agriculture.

Recommendation #7: Develop a program focused on the water-energy nexus. A program focused on the water-energy nexus could engage agricultural producers and water agencies in a collaborative effort to bring solutions to greater market awareness and deployment. Water access and cost are dominant areas of concern and operational stress in the region's agricultural sector. However, there appears to be very little discernable activity directed at water conservation, storage, and water management technologies that could help ease the burden of droughts, water shortages, and increasingly uncertain precipitation patterns.

Recommendation #8: Develop and deploy targeted demonstrations and pilot projects. Technology and application micro-pilot¹ demonstration projects in real-world operating conditions (i.e., onsite) conducted in collaboration with trusted industry actors (e.g., the University of California Cooperative Extensions and Natural Resources Conservation Service) could help alleviate performance and cost anxieties surrounding new and emerging technology applications. Based on the principles of Rapid Iterative Development, micro-pilot projects have lower costs than fully operational customer programs and provide faster turnaround for data acquisition and analysis to quickly refine solution options.

Recommendation #9: Form a farm implement electrification manufacturers and product distributors consortium or collaborative. Electrification of farm implements has broad and deep potential to reduce farm operating costs, improve productivity, and help alleviate the chronic farm labor shortage. To aid in the most rapid development and deployment of these technologies, SCP may want to consider working with local and regional manufactures and equipment suppliers to form an electric farm implement development consortium or collaborative.

Recommendation #10: Develop a program designed to assist with tackling the farmworker housing shortage. SCP can develop a program or program element focused on farmworker housing, including a comprehensive package of energy cost reduction measures for all-electric new housing and retrofit of existing housing. Additionally, SCP could consider participating in a joint agency farmworker housing baseline study to define farmworker housing needs and how they might be addressed.

Recommendation #11: Provide market support for electric farm equipment and battery-electric tractor charging. SCP could provide market support for electric farm equipment and electric tractor charging by providing a flat rate for charging electric farm equipment. SCP can also offer charging infrastructure support, so that electric farm implements can compete with fossil fuel machines more effectively, as equipment charging capacity was found to be a concern among producers.

¹ We use the term micro-pilot throughout this document to refer to small, limited availability programs that are not fully launched. Micro-pilots are a valuable mechanism to test and evaluate program designs prior to scaling to fully launched program solutions.

2. Methodology

The Assessment was developed through a collaborative process between SCP staff and Tierra Resource Consultants (Tierra). At the start of this joint effort, Tierra developed a Stakeholder Contacts Database highlighting individuals and organizations with unique insights into the needs of the agricultural community. With SCP's input, the database was refined to ensure we received diverse perspectives on the challenges producers are facing today, energy use in the sector, and what SCP can do to support its agricultural customers. This database includes agricultural customers, research organizations, trade association representatives, agriculture-focused community-based organizations, industry experts, and electric equipment manufacturers.

The Tierra team completed the Agricultural Needs Assessment by conducting one-on-one interviews, fielding a quantitative survey, and completing a market profile of the key topics that arose throughout the research. The findings in the report are informed by these three approaches, which are summarized in the sections below. Figure 1 depicts our process to better understanding the challenges and concerns affecting the agricultural community in Mendocino and Sonoma Counties, the programs that are of interest to stakeholders, and the solutions that SCP might provide.





The interviews were primarily a listening exercise during which we asked agricultural producers about the main challenges they see in the local agricultural community and within their specific industry segments. We also interviewed local agriculture-focused agencies, and tailored a separate interview guide for this group to ask about the services they provide, the challenges occurring in the specific segments they serve, and the solutions they recommend for tackling these challenges. The surveys

presented questions to agricultural-rate customers² regarding their operations; issues, challenges, and opportunities for electrification; energy use characteristics; water availability concerns; agricultural community support needs; and interest in specific program or technology offerings. The final step, the market profile, consisted of a review of relevant customer and market data to accompany our interview and survey findings.

2.1 Interview Summary

The process of identifying who to reach out to and which contacts to prioritize was a collaborative effort with SCP. It was important for our interview outreach to be representative of the agricultural industries active in Mendocino and Sonoma Counties, and to include a cross-section of producers. While wine grapes are the highest value crop across the two counties, it was important for our interview outreach to avoid *overrepresentation* of wine grape producers. In addition, the team sought to avoid overrepresentation of large-scale producers, and took steps to reach out to small farms, BIPOC-owned and operated farms, and farms with a focus on sustainable practices. Steps taken to prepare for and complete the in-depth interviews are illustrated in Figure 2. Interviews began in March 2023 and concluded in May 2023. Participants were offered a \$100 e-gift card in recognition of their time commitment and valuable input.

Figure 2. Approach to Interviews



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Assemble Contacts Database

We developed a stakeholder database that listed all organizations and individuals active in the local agricultural community that could potentially provide valuable insights into the community's needs during the interview phase and beyond.

Review Contacts Database with SCP & Identify Priority Outreach

We reviewed the database with SCP and added key contacts that were not already represented in the database and solicited input from SCP on interview prioritization. Among the high-priority contacts were small farms (a combination of SCP customers and non-customers), U.S. Department of Agriculture (USDA) Service Centers, UC Cooperative Extension Centers, and the local Farm Bureaus.



Complete Interviews

Tierra developed interview guides that would cover a broad range of topics related to community needs. We completed 25 interviews with local agencies, customers, industry experts and equipment manufacturers between March 2023 and May 2023. Table 1 offers a summary of the interview participants.

Contact Type	Outreach	Complete	% Yield
Agencies and Industry Experts	17	13	76%
Agricultural Producers	20	11	55%
Equipment Manufacturers	1	1	100%
Total	38	25	66%

Table 1. Interview Participant Summary

² Customers that are classified as government facilities and on SCP Ag-rates were excluded from the interviews, survey, and market profile as the report's intent was to focus specifically on agricultural producers.

As seen in Table 1, the telephone interviews consisted of a variety of stakeholder groups. The Tierra team used two topic guides to conduct these interviews: one for agricultural producers, and another for agencies and organizations specializing in local agriculture. The primary topics that were covered during the interviews were:

- General questions about the farm operations or organizations.
- Issues, challenges, and opportunities regarding energy, water, climate, farm labor, and crop and animal product processing capacity.
- Interest in energy efficient and electric equipment improvements.
- Interest in potential agriculture-sector targeted programs and services.
- Level of support received from local government agencies and organizations.
- Satisfaction with Sonoma Clean Power as an electricity provider.
- Awareness of SCP and Pacific Gas and Electric Company (PG&E) services and program offerings.
- How SCP can provide support to the agricultural communities.

2.2 Survey Summary

Following the in-depth telephone interviews, Tierra developed a survey to learn more about SCP's agricultural customers. The survey effort was an opportunity to broaden stakeholder input and gather additional insights on the trends that emerged during the interviews. The survey broadly covered the same topics as the interviews, but also evaluated interest in specific program offerings and energy improvements. Tierra developed the survey in collaboration with SCP and programmed the survey using the Qualtrics survey platform. SCP distributed the survey via email to customers on agricultural rates and collected responses between May 18th and August 16th of 2023.

Table 2 provides an overview of the survey outreach that Tierra and SCP conducted. To drive further customer engagement throughout the survey effort, the team sent out two additional reminders to customers who had not completed the survey. Survey findings are discussed further in Section 4: Needs, Challenges and Opportunities. Figure 3 shows how survey respondents identified their business type, with 36 out of the 65 respondents identifying as vineyard operators.

Table 2. Survey Response Summary

Audience Size	Full Survey Completions	Partial Survey Completions	Response Rate	Completion Rate
1,179	51	14	6%	78%



Figure 3. Survey Respondents by Business Type (n=65)

High-level findings from the survey included that there is highest interest among respondents for agricultural rebate offerings, with 39 out of 52 (or 75%) who were interested or extremely interested. Thirty-two out of 52 (or 62%) were interested or extremely interested in technical support and education offerings. In comparison to other potential SCP offerings, there was a high percentage of respondents who were uninterested in a loan offering, with nearly 40% responding "not interested" or "not at all interested." Additional key findings for the survey included that electricity costs, farm labor availability and cost, drought and wildfire concerns, and water availability and cost rank among the highest concerns for this customer segment (see Figure 7). Figure 4 below shows survey responses to questions regarding interest in potential SCP program offerings.



Figure 4. Interest in Potential SCP Offerings (n=52)

3. Market Segment Profiles

The agricultural market is a diverse and important segment of the economies in Sonoma and Mendocino Counties. One way to assess the role of this sector is to analyze trends in gross domestic product (GDP) for the region. The California Regional Economic Analysis Project (CREAP)³ provides GDP data from 2001 through 2021 for Sonoma⁴ and Mendocino⁵ Counties. Figure 5 shows the trend in the agricultural sector as a percent of private industry GDP between 2001 and 2021. While there are significant annual swings in GDP, Mendocino has experienced a higher rate of growth over this period when compared to Sonoma County. For example, in the five years between 2001 and 2006, the sector averaged 3.3% of Mendocino County GDP, growing to an average of 4.5% in the five years between 2017 and 2021. For Sonoma County, the sector averaged 0.9% between 2001 and 2006, growing to an average of 1.0% in the 5 years between 2017 and 2021.





While we could not verify why there are different growth rates between the two counites, it is generally accepted that cannabis is a larger part of the agricultural sector in Mendocino County, and growth in that industry has increased with the passage of the Adult Use of Marijuana Act (AUMA) in 2016. As shown in Table 3, cannabis now comprises the largest market segment by kWh among the 100 accounts with the highest electricity usage. Cannabis accounts make up 32% of total usage among this group, with dairy close behind at 31%, and wine at 23%.

³ California Regional Economic Analysis Project is the annual data compiled by the Regional Income Division and Regional Product Division of the Bureau of Economic Analysis (BEA), U.S. Department of Commerce encompassing more than 5 decades--from 1969 to 2021. At <u>California Regional Economic Analysis Project (CA-REAP) (reaproject.org)</u>

⁴ Sonoma County Gross Domestic Product, 2001-2021 (reaproject.org)

⁵ Mendocino County Gross Domestic Product, 2001-2021 (reaproject.org)

Industry Segment	Accounts	Annual kWh	Annual Therms	Percent kWh
Cannabis	25	11,388,493	1,632	32%
Dairy	23	11,172,585	358,837	31%
Wine	29	8,146,802	6,266	23%
Farming	9	1,834,747	53,734	5%
Nursery/Floral	3	1,077,622	1,049	3%
Poultry	2	1,021,291	0	3%
Dairy/Poultry	2	365,265	0	1%
Unknown	2	301,063	545	1%
Tourism	2	223,052	0	1%
Government	1	176,919	4,914	0%
Fruit and Nuts	1	159,517	0	0%
Equestrian	1	83,573	0	0%
Total	100	35,950,929	426,977	100%

Table 3. Breakdown of the Top 100 Agricultural Electricity Accounts by Industry

The following section provides a brief overview of some of the key segments that drive the agricultural markets in Sonoma and Mendocino Counties, emerging trends, and high-level recommendations specific to each.

3.1 Vineyards

Sonoma County is home to over 1,800 winegrape growers and approximately 60,000 acres of vineyards.⁶ An increasing number of winegrape growers are going out of business due to the impacts of climate change, operational costs, and labor availability and cost. Growers know that there is a need to evolve business practices and technologies to ensure a sustainable future, and our research shows a strong commitment to sustainability and being good stewards of the land. Twenty-eight out of thirty-one survey respondents who classified their operation as a vineyard, considered being a good steward of the land and natural resources to be "very important."

Vineyard operators made up the largest group of respondents, with 36 out of 65 respondents operating vineyards. The top concerns among winegrowers and experts we spoke to and surveyed are consistent with the other agricultural sectors covered in this study, and include:

- Electricity costs (62% of vineyard respondents very concerned)
- Labor availability and cost (65% of vineyard respondents very concerned)
- Drought and wildfire concerns (62% of vineyard respondents very concerned)
- Electric energy system reliability (62% of vineyard respondents very concerned)
- Water availability and cost (62% of vineyard respondents very concerned)

⁶Sonoma County Profile - 2017 Census of Agriculture, NASS

Winegrowers recognize the impacts of climate change, such as rising temperatures and drought conditions, and they are interested in (and pursuing) climate adaptive viticulture efforts. Some agricultural producers are taking steps to adapt, including: migrating from the most common varietals (Chardonnay and Pinot Noir) to new varietals (Zinfandel and Cabernet Sauvignon) in the warmest areas; adopting new watering approaches and technologies and trialing innovative technologies (such as frost fans) to address an increasing number of frost events.

Some additional learnings from our outreach and research worth noting include:

- 1. Labor is critical in the production of premium wine grapes and a significant expense. Many leverage the federal H-2A temporary agricultural workers program⁷ to meet seasonal needs, which requires that the operator provide employee housing.
- 2. Common energy applications are water pumping and irrigation, machinery for wine production, and HVAC in wine production facilities and tasting rooms.
- 3. A local Ford Pro Partnership is helping to identify electric vehicle modifications to meet vineyard needs. These include truck bed-size, carrying capacity, understanding and adapting to reduced capacity due to battery weight, battery life and charging. It is also highlighting the overall need to increase charging infrastructure to support the move to vehicle electrification.
- 4. Vineyard management companies assist approximately one-quarter to one-third of vineyards in Sonoma County. They provide technical expertise and specialization, labor and resource management, cost efficiency and access to technology, risk mitigation and time savings.

Vineyard operators who responded to the survey showed interest in rebates, technical support, and pilot offerings, but little interest in loan offerings. However, this was based on a small survey sample size so it may be necessary to conduct additional outreach to get a sense of priorities among this segment. Out of the 33 who responded to a survey question gauging interest in potential programs and services from SCP, 79% were somewhat to very interested in rebate programs for energy efficiency, renewable energy systems, electric farm implements, and electric vehicles. Seventy-three percent of vineyard operators were somewhat to very interested in technical support, education, and training regarding how to reduce energy operating costs. Sixty-three percent were interested in pilot and demonstration projects. However, the sample pilot project and demonstration topics were broadly grouped in the survey so interest may vary depending on the topic.

Respondents also indicated their level of interest for specific energy improvements. The highest interest was for solar energy systems (79% interested), energy efficiency improvement in water pumping and irrigation (64% interested), battery storage and microgrids (64% interested).⁸ Vineyard operators expressed lower interest for conversion of gas to electric equipment (33%), biomass and anaerobic digesters (30%), electric irrigation and pumping systems (55%), electric tractors, farm utility vehicles and farm implements (55%), and electric product distribution trucks and vans (33%). However, some of the low interest ratings could be attributed to lack of awareness for certain improvements, with 12-27% respondents selecting "not sure" when asked about these improvements.

In line with our finding that there is a lack of an available technical energy resource, winegrowers appear to be familiar with traditional local resources such as USDA and University of California Cooperative

⁷ The H-2A temporary agriculture workers program allows U.S. employers to hire workers from other countries to perform temporary or seasonal agricultural work. Additional detail on the program can be found <u>here.</u>
⁸ There appeared to be a higher interest in energy efficiency improvements for farm housing facilities among this segment (61% interested), in comparison to dairies, livestock, specialty and field crop operators. However, survey sample sizes for all other segments were small (12 or less respondents), and more research is needed to determine if interest in farm housing efficiency improvements is statistically higher among this group than other segments.

Extensions (UCCEs) for core business operations, but are not aware of any unbiased resource for energy-related guidance, such as for battery storage and for electric vehicle (EV) charging infrastructure. Considering winegrower time constraints, and to make the greatest impact, SCP should look for opportunities to meet the winegrowers at their facilities. For example, SCP could partner with existing organizations, such as the Sonoma County Winegrowers, on pilot programs and on sector education and outreach. The association has a forward-looking Farm of the Future effort and has developed the pilot with Ford Pro Partnership to assess the use of electric trucks in winegrowing and on vineyards. The association doesn't have technical expertise related to energy issues and could leverage resources developed by SCP. They also have a foundation that provides vineyard workforce development that SCP could potentially partner with.

The UCCEs are another resource on the leading edge of climate adaptive viticulture and SCP could look for partnership opportunities with the extensions. For example, UCCE Sonoma County offers quarterly Sonoma County Vineyard mastery classes, in which it may be possible to integrate energy-related content. There are also vineyard management companies that may be able to participate in pilots and trials that would benefit multiple agricultural producers.

3.2 Dairies

Dairy is the second largest market segment by kilowatt-hour (kWh) among the 100 accounts with the highest electricity usage, accounting for a total of 31% usage among this group in Sonoma and Mendocino Counties. A dairy specialist from one of the local UCCE offices stated that there are a total of 69 dairy farms in the counties, down from 78 two years ago. The specialist also mentioned that, in 2022, there was a loss of nine dairies, an 11% decline, due at least in part to wildfires. This is consistent with the larger trend of decline in the number of dairy operations in California, and more broadly in the U.S. These trends were documented in a 2020 publication from the USDA, which noted the significant financial strain on dairies and the rate of consolidation wherein small dairies are being replaced by fewer, larger dairy farms.⁹ Though many agricultural segments report being financially stressed, some financial burdens are specific to dairies. Drought has led to compounded costs generally, and the thinning of dairy herds. When there is a drought, less natural feed is available, which leads to higher operating costs for purchased feed. Many dairies also need to haul water for their herds during periods of drought, which is very costly. Lastly, dairies are energy intensive operations and the rising costs of energy further increase financial strain.

In addition to drought concerns and increasing energy costs, many in the dairy industry are concerned with processing capacity, the cost of labor, and electricity reliability. With respect to processing, major dairy processors such as Tillamook and Horizon have left the area, which has led operators to turn to more on-farm processing. However, the cost of facilities, labor, and marketing are all barriers to this option. Dairies face many of the same labor availability and farm labor housing issues as other segments studied. Most dairies have permanent staff, and many provide on-farm housing. However, building new housing is a challenge. Permits to build new housing were said to be "tedious and expensive" and appear to be a significant barrier. Electricity reliability is reported to be a big issue as well, but most dairies have fossil-fuel backup generators to power time-critical functions, such as milking and refrigeration. In addition to milking, refrigeration, and water pumping, manure management is an energy and labor-intensive process, and is an end-use specific to dairies.

It is important to note that while we were able to achieve valuable insight into the dairy segment by speaking with dairies during interviews and through the market profile, few survey respondents were dairy operators. Greater outreach to this key segment may be needed to better understand unique local needs, challenges, and opportunities. And while there is a fair amount of technical support available on

⁹ Consolidation in U.S. Dairy Farming, USDA. Accessed November 9, 2023.

agricultural topics, there is a general need for unbiased energy expertise. Most operators indicated that they do not know where to start when it comes to energy issues. Government agencies have funding and technical assistance programs, but they generally take a long time to get approved and underway, are paperwork intensive, and are often underfunded. Using the current insights from the interviews and market profile, some avenues worth exploring for this segment include:

- Support for solar energy systems on dairy farms would be a sizable benefit to producers, and our research indicates there is a great deal of interest in solar (largely to reduce operating costs).
- Agrivoltaics (solar PV co-located with crops or livestock) has the additional advantage of providing shade for animals, reducing their heat stress and water consumption.
- Energy storage as a backup for critical dairy end-uses during outages and public safety power shutoff (PSPS) events represent a significant end-use technology opportunity.
- Dairy livestock and poultry farm manure biogas digesters represent renewable energy generation opportunities. Some operators in the counties are already using this technology. A program to support deployment of this technology would be welcomed by this segment.
- There are several opportunities for electrification of dairy farm applications, including farm implements, tractors, and water pumping. For example, manure management requires equipment such as barn scrapers, manure movers, and manure separation equipment that is now fossil fuel driven but could be electrified.
- > There is significant potential for electrification of dairy product distribution vehicles.
- With the departure of major dairy product processors from the area, assisting dairies with developing high efficiency on-farm processing facilities is a current need with the potential for long-term product diversification and financial benefits.
- A research study or demonstration project on mobile/remote solar for electric fencing, livestock water pumping, and animal shade was recommended by one of the interview respondents.

3.3 Field and Specialty Crops

As with other segments, field and specialty crop producers are struggling financially, water and farm labor are dominant issues, and there is a high level of concern about climate change and its impacts. Twelve out of 17 survey respondents from this segment said that avoiding the negative impacts of climate change to be "very important". Eleven out of 17 respondents were "extremely concerned" about water cost and availability. Having efficient, effective, and more diverse market delivery channels is likely a larger issue for this market segment than larger segments such as vineyards; this is particularly true for the smaller produce and specialty crop grower. Field and specialty crop agricultural producers tend to financially rely on the higher prices and margins they can get from direct sales through farmers markets, Community Supported Agriculture (CSA), and farm stands. Primary delivery channels include:

- Farmers markets
- Food hubs
- Institutional procurement
- CSAs and farm stands
- Restaurants

Only seventeen survey respondents identified their business as a field or specialty crop operation, but responses point towards small operations, with half of respondents operating on 1-9 acres of land, and a quarter of respondents operating on 10-49 acres of land. It is also worth noting that this segment tended

to have fewer misconceptions about SCP compared to other segments when asked a set of True/False questions in the survey. For example, 75% of field crop segment respondents and 60% of the specialty crop segment respondents were aware that SCP is not a company division or branch of Pacific Gas and Electric Company (PG&E). Meanwhile, 54% or less of the vineyard, dairy, livestock, and other segment respondents were aware that SCP is not a division or branch of PG&E.

Because field and specialty crop agricultural producers rely on diverse market delivery channels, food hubs provide an important opportunity and may also increasingly include value-added on-site food processors for producers in this segment. The USDA defines a food hub as "a centrally located facility with a business management structure facilitating the aggregation, storage, processing, distribution, and/or marketing of locally/regionally produced food products."¹⁰

Small operators face a variety of issues, including access to capital for farm operations, infrastructure, and energy improvements. Government agencies (e.g., CEC, USDA) have funding and technical assistance programs, but the paperwork required often delays enrollment. Interview respondents knowledgeable about this market segment also expressed concern about issues such as food justice, food security, and emergency food distribution. In addition, organic certification and operation adds layers of inspections and paperwork.

Programs to improve efficiency and reduce operational costs would be particularly helpful for small agricultural producers in this segment. Among this group, there is high interest in solar, battery storage, electric tractors, and energy efficiency water pumping and irrigation improvements. This provides an opportunity for SCP to develop programs, demonstrations and pilots around these and other energy efficiency applications. Capital is scarce for investments in these technologies, however, and agricultural producers are seeking more information on the benefits and costs of these improvements. This segment also offers another opportunity for SCP to emerge as the "energy expert" on these topics. There is a notable lack of understanding of energy issues among customer decision-makers, including available opportunities for energy improvements.

3.4 Cannabis

The California cannabis industry has grown significantly over the past few years. Analysis of electricity data shows that among SCP's highest electricity users (by kWh), total usage among cannabis accounts increased from about 372,000 kWh in 2018 to over 11,000,000 in 2022, with continued growth expected. This has been despite several significant challenges facing the industry. For example, there was a 19.4% decline in cultivation licenses from the start of 2022 to September 2023 (from 8,380 to 6,757). This has affected the various sub-sectors – growers, testing facilities, processors and retail establishments.¹¹ The processes for zoning and the release of business permits have reportedly been slow and cumbersome in both Sonoma and Mendocino Counties. Cannabis growers also do not have access to banking and other federal resources (e.g., USDA loans and grants), and are also excluded from state-level programs that receive federal funding, such as those offered by UCCEs.

Cannabis farms tend to be small-scale operations in Sonoma and Mendocino Counties (10,000 square foot cap for indoor or a one-acre cap for outdoor) compared to other areas in California, such as Santa Barbara. Growers are subject to a high level of regulation, including requirements of the California State Water Resources Control Board, which respondents suggested is regionally very active. Meeting these requirements can require high-cost engineering studies and investments (e.g., amending culverts,

¹⁰ Getting to Scale with Regional Food Hubs, USDA. Accessed November 10, 2023.

¹¹ California, Sonoma County See Fewer Cannabis Growers Licensed, the North Bay Business Journal, April 20, 2023.

adding water catchment ponds). Given the size of these entities and limited funding sources, there is a need for financial support. Other financial factors that negatively impact the industry include:

- Cannabis operators face high taxation. They pay taxes on gross income rather than net income, as they cannot deduct standard business expenses.¹²
- Cannabis products are concentrated, and inputs into products (e.g., flour, sugar), such as edibles, can show up in trace amounts and result in test failures and require product destruction.
- Some jurisdictions have instituted limits on vertical integration of operations from growing through processing to retail.
- Cannabis growing and production are energy intensive and there can be high costs for needed electrical infrastructure upgrades and long waits for PG&E grid interconnection.
- There is a lack of technical energy-related expertise and support specific to industry needs that has resulted in expensive mistakes—e.g., a high-cost lighting project was cited that was inappropriate for the specific cannabis application.

There are several possible solutions available to support this industry. One of those is to identify ways to fill the resource gaps created by cannabis growers' exclusion from federal programs. Industry participants are open to technical and funding resources and pilots. Like other agricultural customers, there is interest in solar energy systems and energy storage, both to reduce operating costs and to mitigate impacts of PSPS events. Respondents also expressed interest in the adoption of high-efficiency lighting applications and carbon sequestration practices.

¹² Section 280E of IRS Code.

4. Needs, Challenges & Opportunities

Key insights and observations from the in-depth interviews, surveys, and market profile are grouped into the following broad categories. Observations for each are summarized in this section.

- 1. Agricultural Producer Money and Time Constraints
- 2. Farm Labor Availability Concerns
- 3. Climate Change Concerns
- 4. Water Cost and Availability
- 5. Energy Cost and Reliability
- 6. Solar and Electrification Opportunities and Technology Developments
- 7. Product Delivery Channel and Infrastructure Issues
- 8. Regulatory Compliance and Paperwork
- 9. SCP's Market Presence in the Agricultural Sector

4.1 Agricultural Producer Money and Time Constraints

4.1.1 Interview and Survey Response Perspectives

Agricultural producers are typically heavily constrained in terms of time and money. Recent increases in operating costs have had a negative impact on producers, forcing some out of business. Multiyear production contracts have also created a significant lag in the ability of some to recoup cost increases. Producers recognize that process improvements and cost reductions are critical to sustaining their businesses. We saw this in the survey responses, with 39 out of 52 (or 75%) survey respondents expressing a high interest in rebates for energy efficiency and electrification measures. Respondents expressed particular interest in solar energy systems, battery storage, and microgrids, along with electrified machinery, such as tractors, farm utility vehicles and farm implements (see Figure 13). However, the operation of a farm tends to be 24/7 work, leaving little time to research options.

"While I think that it's great to be able to do 100% renewable, we just have no money now. It's really awful...I'm a little nervous."

SCP customer
 & owner of a
 small field crop
 farm

Producers also broadly understand the potential benefits of investing in energy efficiency improvements and sustainability. However, due to thin margins and limited capital, these customers are often risk averse and reluctant to invest in energy improvements, given uncertainties regarding costs, benefits and technology performance. Therefore, a combination of low-cost, and low-risk pilots, partnerships and technical assistance may be appealing options for them.

4.1.2 Market Research Perspectives

Summary: There are a significant number of funding and technical assistance programs available to agricultural stakeholders including for agricultural water conservation, energy efficiency, carbon sequestration, and farmworker housing. The research team found at least 58 state and federal programs offering funding and technical support programs across a variety of sustainability topics to agricultural producers (see Appendix A for the list of programs). Effectively accessing these programs could address

many of the agricultural producers' financial concerns. However, time constraints are still a likely barrier because these programs are distributed across multiple agencies, each with their own application learning curve, submittal process, and program delivery requirements. Providing a high level of program assistance, conducting baseline studies, and understanding customer barriers could help customers better access these funds.

Actions for SCP to consider:

- Define a Single Point of Contact (SPOC) function that would assist stakeholders in accessing funding and technical assistance programs. A resource that can effectively access and leverage this support may help address this barrier. This could be particularly useful to smaller operators that cannot invest in dedicated resources to work through diverse program requirements. As shown later in the report, in Figure 11, roughly 75% of Sonoma County farms and 50% of Mendocino County farms are considered "small" at less than 50 acres.
- 2. Participate in a joint agency project to complete a funding baseline and access study that defines how effectively agricultural market stakeholders in Sonoma and Mendocino Counties are accessing available funding and technical assistance programs, and how barriers to participation might be addressed.
- Complete targeted research to better understand why agricultural market stakeholders are participating at below-average rates in PG&E energy efficiency programs that target specific high energy use equipment and measures, such as HVAC, irrigation, process efficiency, and refrigeration.

Analysis: Our market research affirms stakeholder views about the importance of energy costs and the need to reduce this expense. The 2010-2012 Statewide Agricultural Energy Efficiency Potential and Market Characterization Study,¹³ completed for the CPUC and California's IOUs, interviewed 86 farm operations to identify their top costs of doing business. Labor rates and electricity ranked highest among costs for vineyards and wineries, as shown in Figure 6. Similar trends were revealed for field crops, fruit, and tree nuts. The greatest costs identified by dairy operators in the report were animal feed, electricity, and labor.





 ¹³ <u>https://www.calmac.org/publications/CA Ag Mrkt Characterization Final 5-13-13.pdf</u>
 ¹⁴ Ibid., page 47.

Our research indicated that there are several programs that provide funding and technical assistance that can reduce the cost and effort to implement solutions across a range of sustainability issues. Table 4 shows a count of 39 funding and 48 technical assistance programs by area of sustainability interest, including programs that are specific to California, and Federal agency programs offered by across the U.S. Appendix A provides additional details on these programs.

Area of Sustainability Interest	Funding	Technical Assistance
Agricultural Water Conservation	5	8
Carbon and Sequestration	7	9
Farm Equipment Electrification	5	6
Farmworker Housing	3	6
Wildfire Mitigation	7	7
Advanced Agriculture Technology and Practices	12	12
Grand Total	39	48

Table 4. Funding and Technical Assistance Programs by Sustainability Topic

To assess how stakeholders are accessing available funding to install energy efficiency measures, the team reviewed total incentives paid throughout PG&E's service territory between 2018 and 2021. As shown in Table 5, approximately 87% of incentives paid to SCP counties were for lighting retrofits, with no or very little paid for irrigation or HVAC measures, two areas expected to be heavily impacted by climate change. For comparison, irrigation and HVAC measures account for over 53% of agricultural program energy savings across PG&E's service territory.

Table 5. Total Savings Performance by Measure Use Category, 2018 – 2021

Use Category	SCP Counties Savings	Total PG&E Savings	% SCP Counties Savings	% PG&E Savings
HVAC	0	5,278,672	0.0%	5.3%
Irrigation	10,199	48,747,165	0.5%	48.9%
Lighting	1,696,056	18,889,849	87.3%	18.9%
Process Distribution	73,388	17,641,646	3.8%	17.7%
Refrigeration	164,358	9,142,723	8.5%	9.2%
Total	1,944,001	99,700,055	100.0%	100.0%

Combining funding with technical assistance is known to drive adoption of technologies and practices that help manage electricity costs for agricultural customers. Many agricultural producers rely on their local utility as a source of information on energy use and savings opportunities. At present, SCP program offerings include those for commercial customers, but do not specifically address the needs of agricultural customers. We also researched Marin Clean Energy's (MCE) customer offerings and note that, in 2022, a program¹⁵ to integrate energy management

¹⁵ Application of Marin Clean Energy for approval of 2024-2031 energy efficiency business plan and 2024-2027 energy efficiency portfolio plan, March 4, 2022.

incentives was implemented, including a targeted agricultural market initiative called the Agricultural and Industrial Resource (AIR) program.¹⁶ ¹⁷

4.2 Farm Labor Availability Concerns

4.2.1 Interview and Survey Response Perspectives

Our research found access to farm labor to be a prominent issue, that varies in form by segment: dairy operators tend to have their own permanent staff while larger vineyards have increased their base of full-time employees over time. As seen in Figure 7, farm labor housing cost and farm labor availability and cost ranked highly among producer concerns, with 76% replying that they are either extremely concerned or concerned. However, other agricultural segments have found it difficult to compete with construction, retail, and restaurant jobs. Other stakeholder concerns related to farm labor included:

1. Farm workforce health and safety is a major concern with COVID-19 and toxic chemical exposure being a strong focus of some non-profit organizations, such as the California Farmworker Foundation (CFF). "I think labor supply is a huge concern that I've heard multiple times...The more costly the labor supply, the more farmers are going to be looking to mechanize their operations."

- Employee of ANR Hopland Research & UC Extension Center
- Development of new farmworker housing is a strong concern among agricultural producers, which is often hampered by the permitting process. While farms hiring H-2A Visa labor must provide labor housing, doing so is also helpful in attracting labor in Sonoma County's housing market.

¹⁶ This program provides rebates, and technical procurement to organizations. An energy coach is available to organizations throughout the process of defining and meeting their energy management goals. The program website is available <u>here</u>.
¹⁷ <u>MCE AIR 2023 Deemed Rebate List</u>



Figure 7. Customer Concerns¹⁸ (n=53)

4.2.2 Market Research Perspectives

Summary: Farmworker availability is inextricably tied to the availability of housing generally, especially during periods of high-season demand (i.e. planting and harvest), when an already tight housing supply is further strained. Our research using CalEnviroScreen indicates that Mendocino County is in the 66th percentile of housing burden,¹⁹ which is considerably higher than Sonoma County's housing burden in the 46th percentile.

Actions for SCP to consider:

- Participate in a joint-agency project to complete a farmworker housing baseline study that defines farmworker housing needs and how they might be addressed, including coordination on housing plans mandated by each city and county in California. As mandated by California's Government Code, cities and counties are required to have a General Plan that must include a Housing Element based on regional housing needs assessments. SCP's role could be to support access to funding and incentives for efficient new construction.
- 2. Complete targeted research to find out how agricultural market stakeholders are meeting the challenge of providing farm worker housing, especially during periods of high seasonal demand.

Analysis: To understand the state of farmworker housing concern, we reviewed data on labor participation, poverty, and housing burden from various sources. Table 6 shows that the California Employment Development Department²⁰ estimates that in August 2023, farmworkers make up about

¹⁸ The full survey question read: "On a scale of 1 to 5, how concerned are you about these impacting your business operations? 1 is "Not at all Concerned" and 5 is "Extremely Concerned."

¹⁹ 100th percentile is the highest burden.

²⁰ Current Industry Employment and Unemployment Rates for Counties via the CA Employment Development Department

6.9% of the total Mendocino County workforce, roughly twice the farm labor participation rate for Sonoma County, estimated to be 3.3%. CalEnviroScreen²¹ rates the housing burden for low-income households²² and shows Mendocino County is in the 66th percentile of housing burden, considerably higher than Sonoma County at about the 46th percentile. Additionally, eligibility for the California Alternative Rate for Energy (CARE), a discount on electricity and natural gas costs offered to low-income residents,²³ can be used as an estimate of poverty within a county. Based on public records, 44% of Mendocino residents are eligible for CARE, compared to 27% for Sonoma County. Collectively, the housing burden estimates, and CARE eligibility rates are reflective of research indicating that over 50% of farmworkers are estimated to be low income.²⁴

County	Sonoma	Mendocino	Total
Total Wage and Salary Workers	215,900	33,140	249,040
Farmworkers	7,200	2,280	9,480
Total Farmworkers as % of Total Wage and Salary Workers	3.3%	6.9%	3.8%
Average of Housing Burden Percentile	45.8	66.1	47.2
CARE Eligibility - % Households	27%	44%	30%

Table 6. Financial Burden Metrics by County

4.3 Climate Change Concerns

4.3.1 Interview and Survey Response Perspectives

Climate change is another issue high on the list of concerns among all interested parties. Drought, flooding, and wildfire risks are top of mind for most constituents. The impacts of increasing and fluctuating temperatures are a major concern as well, particularly for long- and mid-term planning. For example, drought conditions result in less natural animal feed, and higher demand and costs for purchased feed. Anticipated drought conditions are also driving a shift to more drought-tolerant varietals for vineyards.

Wildfires have already caused major crop damage and even resulted in closure for some businesses. The Sonoma County Winegrowers President discussed the impacts of 2017-18 and 2020 wildfires on winegrape growers during an informational hearing held by the California State Assembly Committee on Agriculture.²⁵ During the hearing, she spoke about the smoke damage to crops from the Glass fire, which occurred during harvest season in September 2020: *"[w]e had so much unpredictability in what was harvested and whether those grapes would actually be made into wine, just because we couldn't get good test results back in time... Crops got left on the vine because wineries didn't want to take that risk, so that's a financial impact to farmers and farmworkers."*

When asked about their concerns surrounding climate change, one University of California Cooperative Extension Vineyard Management Systems employee stated, "climate change with sustainability are going to be the biggest impacts on energy efficiency and cost, hopefully trending toward the more efficient and less costly for vineyard operations." Another vineyard manager voiced their opinions, saying, "[i]f we're going to stay in the wine business, we should maybe be thinking about varieties of

²¹ Housing-Burdened Low-Income Households. Percent of households in a census tract that are both low income (making less than 80% of the HUD Area Median Family Income) and severely burdened by housing costs (paying greater than 50% of their income to housing costs). (5-year estimates, 2013-2017). at <u>CalEnviroScreen 4.0</u> ²² Housing Burden | OEHHA (ca.gov)

 ²³ Defined as residents earing 200% or less of Federal Poverty Limit (FPL)

²⁴ The Public Policy Institute of California. Health Care Access among California's Farmworkers, April 2022.

²⁵ The Impact of Wildfires on California Agriculture Report

grapes that are more tolerant to hotter growing conditions." Climate change, and subsequent environmental shifts, is a topic at the forefront for many in the wine industry and is causing operators to significantly change the way they manage their vineyards.

4.3.2 Market Research Perspectives

Summary: Tools provided by Cal-Adapt indicate that outdoor temperatures will increase more in Sonoma County than in Mendocino County. Cooling degree days (CDDs) are a measure of how many days per year outdoor temperatures are above a certain baseline temperature. Forecasts of CDDs can be used to predict temperature increases associated with climate change. Data predicts that CDDs in Sonoma County are forecast to increase by over 50%, from under 300 in 2020 to over 450 by 2050. Mendocino County is expected to have a milder increase, from 10 CDD in 2020 to over 60 by 2050.

Increased temperatures have multiple impacts on agricultural production, including increased water use, changes in growing seasons and business operations, and potential changes in product quality. These impacts will result in higher operating costs, such as higher insurance costs to increased energy use for water pumping to irrigate crops.

Actions for SCP to consider:

- 1. Look for opportunities to increase participation in EverGreen. Excluding water treatment plants, EverGreen sales totaled 1.2 GWh, and account for 2.2% of total sales to agricultural customers in 2022. Increasing participation would help reduce carbon emissions on grid purchased power.
- 2. Create innovative approaches to drive the electrification of farm equipment. This could include implementing supportive rate designs, providing technical assistance and direct incentives (especially for installing charging infrastructure), and cross marketing with equipment providers.
- Support access to funding for water, energy and carbon projects through an integrated resource partnership with local, state and federal agencies. This could include the creation of a Single Point of Contact (SPOC) program to minimize agricultural producer time and effort required to access funds and technical assistance for projects to reduce carbon emissions.

Analysis: We took several market research perspectives to understand stakeholder concerns about climate change. First, we assessed forecasted climate change impacts by reviewing data on anticipated changes in cooling degree days between 2020 and 2050. Cooling degree days (CDD) are a measure of how many days per year the outdoor temperature is above a certain baseline temperature that represents the temperature at which people generally start to use air conditioning to cool their homes and buildings. The baseline temperature can vary but is often set at 65°F (18.3°C) in the U.S. Sonoma County CDD are forecasted to increase by over 50% from under 300 CDD in 2020 to over 450 CDD by 2050.²⁶ Barring any changes in HVAC efficiency, this correlates roughly to a 50% increase in electricity use for air conditioning. The change in Mendocino County is forecasted to be much smaller, about one third the magnitude of change expected for Sonoma County.

Increased outdoor temperatures will impact agriculture in various ways, including higher energy usage for irrigation water and increases to other operating costs. For example, we reviewed data on fire insurance coverage,²⁷ and it is becoming increasingly difficult for agricultural producers in the North Coast region to obtain and retain. The North Coast²⁸ had the highest fire losses in 2017 and 2020 of any California region for commercial agriculture and farm owners. These losses totaled approximately \$133 million dollars in 2017 and \$75 million dollars in 2020.

Our next step in assessing market perspectives was to review near term actions that agricultural producers could undertake to help address climate change concerns, including participation in SCP's

²⁶ These are county averages and may not reflect all areas and microclimates within a county.

²⁷ CA Department of Insurance, Increasing the Availability of Agricultural Insurance

²⁸ The North Coast includes Mendocino, Sonoma, Humboldt, Marin, Lake and Del Norte Counties, along with parts of Napa County.

EverGreen rate that provides 100% local renewable energy.²⁹ We reviewed billing records for calendar year 2022 and 18 agricultural customers subscribed to the EverGreen rate, which is about 1.2% of agricultural accounts.

While there is no benchmark on how high concern for climate issues would translate into participation in a low-carbon electric rate, an analysis of the market segment participation in EverGreen may provide useful metrics and benchmarks about customer engagement in broader climate change initiatives.

Agricultural Segment	Total Accounts	EverGreen Accounts	EverGreen % of Accounts
Agriculture, Forestry, and Hunting	667	4	0.6%
Grape Vineyards	500	2	0.4%
Greenhouse and Floriculture	7	1	14.3%
Wineries	333	7	2.1%
Grand Total	1,507	14	1.2%

Table 7. EverGreen Sales to Agricultural Market by 6-Digit NAICS

In addition to participating in EverGreen, we note that there are programs currently in operation that provide financial incentives to agricultural producers for reducing greenhouse gas emissions. For example, the Natural Resources Conservation Service (NRCS) and the California Department of Food and Agriculture (CDFA) collaborate on the Healthy Soils Program that provides technical and financial assistance through various means. One solution offered by the Healthy Soils Program is based on the COMET-Planner that calculates the cash incentives that agricultural producers can receive by implementing practices defined by the NRCS that have greenhouse gas mitigation and/or carbon sequestration benefits on farms and ranches.³⁰ These funds originate primarily through proceeds from California's cap-and-trade program. We ran the COMET-Planner for four NRCS Conservation Practices that may apply to a 100-acre vineyard and the resulting one-time incentive of \$77,000 yielded approximately 330 Metric Tons CO2 equivalent (MTCO2e) per year as seen in Table 8.

Table 8. Examples of Healthy Soils Program Incentives

NRCS Conservation Practices	NRCS Conservation Practices	Payment Scenario	Payment	Emissions Reductions (MTCO2e / yr)
Cover Crop (CPS 340)	Add Legume Seasonal Cover Crop to Irrigated Cropland	Basic (Organic and Non-organic)	\$30,894	50
Compost Application (Interim CPS 808)	Compost (C/N < or = 11) Application to Annual Crops, On- farm produced compost	3 tons/acre	\$45,000	280
Hedgerow Planting (CPS 422)	Replace a Strip of Cropland with 1 Row of Woody Plants	Single Row	\$1,032	0
Windbreak/Shelterbelt Establishment (CPS 380)	Replace a Strip of Cropland with 1 Row of Woody Plants	1-row/Tree or Shrub/Wind Protection Fence	\$240	0
Total			\$77,166	330

²⁹ SCP's default option electricity service is 50% renewable and 91% carbon-free.

³⁰ COMET-Planner California Healthy Soils (comet-planner-cdfahsp.com)

Funding and support from the Healthy Soils program could be combined with other recommendations in this report to establish a comprehensive 'carbon farming' single point of contact (SPOC) program that provides technical and funding acquisition support for a broad range of initiatives. These may include water management through precision agriculture, electrification of equipment, and expanded use of renewable energy and measures, such as conservation tillage or planting hedgerows and windbreaks.

4.4 Water Cost and Availability

4.4.1 Interview and Survey Respondent Perspectives

The interviews and survey confirmed that water availability is a central issue to agriculture in general, and at a very high level of concern in Mendocino County. Concerns about the impact of drought and wildfire on business operations ranked second highest among survey respondents. Water worries are exacerbated by drought, recent excessive rainfall, and increasing unpredictability of seasonal moisture patterns. Some agricultural producers (e.g., dairies) have needed to haul water for livestock at an increased cost. Drought conditions began in 2013 with rain recorded at the lowest level in 120 years and became extreme in 2021 with Mendocino and Sonoma counties dipping into what the USDA designates as "D4: Extraordinary Drought."³¹

When asked how water cost and availability affect Mendocino cannabis growers, the interviewee replied:

"It's part of the reason that we decided to shut down our outdoor farm."

Livestock and dairy ranchers are some of the worst affected by drought as they face increased difficulty providing feed for their animals. During times of drought, supplemental hay becomes more expensive due to the demand increase. Organic ranchers are under particular stress because they are required to raise animals in pasture for the first six months. In addition, the 2021 Sonoma County Crop Report stated that local ranchers reported having their water rations cut by up to 70%, with some ranchers having to sell portions of their herds due to drought-related difficulties.

4.4.2 Market Research Perspectives

Summary: Sonoma County has the most wells per capita of any county in California³² and drought frequently reduces ground water levels, resulting in more electricity needed to pump water from greater depths. Research suggests the growth in water pumping is not sustainable. The 2022 Groundwater Sustainability Plan (GSP) for the Sonoma Valley Groundwater Subbasin defines a water budget that provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin and forecasts a deficit of 300 acre-feet per year from 2021 through 2070. Moreover, research completed by the CPUC in 2013 identified irrigation as the most energy intensive end-use in the agricultural space. Water-related energy savings can be garnered through efficient water pumps and motors, and a combination of sensors and controls.

Actions for SCP to consider:

1. Implement a well pump test program to test how efficiently wells are operating and to identify when repairs and replacements are needed to minimize energy costs. Southern California Edison (SCE) has been operating a pump test since 1911.³³

³¹ U.S. Drought Monitor- Mendocino County, CA

³² Sonoma County unveils resources for well owners impacted by drought (ca.gov)

³³ 25777_Arg_Pump_v8_WCAG.pdf (sce.com)

- 2. Provide additional incentives for irrigation measures currently covered by PG&E, such as variable speed drive applications. New incentive offerings could build on the energy savings of VSD by leveraging precision irrigation technology, such as soil moisture sensors, smart irrigation control systems, and predictive weather models.
- 3. Support access to funding for water, energy, and carbon projects through an integrated resource partnership with various local, state, and federal agencies. This could include the creation of a Single Point of Contact (SPOC) program to minimize the producer time and effort required to access resources that address the energy-water nexus.

Analysis: To assess very high concerns expressed by stakeholders about water availability, Tierra reviewed United States Geological Survey (USGS) data³⁴ on self-supplied water withdrawals (i.e. well water) over a 20-year period from 1995 through 2015. Over this period, Sonoma County irrigation water withdrawals grew at a compound annual growth rate (CAGR) of 6.8%, while Mendocino County withdrawals grew at 3.2%. In contrast, USDA data indicates that the growth rate in irrigated cropland is lower than the growth rate in self-supplied water withdrawals for irrigation. Between 2012 and 2017 irrigated land grew at about one half the withdrawal rate, with 2017 irrigated land growing in Sonoma County at a CAGR of 2.9% and Mendocino County with a CAGR of 1.6%. Additionally, Figure 8 and Figure 9 show that irrigation withdrawals have been increasing, while those for public and industrial uses have remained relatively stable.



Figure 8. Sonoma County Water Withdrawal Trends by Market Segment

³⁴ USGS Water Use Data for California accessed August 2023, Irrigation, Total self-supplied withdrawals, fresh, in Mgal/d



Figure 9. Mendocino County Water Withdrawal Trends by Market Segment

The ground water extraction trends shown in Figure 8 and Figure 9 have contributed to groundwater deficits, as illustrated in Table 9 for water years (WY) 2012 through 2018 according to the 2022 Groundwater Sustainability Plan (GSP) for the Sonoma Valley Groundwater Subbasin.³⁵ The GSP defines a water budget that provides an accounting and assessment of the total annual volume of surface water and groundwater entering and leaving the basin, and Figure 10 shows an average deficit of 900-acre feet per year (AFY) between 2012 and 2018. The GSP also forecasts a deficit of 300 AFY³⁶ from 2021 through 2070 as shown in Table 9. The total cumulative storage loss between 2021 and 2070 is projected to be 21,000 acre-feet based on climate change projections and assumed water demand increases.³⁷

	-
	Deficit
Water Budget Period	(AFY)
Average, Historical Period (1971-2018)	-300
Average, Current Period (2012-2018)	-900

-300

Table 9. Historical and Forecast Water Budgets

³⁶ Ibid, Table ES-1. Average Changes in Groundwater Storage in Sonoma Valley Subbasin.

Average (2021-2070)

³⁵ The plan was prepared and submitted by Sonoma Water to the California Department of Water Resources (DWR), approved by the DWR on January 26, 2023. Figure ES-6. Groundwater Inflows and Outflows.

³⁷ Ibid, page ES-12.



Figure 10. Sonoma Valley Groundwater Budget Summary Diagram for Water Years 2012-2018

For customers with self-supplied withdrawals (i.e., well water), conservation and resource management initiatives are largely handled by various state agencies, such as the California Department of Water Resources' Agricultural Water Use Efficiency project.³⁸ There are, however, opportunities for electricity and water providers to collaborate. Based on market characterization research completed for the CPUC in 2012,³⁹ "utility-sponsored research should identify the technologies and techniques most likely to conserve water and electricity." This same report identified that irrigation is the most energy intensive end-use.⁴⁰ A second study, completed by the CPUC in 2021, showed efficient water pumps and motors can save 15% on pumping energy.⁴¹

As discussed previously at Table 5, CPUC data shows that only a small amount of rebate incentives are paid in SCP counties for the implementation of energy efficient irrigation measures. For example, incentives for irrigation measures account for only 0.5% of all agriculture sector energy efficiency rebates paid in Sonoma and Mendocino counties. In contrast, these same measures account for over 48% of agricultural program rebates paid across PG&E's service territory. Improving water pumping efficiency is an important opportunity in the water-energy nexus. Programs such as SCE's Pump Testing and Hydraulic Services program can reduce energy used for irrigation by testing well pumps to assess various efficiency parameters, including:

- How well the pump system is working overall, including pumping mechanism hardware, controls, and piping.
- The potential for more serious mechanical problems that result in inefficient operation or system breakdowns.
- Whether the correct type of pump is being used.

³⁸ Agricultural Water Use Efficiency (ca.gov)

 ³⁹ 2010-2012 Statewide Agricultural Energy Efficiency Potential and Market Characterization Study. Navigant, May 6, 2013.
 Executive Summary, page xviii. Found at <u>CA Ag Mrkt Characterization Final - Final (calmac.org)</u>
 ⁴⁰ Ibid

⁴¹ Industrial/Agricultural Market Saturation Study, 2021 Potential and Goals Study here.

4.5 Energy Cost and Reliability

4.5.1 Interview and Survey Response Perspectives

Interviewees reported that diesel fuel costs are increasing rapidly along with the cost of propane and electricity. These rising costs, combined with the unpredictability of energy costs over time, makes planning and budgeting difficult. Thirty-eight out of 53 (or 72%) survey respondents also indicated that they were very concerned to extremely concerned about the impact of the electric system's reliability on their business. In response, many farms with critical functions have installed fossil fuel backup generators to ensure a reliable energy supply to sustain their business operations. Examples of supported functions include their milking and refrigeration needs for dairies, freeze protection for vineyards, and fresh-freezing processes for cannabis growers.

One thing that could be helpful [in dealing with PSPS] would be, we have solar power at our personal residence, but no backup storage. So, with the PSPS we've been unable to use our solar power.

> Mendocino winegrape grower

One local cannabis grower shared that their business's biggest struggle is related to power and energy affordability, stating, "it's very ironic that you reached out because we're having a major power issue." The business needs to replace inefficient equipment with more efficient equipment because they have high usage—they are running lights, machinery, freezers, pumps, and tanks—and only have access to 100-Amp three-phase power. They reached out to PG&E for support and participated in a months-long design process. They are currently in line to receive upgrades, however, costs are high and lead times are long. And due to financial constraints, their down payment for a new switch gear has been delayed. Once paid, they claimed there will be a 9-month lead time for the upgrades to take place. As the business owner put it: "we need the equipment, but we can't afford the switch gear, and once we finally can [afford it] we have to wait 275 days."

During a separate interview with the owner of an egg farm, the interviewee stated that "power cost and reliability is a huge problem." They have backup diesel generators because of electricity reliability concerns and mentioned that they had lost power 7 to 8 times in 2023. The generators are used to support critical functions, such as egg refrigeration. The eggs also must be processed using electric-powered belts to avoid bottlenecks, delays, and spoiled product. If egg processing is unexpectedly delayed, a fresh product is ruined. When asked if their needs are being met by the generator, the respondent said "yes but no" due to the high cost of running, maintaining, and installing their generators.

4.5.2 Market Research Perspectives

Summary: Between 2010 and 2020, on average, rates for agricultural customers increased at a compound annual growth rate (CAGR) of 4.8%. However, this increased significantly between 2020 and 2023 to a CAGR of 11.6% for large customers, and 14.9% for small customers. In November 2023, the California Public Utilities Commission (CPUC) approved a rate hike for PG&E, set to take effect in 2024. However, the impact of this increase on agricultural customers remains unknown at the time of publishing this report. PG&E requested the increase to improve the safety and reliability of its electric services, based largely on wildfire concerns related to climate change.

Actions for SCP to consider:

1. Complete a full assessment of how public purpose program funds are being applied to SCP service counties. In addition to energy efficiency, this would include accessing records from the CPUC and CEC to determine how funds are being used to implement additional energy management and

reliability initiatives, such as demand response, distributed generation, and energy storage measures.

- 2. Complete outreach and marketing efforts to inform agricultural producers about rebates and financing available to them. This would include an assessment of what measures are being incentivized and are accessible to SCP customers through PG&E, Regional Energy Networks or other third-party programs, and where gaps exist. We encourage a focus on gaps with newer technologies, such as precision agriculture, that have a combined impact on energy, water, and carbon.
- 3. Review the recommended actions in Section 4.4: Water Cost and Availability, as they also have significant energy impacts.
- 4. The SPOC program first discussed in Section 4.3: Climate Change Concerns, should include support for agricultural producers to access California's Public Safety Power Shutoff (PSPS) Resiliency Program. This program provides technical assistance and state and federal grants and funding to agricultural producers to address the increasing threat from wildfires, such as infrastructure hardening, microgrids, backup power solutions, and vegetation management.

Analysis: As shown in Table 10, between 2010 and 2020, on average, rates for agricultural customers increased at a compound annual growth rate (CAGR) of 4.8%. However, this increased significantly between 2020 and 2023 to a CAGR of 11.6% for large customers, and 14.9% for small customers. As shown in Figure 11, our analysis of the 2017 Census of Agriculture from the USDA⁴² indicates that roughly 75% of Sonoma County farms and 50% on Mendocino County farms are considered "small" at less than 50 acres. An annual CAGR of 14.9% indicates that electricity costs for these customers could double in under 5 years, between 2020 and 2025. In November 2023, the CPUC approved a rate hike for PG&E, set to take effect in 2024. However, the impact of this increase on agricultural customers remains unknown at the time of publishing this report.

Customer Segment	\$ / kWh	CAGR			
	2010	2023	2010 to 2020	2010 to 2023	2020 to 2023
Small	\$0.22	\$0.50	4.3%	6.6%	14.9%
Large	\$0.18	\$0.40	5.4%	5.9%	11.6%
Average	\$0.20	\$0.45	4.8%	6.3%	13.3%

Table 10. PG&E Agriculture Customer Rate Trends

⁴² 2017 Census of Agriculture- State and County Profiles, USDA



Figure 11. Distribution of Farms by Acreage

In recent years, fire season has often brought power outages for public safety. We compared the overlap between Northern California's fire season and the harvest seasons for various high value crops. In Northern California, fire season has traditionally started in June and extended through October. However, climate change and prolonged droughts have resulted in the fire season starting as early as May and lasting into November. This season overlaps with the harvest period for major crops in Sonoma County, such as grapes, apples and vegetables as shown in Figure 12.

Figure 12. Overlap Between Fire and Harvest Seasons



In 2021 the crops presented in Figure 14 were valued at \$551M in 2021⁴³ and the loss of electricity during harvest can significantly impact crop loss rates or the economic value of a crop, especially for crops that require electricity-dependent post-harvest handling, including refrigeration and storage. For example, many fruit and vegetable crops are sensitive to temperature, and after being harvested need to be quickly cooled and stored in refrigerated conditions to maintain freshness. Other crops require immediate post-harvest processing, such as milk, which needs to be pasteurized and cooled quickly. The loss of electricity can also have significant consequences for grapes immediately after harvesting. For example, grapes are sometimes cooled after harvest to delay fermentation and preserve their characteristics, while electric equipment is used for crushing and pressing the grapes.⁴⁴

^{43 2021} Sonoma County Crop Report

⁴⁴ Other grape harvesting processes that are interrupted by power shut-offs include interference with temperature-controlled fermentation tanks used after harvest, and interruption of the pumps that are move wine between tanks and barrels. When irrigation stops during power outages it also puts water stress on the crops.

Beyond the immediate physical loss of crops, there can be significant economic ramifications. Producers might face reduced incomes due to lost sales, lower prices from compromised quality, or additional costs for measures taken to salvage some value from the harvest. To help address the impacts from the increase in wildfires related to climate related various state agencies and stakeholders have formed California's Public Safety Power Shutoff (PSPS) Resiliency Program. The CA PSPS Resiliency Program began operating in 2019 and offers a set of initiatives and measures designed to enhance the resilience of communities and critical infrastructure against the impacts of PSPS occurrences related to wildfires and other events. The program helps coordinate technical assistance and state and federal grants and funding. This includes support for initiatives relevant to agricultural producers such as infrastructure hardening, microgrids, backup power solutions, and vegetation management. Given the breadth of activities and agencies represented by this program, we recommend helping agricultural producers access CA PSPS Resiliency services as part of the SPOC program discussed in Section 4.3: Climate Change Concerns.

4.6 Solar and Electrification Opportunities and Technology Developments

4.6.1 Interview and Survey Response Perspectives

Our research suggests a high level of interest in both solar and electrification among agricultural producers, but cost and performance concerns are slowing the rate of adoption. Thirty-five out of fifty-two (or 67%) respondents indicated high to extremely high interest in adding solar to reduce operating costs, with solar energy systems ranking highest among the energy improvements, as presented in Figure 13. Additionally, 30 out of 52 (or 60%) respondents expressed interest in battery storage technology. However, small agricultural producers tend to lack the financial resources and technical support to implement such projects.

Although agricultural equipment electrification has matured, there is a need for increased awareness and education on electric equipment and energy efficiency upgrades among this customer base. Twenty-seven out of 52 (or 52%) survey respondents were interested to very interested in electric tractors, farm utility vehicles, and farm implements. However, one of the perceptions that has prevented producers from considering diesel-to-electric equipment conversions is believing that they cannot meet the power requirements for certain applications. Additionally, there is the convenience of diesel equipment during power shut offs. One vineyard employee also mentioned that they are concerned the weight of a battery in an electric truck, combined with the average weight of the grape product they transport in their diesel trucks, will exceed the maximum legal weight limit of a full-size truck on California highways. It is in the interest of the business to maximize the product weight during delivery because they are paid by weight of the product. This makes any perceived increase in the weight of their delivery vehicles unappealing.

Figure 13. Level of Interest in Energy Improvements (n=52)



4.6.2 Market Research Perspectives

Summary: Our market characterization research focused on characterizing participation in SCP's Net Energy Metering (NEM) rates and trends in solar and storage costs, while our research into electrification opportunities focused on comparing the performance and operating costs of electric tractors to an equivalent diesel-powered machine.

Net Energy Metering (NEM) tariffs allow customers with solar photovoltaic (PV) systems to receive bill credits for excess generation that is exported to the electric grid during times when it is not serving onsite load. In 2022, there were 186 NEM electricity accounts in the agricultural sector. Applications of solar energy appear to be growing in the agricultural sector.⁴⁵ This may represent a long-term cost savings opportunity and a hedge against future price increases for grid-purchased electricity. As discussed previously in Table 11, between 2020 and 2023, PG&E rates for small customers grew at a CAGR of 14.9%. Over this same period, solar system costs for small systems grew at a CAGR of 1.9% and battery storage costs increased at a CAGR of 0.80% for small battery systems. This suggests solar will be an increasingly competitive source of electricity for agricultural producers.

Electric farm equipment is an emerging market that will see broader adoption in the coming years. Our analysis of data provided by a local manufacturer of electric tractors, Solectrac,⁴⁶ indicates annual fuel saving savings of \$4,700 is possible at current fuel costs. The technical limitations of electric tractors

⁴⁵ The solar farm market is expected to grow at a CAGR of 17.3% over the forecast period from 2023 to 2032 via https://www.precedenceresearch.com/solar-farm-market.

⁴⁶ California Core | Solectrac

noted by stakeholders will be addressed in the coming years, but charging infrastructure will remain a problem without market innovations.

Actions for SCP to consider:

- 1. Provide a flat rate for charging electric farm equipment. This could spur adoption, and may be modelled on programs offering flat rates for residential electric car charging.
- 2. Provide charging infrastructure support for electrified equipment. As noted by stakeholders, electric tractor charging capability is a concern. To compete with fossil fuel tractors more effectively, SCP should consider how to coordinate funding and technical assistance for building out charging infrastructure in the agricultural market, including methods to address reliability concerns during harvest seasons that coincide with periods of high fire danger (typically between late summer and early fall).
- Support access to technical assistance for solar, energy storage, and farm equipment electrification through an integrated resource partnership with various local, state, and federal agencies. This could include the creation of a Single Point of Contact (SPOC) program to minimize the agricultural producer time and effort required to increase distributed generation and electrification of farm equipment.

Analysis: To assess stakeholder views, we focused our market characterization research on characterizing participation in SCP's Net Energy Metering (NEM) rates, and trends in solar and storage costs and our research into electrification opportunities was focused on comparing the performance and operating costs of electric tractors to an equivalent diesel-powered machine.

Analysis of NEM Accounts and Solar Installation Cost Trends

Net Energy Metering (NEM) rates⁴⁷ provide a useful benchmark in defining the saturation of solar energy installation, and what types of customers are installing solar photovoltaic (PV) systems. In 2022, there were 186 NEM accounts in the agricultural sector. As shown in Table 11, 7% of Winery/Vineyard segment customers participate in the NEM rate. Participation among customers in the Dairy segment is much lower at 1%. This analysis of participation by the individual market segments may provide a useful benchmark for future tracking and outreach.

Market Segment	NEM Market Saturation
Winery/Vineyard	7%
Dairy	1%
Other	9%
Total SCP	8%

Table 11. NEM Analysis Breakdown by Market Segment

Electrification of Farm Equipment

We analyzed data from a local manufacturer of electric tractors, Solectrac,⁴⁸ which showed that annual fuel costs are lower than their diesel counterpart by \$4,700. This analysis is based on the Solectrac model e25G,⁴⁹ and is consistent with broader market research on the viability and application of electric

⁴⁷ NEM rates allow customers with solar photovoltaic (PV) systems to receive bill credits for excess generation that is exported to the electric grid during times when it is not serving onsite load.

⁴⁸ California Core | Solectrac

⁴⁹ e25G Gear | Solectrac | Compact Electric Tractor

farm equipment. Industry literature also points to the potential for additional cost savings in the future through self-driving tractors.⁵⁰ Gasoline and diesel prices have increased at a compound rate of 4.35%⁵¹ in the 23 years between 2000 and 2023. For our operating cost analysis, we priced current diesel costs at \$5.97 per gallon and electricity costs at \$0.2896 per kWh based on Rate AG-A2, assuming typical tractor usage and charging patterns.⁵² Our analysis did not include maintenance costs, which industry literature indicates are lower for electric tractors. In addition to operational cost savings, fossil fuel-powered farm machinery offers no viable path to cost management or carbon reduction. Electric tractors offer multiple paths, including zero carbon options, such as fueling with on-site solar during daylight hours and charging using SCP EverGreen rates when solar power is not available.

Fuel Savings	Generic 25 HP Diesel Tractor	Solectrac e25G Tractor
Annual Fuel Consumption	916 Gallons	3,300 kWh
Annual Fuel Cost	\$5,480	\$780

Table 12. Comparison of Annual Fuel Use and Costs for Electric and Diesel Tractors

While recharge time for electric tractors is longer compared to refuel time for diesel, electric farm implement technology is maturing quickly. According to a long-time manufacturer of electric tractors in the region, some of the advantages of electric farm equipment include higher efficiency, avoided fuel costs, fewer pollutants, and lower auditory and respiratory hazards for farmworkers.

Market penetration of electric tractors is currently very low, but according to a recent study by CalStart,⁵³ battery-electric tractors are projected to account for 12%⁵⁴ of new tractor sales by 2029 in California, and 1% in the U.S. According to the same study, electric tractors and other zero-emission off-road equipment produce significantly fewer pollutants compared to off-road diesel equipment. The study also states that the agricultural segments best positioned to decarbonize their equipment in the near-term are those that use low-speed, lightweight equipment, and mentions that vineyards and orchards in California have already begun to undertake equipment decarbonization.⁵⁵ One model, identified in the study, has been adopted by three local operations and can run for up to eight hours on a single charge and can operate longer by using swappable battery packs.

⁵⁰ Cost analysis of autonomous battery electric field tractors in agriculture - ScienceDirect

⁵¹ Retail Prices for Gasoline, All Grades (eia.gov)

⁵² Schedule AG is the default rate plan for agricultural customers. On this rate plan the price of electricity changes by time of day and by season. During the summer season (June through September), electricity prices are higher for all periods compared to prices during the winter season (October through May). Peak period hours are in effect year-round, 5-8pm daily, including holidays via <u>ELEC_SCHEDS_AG.pdf (pge.com)</u>.

⁵³ Technology and Market Assessment of Zero-Emission Off-Road Equipment, Calstart

⁵⁴ Ibid., page 23.

⁵⁵ https://www.monarchtractor.com/experiences/wente-energy-case-study

4.7 Product Delivery Channel and Infrastructure Issues

4.7.1 Interview and Survey Response Perspectives

Loss of local food processors is a problem that was noted during the interviews and is leading to more on-farm processing efforts. Farmers markets, farm stands, and food hubs are all important sales channels for agricultural products. The USDA defines a food hub as "a business or organization that actively manages the aggregation, distribution, and marketing of course-identified food products primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail, and institutional demand." Feedback we received during the interviews regarding food hubs included:

"Pilot programs for electric vehicle fleets, cold storage efficiency, and backup electricity for a food hub or nonprofit food programs could be really interesting."

> UCCE Food Systems Advisor

- 1. Interest in, and organization of, food hubs in the area is on the rise.
- 2. Food hubs present opportunities for energy efficiency and electrification projects, and provide economic development benefits to agricultural producers.
- 3. Electric farm implements and robotics manufacturers in the area provide opportunities for collaborative research, product development, and demonstration opportunities for agricultural electrification and productivity improvement.



Figure 14. Food Hubs Diagram

4.7.2 Market Research Perspectives

The USDA published a Regional Food Hub Resource Guide in 2012 that examines the impact of food hubs on regional food systems and collected information on the resources that can help support the growth of food hubs.⁵⁶ Among the findings included in the Resource Guide is that "many farmers and ranchers are challenged by the lack of distribution and processing infrastructure that would give them wider access to retail, institutional, and commercial food service markets, where demand for local and regional foods continue to rise." Research suggests that food hubs are an important way of addressing this challenge through expanded revenue opportunities for small to mid-size farmers and ranchers to compete in wholesale supply chains; increased access to facilities where they are able to store, process,

⁵⁶ 2012 USDA Regional Food Hub Resource Guide

and distribute their products; and increased financial viability for wholesalers to purchase products due to lower transaction costs.

Additionally, the 2017 National Food Hub Survey⁵⁷ found that the benefits of food hubs include local job creation, partnerships between businesses, and offering an important sales channel for new small and mid-size farmers.⁵⁸ Additionally, the UC Sustainable Agriculture Research and Education Program (SAREP) reports that the number of food hubs has been steadily increasing in the U.S., with nearly 400 food hubs in the U.S and approximately 20 food hubs in California, in 2017.⁵⁹ Information on the current landscape of food hubs is also available through the 2021 National Food Hub Survey. The survey reported that COVID-19 had a significant impact on food hubs, with sales to large markets falling in 2020—although food hub revenues increased in 2020⁶⁰ compared to 2019. However, significant increases in expenses were also experienced. Despite this trend in rising costs, the survey reports that "organizations are continuing to enter the market at a steady rate"⁶¹ (see Figure 15).



Figure 15. Percentage of 2021 National Food Hub Survey Organizations by Years in Operation

4.8 Regulatory Compliance and Paperwork

4.8.1 Interview and Survey Response Perspectives

The agricultural industry is heavily regulated in terms of labor, pesticide use, water, organic certification, and more. Meeting these requirements demands time-consuming paperwork, which poses a considerable challenge, particularly for the small family agricultural producer. Challenges related to paperwork and regulatory compliance in the agricultural community emerged as recurring issues during the interview process. Local cannabis growers, in particular, have faced permitting challenges and local scrutiny related to water usage. These interviews revealed that filing the appropriate paperwork is often a convoluted process, with confusing guidelines, and an unreasonable time commitment.

⁵⁷ The National Food Hub Survey is completed every five years since 2012 by Michigan State University's Center for Reliable Food Systems, the University of Michigan Program Evaluation Group, and the Wallace Center.

⁵⁸ Colasanti, K. et al. 2018. Findings of the 2017 National Food Hub Survey. Michigan State University Center for Regional Food Systems & The Wallace Center at Winrock International.

⁵⁹ Colasanti, K. et al. 2018. Findings of the 2017 National Food Hub Survey. Michigan State University Center for Regional Food Systems & The Wallace Center at Winrock International.

⁶⁰ The <u>2021 National Food Hub Survey</u> also suggested that non-sales revenue likely increased due to government funding available after the Covid-19 pandemic.

⁶¹ <u>2021 National Food Hub Survey Report</u>, page 9.

One vineyard and orchard operator reported that "[r]egulations are always an issue, [...] the state and county tend to make life more challenging difficult, and usually, from a farmer's perspective, without really accomplishing anything of worth." They further emphasized the daily burden of paperwork, "it feels like the regulations are things that we're already doing but we end up spending a lot of time just kind of verifying that we're doing things that we're already doing."

One of the UCCE interviewees expressed sympathy for agricultural workers, stating "farmers and ranchers can come to me with questions about rules, regulations, licenses, permits, all the sort of intimidating and unpleasant things that come with what they're trying to do as farmers and ranchers." From his experience, he noted that a big hurdle for farm operators is simply submitting their documentation to maintain ongoing business operations.

4.8.2 Market Research Perspectives

Overall, there has been a lack of research at the macro-economic scale that examines the impacts of regulation on farm productivity and profitability, with one study noting that "there have been works examining

specific regulations, but little work on the cumulative impact of agricultural regulations." ⁶² Despite this lack of research on the financial impacts of regulatory compliance, there are examples of small farms facing higher costs for regulatory compliance in comparison to larger farms. A USDA Economic Research Service (ERS) report from 2018 on the cost of complying with Food Safety Modernization Act's (FSMA) Produce Safety Rule, estimated that farm-level compliance costs are driven by farm size.⁶³ The report estimates that the average cost of compliance for very small farms (\$25,000 to \$250,000 in value of annual produce sales) would be 6.77% of revenue, while the cost of average compliance for the largest farms (\$3,450,000 or more in value of annual produce sales) would be 0.33%.⁶⁴

This finding is significant, as roughly 75% of Sonoma County farms and 50% of Mendocino County farms are considered "small," at less than 50 acres. Although more research is needed to better understand the financial and time impacts of agricultural policy on farms in Sonoma and Mendocino Counties, our research indicates that compliance with rules, regulations, licenses, and permits is complex and challenging. However, certain tools exist to alleviate this burden. For example, Farm Bureaus in the area are heavily involved in legislative and advocacy activities on behalf of local agricultural producers. Additionally, UCCE advisors provide aid to agricultural producers in managing regulatory compliance matters. SCP could augment these support activities by offering assistance for financing applications and documentation support for energy improvement projects through the aforementioned single-point-of-contact program.

"The future of groundwater use is also unknown as the entire county is now subject to expansive permitting (still being developed) or SGMA (Sustainable Groundwater Management Act) in the Ukiah Valley. So, in terms of what services can be provided to improve water supply, I would say this is more of a regulatory auestion."

> Mendocino County Farm Bureau

⁶² Agricultural Productivity Growth and Regulation published by Purdue University in 2015

⁶³ Estimated Costs for Fruit and Vegetable, USDA, 2018

⁶⁴ Ibid.

4.9 SCP's Presence in the Agricultural Sector

4.9.1 Interview and Survey Response Perspectives

SCP brand recognition and awareness of SCP customer programs and offerings appears high among agencies and associations, but generally low among agricultural producers. As seen in Figure 16, respondents were evenly divided when it came to the question of whether SCP charges lower rates than PG&E. Twenty-one percent of respondents indicated SCP rates are lower and 21% responded that PG&E rates are lower, while 58% were unsure.⁶⁵ And, while 56% of respondents were aware that SCP is not a division of PG&E, 39% were not sure. Nearly half of the respondents were aware that SCP does the following: provides cleaner energy than PG&E, is working to improve the environment, and offers programs that benefit the environment. The true/false statement with the highest uncertainty was "[SCP] is financially strong." This is consistent with findings from SCP's 2022 brand awareness survey with 82% of residential customers unsure if this statement was true or false.



Figure 16. True or False Questions about SCP (n=57)

Survey respondents were also asked to indicate their satisfaction with SCP, and the results are presented in Figure 17. Fifty percent of survey respondents were either very satisfied or satisfied, 22% were neutral, and 10% were dissatisfied or very dissatisfied. Eighteen percent of respondents selected "not sure."

⁶⁵ At the time of this survey SCP rates were approximately 5% lower than PG&E rates.



Figure 17. Survey Respondent Satisfaction with SCP (n=60)

SCP has an opportunity to grow its presence in the agricultural sector by developing technical or financial subject matter expertise. While there are technical and financial resources available from government programs (e.g., USDA NRCS), there is a notable need for objective, unbiased expertise, and advisory services on energy matters to supplement these offerings. Government programs tend to be highly competitive and have limited funding, but the Inflation Reduction Act (IRA) is expected to increase relevant grants and incentives. Further, application processes can be complex and time-consuming. Overall, complementary programs that provide more immediately available funds and technical support for energy efficiency opportunities are needed.



Figure 18. Interest in Potential SCP Offerings

Agencies – including UC Cooperative Extensions, USDA Natural Resource Conservation Service (NRCS) centers, and the Farm Bureaus – and industry groups, such as Sonoma County Winegrowers, represent key points of ongoing collaboration for SCP. A collaboration or partnership with one, or a combination, of these entities could expand SCP's presence in the agricultural sector. These organizations offer research, education, and support that SCP could link customers to or leverage directly for green energy and electrification and local economic development.

4.9.2 Market Research Perspectives

Summary: Approximately 79% of agricultural stakeholders are <u>not sure</u> that SCP understands and is responsive to customer needs, compared to 68% of residential customers who responded "not sure" to this statement in 2022. This contrasts with market research completed by the CPUC in 2013 that identified local utilities as the primary source of energy information for customers across all agricultural market segments. This information gathering and dissemination role is becoming increasingly important due to the agricultural sector's unique role in the water-energy-carbon nexus. In response to this need, Marin Clean Energy (MCE) has launched an agricultural sector program that leverages the Single Point of Contact (SPOC) to provide comprehensive guidance to customers on technical and financial solutions.

Actions for SCP to consider:

- 1. Provide a single point of contact (SPOC) program offering support on energy related topics, including technical assistance for project development and delivery; financing application and documentation support; and help with marketing and outreach.
- 2. Lead a cross-agency effort to provide SPOC support on issues impacting the agricultural sector, including:
 - a. Support for accessing all available funding sources.
 - b. Climate change concerns, including the role of agriculture in mitigation.
 - c. Water and energy cost and availability.
 - d. Distributed generation, reliability, and electrification opportunities.

Analysis: Utilities have been identified as an important information channel within the agricultural sector, including the role of coordinating technical and financial resources in an increasingly complex market. An agricultural sector market characterization study completed in 2013⁶⁶ indicated that, for vineyard and winery operators, utilities are the most commonly used information channels for energy-related issues.

To support these needs, Marin Clean Energy (MCE), another California CCA, has designed an agricultural sector program⁶⁷ that provides Single Point of Contact (SPOC) to work with customers and to ensure that "all options are presented to the customers" via an assessment report. The SPOC has four primary areas of responsibility:

- 1. Quality Assurance and Quality Control: The SPOC will offer quality assurance to the program by preventing, identifying, and/or resolving project management issues as they occur.
- 2. Financing: The SPOC will facilitate access to all available financing programs, depending on the best fit for the applicant. The SPOC will also aid in completing applications, identifying energy impacts of the proposed project, and provide project management and oversight of the application process.

⁶⁶ 2010-2012 Statewide Agricultural Energy Efficiency Potential and Market Characterization Study. Navigant Consulting, Inc. May 6, 2013.

⁶⁷ Agricultural-Sector.pdf (mcecleanenergy.org)

- 3. Marketing and Outreach: The SPOC will manage relationships with customers in the agricultural program using SCP's Customer Relationship Management (CRM) software to organize data for lead generation and follow-up.
- 4. Technical Assistance: The SPOC will serve as a project facilitator and customer advocate to help guide business owners throughout the process, from initial contact to project completion, and help them to identify future participation opportunities.

5. Program & Strategy Recommendations

Our research reveals that there is a clear need for SCP to have an active, broad spectrum, and durable level of engagement with the agricultural sector in Sonoma and Mendocino Counties. This need stems largely from the following key factors:

- > The importance of the agricultural sector to the culture and economy of the region.
- > The severe financial stress that the sector is currently experiencing.
- A lack of reliable and objective technical and financial support for the implementation of energy saving, managing, and producing strategies.
- Large untapped potential for advancement in the areas of agricultural equipment electrification, solar generation, backup power, and demand management.

Working from this perspective, the project team identified the following set of recommendations to help enable SCP to be a trusted, high-value partner in promoting a sustainable agricultural sector in its service region. Each recommendation includes a set of potential engagement opportunities with the agricultural sector. However, caution must be exercised as this sector is highly risk averse, has few reliable resources for making energy decisions, and limited access to investment capital. Hence, the authors recommend a "go slow" approach that demonstrates the practical and financial viability of available options.

Recommendation #1: Conduct near-term follow-up research and engagement with key local market actors. This project represents an important step in developing working relationships between SCP and key market sector actors, and demonstrating SCP's commitment to local sustainable agriculture. Additionally, this study uncovered valuable insights into local market conditions and dynamics, working relationships, and industry needs. As a follow-up step, SCP should build on the insights gathered to date by filling certain identified knowledge gaps and developing metrics to guide future work. Such efforts could include forming an industry collaboration with key stakeholders; conducting focus groups with agricultural customers; hosting working sessions with key agencies and industry groups; and developing a consortium of agricultural manufacturers.

Recommendation #2: Develop a strategy for ongoing and long-term engagement with key partners. Developing a long-term outreach and engagement plan for the relationships initiated during this study would help to elevate SCP's market presence with this customer segment. Potential partners include, but are not limited to, the University of California Cooperative Extensions (UCCEs), local winegrowers associations, Natural Resources Conservation Service (NRCS), the local farm bureaus, and other advocacy groups. Key partnering opportunities exist with these local organizations on research, demonstrations, and pilot projects. Examples of potential outreach and engagement activities with key partners include:

- Research and demonstrations on new and emerging agricultural technologies and demand side management (DSM), distributed energy resources (DER), and electrification measure concepts.
- Grant writing support for demonstration research projects funded by California Air Resources Board (CARB), the Inflation Reduction Act (IRA), or NCRS' Environmental Quality Incentives Program (EQIP).
- Funding for research projects that have an energy or energy-water nexus element.

Recommendation #3: Develop technical support resources and establish SCP as the customer's "energy expert" in the marketplace. Technical support on agricultural best practices (e.g., soil health and pest management) is readily available through agencies such as the University of California Cooperative Extensions (UCCE), the National Resources Conservation Service (NRCS), and other agencies. However, they tend to focus mainly on fundamental agricultural topics, such as soil science, pest management, water access, community health advocacy, and preservation of natural areas. As a result, there is a strong need in the market for objective, unbiased energy expertise around energy efficiency, renewables, electrification measures, and other farm energy use issues. Actions SCP could take to advance this objective include:

- Support research projects with an energy or energy-water nexus element.
- Develop online and in-person educational resources and tools to help the agricultural producer community better understand the costs and benefits of energy-related decisions (e.g., FAQs, webinars, seminars, informational e-mail campaigns).
- Collaborate on demonstration projects on emerging technologies, such as electric farm vehicles and implements.

Recommendation #4: Conduct a detailed benefit-cost analysis of agricultural customer demand-side management measures and programs. Measures and technology applications that alter the way customers use energy are the building blocks of customer-facing demand-side management (DSM) programs. These types of measures are meant to reduce energy use at the meter through energy efficiency; leverage customer-sited energy generation; shift peak load or time of use through demand management strategies; or electrify fossil fuel end-uses. A detailed and systematic benefit-cost analysis is a critical step in determining the viability of these measures from the customer, societal, and utility perspectives. This requires an assessment of energy, climate, grid, and customer impacts. Costs research would need to include defining full and incremental costs for both material and labor required for the initial installation, and any lifecycle costs incurred after a project is installed and commissioned. Candidate measures for a detailed benefit-cost analysis of agricultural DSM opportunities include:

- Energy efficiency improvements in farm housing and facilities, water pumping for irrigation, livestock watering, and frost protection.
- Customer-sited generation measures, including solar photovoltaics (e.g., agrivoltaics for livestock shading), mobile solar for remote applications (e.g., livestock watering and electric fencing), and manure biodigesters for electricity generation.
- Demand management via deployment of battery storage, and control of applications such as vehicle charging and variable speed water pumping. Demand management may be viewed as a cost reduction strategy, such as peak shaving or load shifting to off-peak times, or as a risk mitigation strategy where outages are a risk, such as Public Safety Power Shutoff events.
- Farm electrification measures, including electrification of farm equipment and implements, product distribution transportation, and segment-specific specialty applications, such as manure management in dairy operations.
- Agricultural robotics and precision agricultural technologies to improve productivity, increase resource utilization efficiency, and help alleviate farm labor shortages.

Recommendation #5: Prepare a modeling tool for estimating the load shape and cost impacts of an integrated suite of agricultural customer energy measures. This recommendation addresses the need to quantify the overall load shape impacts, benefits, and costs of a program from SCP's load serving entity (LSE) perspective. This modeling effort would result in an aggregate or integrated load analysis that accounts for the sum total of the contributions of individual measures and demand-side management interventions. This type of benefit-cost analysis typically relies on standardized cost effectiveness tests that are used to make decisions about demand-side management program selection and implementation in the utility industry. To balance SCP's role as a load-serving entity (LSE) and the preferences of its customers and stakeholders, it's necessary to examine program cost-effectiveness in a way that includes a broad spectrum of energy, societal, and climate benefits and costs. The Resource Value Test as developed by the National Energy Screening Project (NESP)⁶⁸ provides such a perspective, as well as flexibility in the formulation of the components of the test. For the sake of replicability, portability, and usability, the load shape impact modeling work could be done in an Excel Workbook and would need to be applicable territory wide.

Recommendation #6: Develop a comprehensive agricultural sector single point of contact resource program. SCP could pursue an agriculture-focused program that would provide a single point of contact (SPOC), offering the financial and technical assistance most needed by local agricultural producers and distribution nodes. As envisioned, this would be a comprehensive resource program with the intent of supporting customers in implementing efficiency, conservation, renewable energy, demand management, and electrification measures.

While beneficial to all agricultural producers, a SPOC approach might be most valuable to small operators (less than 50 acres), who make up roughly 75% of Sonoma County farms and 50% of Mendocino County farms. Such a program could successfully address top customer concerns like energy costs and time constraints. To do so, the SPOC could provide technical assistance to producers in accessing available program funds to implement efficiency, demand response, distributed generation and energy storage opportunities. Depending on whether there is a component focusing on water cost and availability—another top concern—the SPOC could also assist producers with support on project design for upgrading irrigation systems and improving well performance as discussed in Section 4.4. This program approach to addressing concerns could also increase SCP's presence in the agricultural sector and establish SCP as a leader in cross agency coordination on energy, water and carbon issues.

Recommendation #7: Develop a program focused on the water-energy nexus. A program focused on the water-energy nexus could engage agricultural producers and water agencies in a collaborative effort to bring solutions to greater market awareness and deployment. Providing incentives and promoting irrigation measures, such as variable speed drive applications or precision irrigation technologies (e.g., soil moisture sensors), could yield significant energy savings and allow producers to make decisions based on real-time and forecasted weather conditions. SCP could also support access to funding for water, energy, and carbon projects through an integrated resource partnership with various local, state and federal agencies. Finally, well pump testing is a proven strategy for maximizing water pumping efficiency.

Recommendation #8: Develop and deploy targeted demonstrations and pilot projects. Technology demonstration projects in real-world operating conditions, conducted in collaboration with trusted industry actors (e.g., the UCCE and NRCS), could help significantly alleviate performance and cost anxieties associated with new technologies. Due to the high cost of failure, agricultural customers rely heavily on examples and demonstrations of technologies and methods to ensure that new approaches will perform as expected. Examples of these types of projects include:

- A remote solar and electrification pilot project for on-farm applications, such as water pumping, livestock watering, and electric fencing.
- A precision agricultural demo involving soil moisture sensor-controlled irrigation with variable speed drive pumping.

⁶⁸ The National Standard Practice Manual, National Energy Screening Project, Spring 2017.

- A food hub demo for high-efficiency cool storage refrigeration, solar plus storage, transportation electrification, and reduced vehicle miles traveled (VMT).
- A pilot project for electrification of farm tractors and farm implements for harvesting, seeding, compost spreading, cultivation, and other applications. This would include strategies for installing the electric farm vehicle charging infrastructure necessary to meet the unique needs of farm equipment, such as working long hours in remote areas.

Recommendation #9: Form a farm implement electrification manufacturers and product distributors consortium or collaborative. Electrification of farm implements has broad and deep potential to reduce farm operating costs, improve productivity, reduce emissions, and help alleviate the chronic farm labor shortage. Keys to success include the development of electric prime movers (e.g., tractors), a full range of farm implements⁶⁹ (e.g., plows and row trimmers), and adoption of farm robotics. One of the oldest and most well-established electric tractor and implement manufacturers in the country, Solectrac, is located in Santa Rosa. To aid in the rapid development and deployment of these technologies, SCP may want to consider working with local and regional manufactures and equipment suppliers to form an electric farm implement development consortium or collaborative. This type of cross stakeholder initiatives would coordinate on market transformation initiatives such as market facilitation, cobranding, and stacking of financial incentives (e.g., low interest rates loans coupled with rebates).

Recommendation #10: Develop a program designed to assist with tackling the farmworker housing shortage. Although many of the barriers associated with new housing development (e.g., permitting) aren't easily addressed by utilities, a program or program element focused on this segment could make inroads. For example, a comprehensive package of energy cost reduction measures for all-electric new housing and retrofit of existing housing would be a significant contribution to addressing this problem. For existing housing, such a program could include a comprehensive whole home efficiency solution such as Energy Upgrade California, combined with 0% interest loans for replacing old and poorly functioning equipment with more energy-efficient equipment. Such a program could also provide financial incentives for a range of energy efficiency, solar, demand management, and electrification measures. Additionally, SCP could consider participating in a joint agency farmworker housing baseline study that defines housing needs and how they might be addressed, including coordination on local housing plans combined with development waivers on new construction projects that exceed energy code requirements.

Recommendation #11: Provide market support for electric farm equipment and battery-electric tractor charging. As electric tractor adoption continues to grow, one option for SCP to consider is supporting increased charging needs by providing a flat rate for charging farm electric farm equipment. This could spur adoption and may be modelled on other innovations offering flat rates for residential electric car charging, such as Duke Energy's recently approved pilot program providing a flat rate EV charging subscription service to residential customers in North Carolina.⁷⁰ The rate design would need to consider approaches to peak load management, such as limitations on when charging could occur (i.e., TOU time differentiation), or support enrolling rate subscriber in PG&E's demand response programs that offer financial incentives for load reduction during times of peak demand.

SCP can also offer charging infrastructure support so that electric farm implements can compete with fossil fuel machines more effectively, as charging is a concern among agricultural producers. SCP should also consider how to support electric tractor charging through coordinated funding and technical assistant offerings.

⁶⁹ Tools used to perform specialized tasks on farms that assist in agricultural processes.

⁷⁰ Duke Energy to pilot EV charging subscription service in North Carolina | Duke Energy | News Center (duke-energy.com)

Glossary

Term	Definition
Agrivoltaics	The use of land for combined agriculture and solar photovoltaic energy generation.
Anaerobic Biodigesters	Process wherein bacteria break down into organic matter and produce biogas and digestate. Energy in biogas can be used for applications such as electricity, heat, and vehicle fuel. After treatment, digestate can be used as organic fertilizer, animal bedding, and other applications.
California Alternate Rates for Energy (CARE)	A state-wide program that offers a discount on electric and natural gas bills for qualifying California households. Eligibility for the program is determined by household income and size.
California Public Utilities Commission (CPUC)	A California statewide regulatory body that oversees regulation of energy utilities, transportation, telecommunications, and water utilities.
Carbon Farming	Farming practices aimed at removing carbon from the air and storing it in soil. Carbon farming often involves the use of soil amendments, which are products that improve soil qualities and health. Certain soil amendments that improve soil health can also sequester carbon.
Community Choice Aggregation (CCA)	Programs that allow local government agencies (e.g., SCP) to procure electricity for residents, businesses, and municipal sites from alternative energy suppliers while still receiving transmission and distribution service from their existing utility provider (e.g., PG&E).
Compound Annual Growth Rate (CAGR)	A measure used to indicate the mean annual growth rate over a specified time period longer than one year.
Demand Side Energy Management (DSM)	A strategic tool used by electric utilities that encourages customers to reduce and manage their energy use patterns. Strategic tools include programs that incentivize the purchase of energy efficient equipment, and programs or electricity rates that promote using energy at specific times.
Distributed Energy Resources (DER)	Devices and technologies that interface with the electricity system at the distribution level, either directly connected to a distribution utility's wires or on an end-use customer's premises, behind the utility meter.
EverGreen	Electricity rate offered by Sonoma Clean Power, which allows customers to purchase 100% renewable, 24 hour, locally-generated energy.
Food Hub	A business or organization that organizes the aggregation, distribution, and marketing of food products from local producers. Food hubs are distinct from farmers markets where producers sell directly to the customer.
H-2A Temporary Agriculture Workers Program	A federal program allows U.S. employers to hire workers from other countries to perform temporary or seasonal agricultural work.
Inflation Reduction Act	Congressional act passed in August 2022 which funded significant investments into clean energy, climate mitigation and resiliency, agriculture, and conservation.
Investor-Owned Utility (IOU)	A private, for-profit utility that generates and distributes power over a defined service territory.

Load-serving entity (LSE)	An electric market participant that supplies energy to customers, which can include investor-owned utilities, CCAs, and other third-party market actors.
Microgrid	Localized electric grids that can operate independently from the main grid and are therefore able to supply energy and avoid interruptions for users.
Micro-Pilot	A type of small program that is often innovative in nature. These programs are based on the principles of rapid iterative development (RID) and are useful when testing a new idea to monitor results and effectiveness prior to scaling to a wider audience.
Natural Resources Conservation Service (NRCS)	The United States Department of Agriculture's primary private lands conservation agency. The agency's focus is on delivering conservation solutions to agricultural producers in the U.S. and offers technical and financial assistance focusing on improving the quality of soil, air, climate, water, energy and habitats across farms, ranches, forest operations, and rural communities.
Net-Energy Metering (NEM)	Rate option for customers with renewable generation systems (e.g., rooftop solar) that allows them to receive a bill credit for the surplus electricity generated and supplied to the grid.
Precision Agriculture	A farm management system that uses site-specific data and technology to increase crop yields and profitability while lowering the levels of traditional inputs needed to grow crops, including land, water, fertilizer, herbicides and insecticides.
Public Safety Power Shutoff (PSPS)	The proactive shutoff of electrical lines by Investor-Owned Utilities during times when there is a heightened risk of wildfires (e.g., during strong winds and heat events).
Single Point of Contact (SPOC)	Program concept wherein one or a set of contacts could assist stakeholders in accessing funding and technical assistance programs.
Solar Photovoltaic (PV) System	Devices that generate electricity directly from sunlight using semiconducting materials.
Sonoma Clean Power (SCP)	Sonoma Clean Power is a not-for-profit public agency providing cleaner electricity to homes, governments, and businesses in Sonoma and Mendocino Counties. SCP is one of 24 CCAs operating in the state of California.
UC Cooperative Extension (UCCE)	Offices with researchers and educators focused on applying University of California system research to local issues, including local agricultural, economic, natural resource, youth development and nutrition issues.
United States Department of Agriculture (USDA)	A United States federal agency that provides research, funding, and guidance for agriculture, food, natural resources, rural development, nutrition, and other related issues.

Appendix A. Agriculture- Related Funding Programs

Table 13. Agriculture-related Funding Programs by Sustainability Topic

Precision Ag	Farm Worker Housing	Vehicle Electrification	Wildfire Mitigation	Water Conservation	Carbon Sequestration
		Fee	deral		
1. National Institute of Food and Agriculture (NIFA): NIFA offers grants and funding opportunities for research, education, and extension projects related to precision agriculture.	1. USDA Rural Development: This agency provides loans, grants, and technical assistance to rural communities, including those with large populations of farm workers. It has a specific program for farm labor housing, which provides financing for the construction, rehabilitation, and purchase of housing for farm workers.	1. USDA Rural Energy for America Program (REAP): REAP provides grants and loans to rural small businesses, including farms, to purchase and install renewable energy systems and make energy efficiency improvements. This includes funding for the purchase of electric farm equipment.	1. USDA Forest Service: The Forest Service provides funding, technical assistance, and other resources to support wildfire mitigation and preparedness efforts, including fuel reduction treatments, firebreak construction, and public education.	1. USDA Natural Resources Conservation Service (NRCS): NRCS provides financial and technical assistance to farmers, ranchers, and forest landowners for implementing conservation practices that improve water management and water quality.	1. USDA Natural Resources Conservation Service (NRCS): NRCS provides financial and technical assistance to farmers, ranchers, and forest landowners for implementing conservation practices that sequester carbon, such as cover cropping, reduced tillage, and agroforestry.
2. USDA Agricultural Research Service (ARS): ARS invests in research to improve the efficiency and sustainability of agricultural systems, including precision agriculture.	2. U.S. Department of Health and Human Services: The Department of Health and Human Services (HHS) provides funding for health and safety improvements to farm worker housing through its Rural Housing Preservation Grant Program.	2. USDA Natural Resources Conservation Service (NRCS): The NRCS provides funding and technical assistance to farmers to implement conservation practices, including the adoption of energy-efficient technologies, such as electric farm equipment.	2. Federal Emergency Management Agency (FEMA): FEMA provides funding to help communities recover from the impacts of wildfires, including funding for debris removal, rebuilding homes and infrastructure, and emergency protective measures.	2. USDA Agricultural Water Enhancement Program (AWEP): This program provides funding to support agricultural water management practices that conserve and improve water resources in the western United States.	2. USDA Climate Smart Agriculture and Forestry (CSAF) Program: This program provides funding and technical assistance to help farmers, ranchers, and forest landowners implement practices that reduce greenhouse gas emissions and sequester carbon in agricultural and forested landscapes.
3. USDA Natural Resources Conservation Service (NRCS): The NRCS provides technical and financial assistance to farmers and landowners for conservation practices, including those related to precision agriculture.	3. U.S. Department of Housing and Urban Development (HUD): HUD provides funding for affordable housing developments, including those for farm workers, through its Community Development Block Grant Program and HOME Investment Partnerships Program.	3. Environmental Quality Incentives Program (EQIP): EQIP provides funding and technical assistance to farmers to implement conservation practices, including the adoption of energy-efficient technologies, such as electric farm equipment.	3. USDA Natural Resources Conservation Service (NRCS): NRCS provides financial and technical assistance to farmers, ranchers, and forest landowners for implementing conservation practices that reduce the risk of wildfire.	3. Environmental Quality Incentives Program (EQIP): EQIP provides financial and technical assistance to farmers, ranchers, and forest landowners to implement conservation practices that improve water quality and enhance natural resources.	3. USDA Regional Conservation Partnership Program (RCPP): RCPP provides funding and technical assistance to support partnerships between the NRCS, other federal agencies, and private organizations to implement conservation practices that sequester carbon and improve soil health.

4. USDA Farm Service Agency (FSA): FSA offers a variety of loan programs, including guaranteed loans, that can be used to finance precision agriculture technology and equipment.	4. U.S. Department of Labor: The Department of Labor provides grants to organizations that help improve working conditions for farm workers, including efforts to improve their housing.	4. State Energy Program (SEP): SEP provides funding to states to support energy efficiency and renewable energy initiatives, including the adoption of electric farm equipment.	4. Bureau of Land Management (BLM): BLM provides funding, technical assistance, and other resources to support wildfire management and suppression efforts on public lands, including fuel reduction treatments and firebreak construction.	4. Bureau of Reclamation (BOR) WaterSMART: This program provides funding for water management and conservation projects in western states, including those aimed at reducing agricultural water use.	4. USDA Agricultural Conservation Easement Program (ACEP): ACEP provides funding to support conservation easements on agricultural lands, which can help to protect and enhance carbon sequestration in agricultural soils and vegetation.
5. National Aeronautics and Space Administration (NASA): NASA provides funding and resources for research related to precision agriculture, including remote sensing and data analysis.	N/A	5. Advanced Technology Vehicles Manufacturing (ATVM) Loan Program: The ATVM Loan Program provides loans to manufacturers of advanced technology vehicles, including electric farm equipment.	5. Firewise Communities/USA: This is a national program that provides resources and support to help communities take action to reduce their risk from wildfire.	5. USDA Rural Development: This agency provides financing and technical assistance to rural communities and farmers to support infrastructure and water management projects, including those aimed at improving water conservation and efficiency.	5. Environmental Quality Incentives Program (EQIP): EQIP provides financial and technical assistance to farmers, ranchers, and forest landowners to implement conservation practices that improve soil health and sequester carbon.
		Cali	fornia		
1. California Department of Food and Agriculture (CDFA): CDFA offers grants and funding opportunities for research and development projects related to precision agriculture.	1. Agricultural Labor Housing Assistance Program (ALHAP): This program provides grants and loans to farm owners and organizations to construct, improve, or acquire housing for farm workers. The program is administered by the California Department of Housing and Community Development (HCD).	1. Agricultural Energy Efficiency Program (AgEE): AgEE provides funding to farmers and ranchers in California to purchase and install energy-efficient equipment, including electric farm equipment.	1. California Climate Investments (CCI): CCI is a statewide program that invests in clean energy and energy efficiency projects, including wildfire mitigation efforts.	1. State Water Efficiency and Enhancement Program (SWEEP): This program provides grants to California farmers for implementing water-saving technologies and practices.	1. California Climate Investments (CCI) Agricultural Lands: This program provides funding for projects that improve soil health, reduce greenhouse gas emissions, and increase carbon sequestration in California's agricultural sector.
2. USDA Natural Resources Conservation Service (NRCS): The NRCS provides technical and financial assistance to farmers and landowners in California for conservation practices, including those related to precision agriculture.	2. California Tax Credit Allocation Committee (TCAC): TCAC provides tax credits to developers of affordable housing, including farm worker housing. This program has helped finance the construction of new farm worker housing units in California.	2. California Climate Investments (CCI): CCI is a statewide program that invests in clean energy and energy efficiency projects, including the adoption of electric farm equipment.	2. Forest Health Program (FHP): FHP provides funding to support the management and restoration of forests, including efforts to reduce the risk of wildfires.	2. Sustainable Agricultural Water Stewardship Program (SAWS): This program provides funding to support the development and implementation of sustainable water management practices on California agricultural lands.	2. Healthy Soils Program: This program provides financial incentives to California farmers for implementing practices that improve soil health and sequester carbon, such as cover cropping, reduced tillage, and compost application.

3. California Climate Investments: California Climate Investments is a statewide program that provides funding for projects that reduce greenhouse gas emissions and improve the state's environment, including precision agriculture initiatives.	3. California Infrastructure and Economic Development Bank (IBank): IBank provides financing for a wide range of infrastructure and economic development projects, including affordable housing developments for farm workers.	3. Self-Generation Incentive Program (SGIP): SGIP provides incentives to encourage the deployment of distributed energy resources, including electric farm equipment.	3. Fire Prevention Fund (FPF): FPF provides funding to support fire prevention and forest health projects, including efforts to reduce the risk of wildfires.	3. Agricultural Water Management Council (AWMC): The AWMC provides technical assistance, education, and funding opportunities to help California farmers conserve water and improve the efficiency of their water use.	3. California Department of Food and Agriculture (CDFA) Alternative Manure Management Program (AMMP): This program provides funding to support alternative manure management practices that reduce greenhouse gas emissions and sequester carbon in California's agricultural sector.
4. California Energy Commission: The California Energy Commission provides funding and resources for research and development projects related to energy efficiency, including those related to precision agriculture.	4. Affordable Housing and Sustainable Communities (AHSC) Program: This program provides funding for affordable housing developments, including those for farm workers, that are located near transit and other amenities. The program is administered by the Strategic Growth Council.	4. Energy Upgrade California: Energy Upgrade California provides funding and technical assistance to support energy efficiency and renewable energy projects, including the adoption of electric farm equipment.	4. Wildfire Risk Reduction Program (WRRP): WRRP provides funding to support local government efforts to reduce the risk of wildfires through the implementation of projects such as fuel reduction and forest management.	4. Central Valley Project (CVP) Water Management Fund: This fund provides financial support for water conservation projects in California's Central Valley region, including those aimed at reducing agricultural water use.	4. CDFA Healthy Soils Demonstration Project: This program provides funding and technical assistance to farmers to demonstrate and promote practices that improve soil health and sequester carbon.
5. USDA Farm Service Agency (FSA): FSA offers a variety of loan programs, including guaranteed loans, that can be used to finance precision agriculture technology and equipment in California.	5. California Workforce Housing Grant Program: This program provides grants to organizations that are developing or preserving affordable housing for low- income workers, including farm workers. The program is administered by the Housing and Community Development Department (HCD).	N/A	5. California State Responsibility Area Fire Prevention Fee (SRA Fee): The SRA Fee provides funding for fire prevention and forest health projects in areas designated as the State Responsibility Area, where the state is responsible for funding fire protection.	5. California Climate Investments (CCI) Agricultural Water Management: This program provides funding for water management projects that reduce greenhouse gas emissions and improve water use efficiency in California's agricultural sector.	5. USDA Natural Resources Conservation Service (NRCS) Conservation Stewardship Program (CSP): This program provides funding and technical assistance to farmers and ranchers in California for implementing conservation practices that improve soil health and sequester carbon.

Торіс	Area	Program	Funding	Tech Support
Wildfire Mitigation	CA	Forest Health Program (FHP)	Grants	No
Wildfire Mitigation	US	Federal Emergency Management Agency (FEMA)	Grants	Yes
Wildfire Mitigation	US	USDA Natural Resources Conservation Service (NRCS) - EQIP Fire	Grants	Yes
Wildfire Mitigation	CA	Wildfire Risk Reduction Program (WRRP)	Grants	
Wildfire Mitigation	US	USDA Forest Service	Grants	No
Wildfire Mitigation	US	Bureau of Land Management (BLM)	Grants	Yes
Wildfire Mitigation	US	Firewise Communities/USA	Grants	Yes
Wildfire Mitigation	CA	California Climate Investments (CCI)	Grants	No
Wildfire Mitigation	CA	Fire Prevention Fund (FPF)	Grants	No
Wildfire Mitigation	CA	California State Responsibility Area Fire Prevention Fee (SRA Fee)		Yes
Advanced Ag Tech& Practices	CA	California Department of Food and Agriculture (CDFA) - Office of Environmental Farming and Innovation (OEFI)	Finance	Yes
Advanced Ag Tech& Practices	CA	California Energy Commission (CEC)	Finance	No
Advanced Ag Tech& Practices	US	USDA Natural Resources Conservation Service (NRCS) - Conservation Innovation Grants (CIG)	Finance	Yes
Advanced Ag Tech& Practices	US	USDA Natural Resources Conservation Service (NRCS) - On- Farm Energy Initiative	Finance	Yes
Advanced Ag Tech& Practices	US	USDA Rural Development - Rural Energy for America Program (REAP)	Grants	Yes
Advanced Ag Tech& Practices	US	USDA National Institute of Food and Agriculture (NIFA) – Ag and Food Research Initiative (AFRI)	Grants	No
Advanced Ag Tech& Practices	US	USDA Farm Service Agency (FSA) - Conservation Reserve Program (CRP) - Conservation Reserve Enhancement Program (CREP)	Grants and Finance	Yes
Advanced Ag Tech& Practices	CA	University of California Agriculture and Natural Resources (UC ANR)		Yes
Advanced Ag Tech& Practices	CA	California Farm Bureau Federation (CFBF)	Grants	No
Advanced Ag Tech& Practices	CA	California Sustainable Agricultural Research and Education Program (SAREP)	Grants	Yes
Advanced Ag Tech& Practices	US	National Oceanic and Atmospheric Administration (NOAA) - Weather and Climate Data Application Program	Grants	No

Table 14. Compendium of Agency Programs

Advanced Ag Tech& Practices	US	USDA Agricultural Research Service (ARS) and USDA Economic Research Service (ERS)	Finance	No
Advanced Ag Tech& Practices	US	USDA Rural Utilities Service (RUS) - Distance Learning and Telemedicine Program (DLT)	Grants	Yes
Advanced Ag Tech& Practices	US	USDA Specialty Crop Research Initiative (SCRI)	Grants	Yes
Farm Worker Housing	CA	California Tax Credit Allocation Committee (TCAC)	Tax credit	Yes
Farm Worker Housing	CA	Affordable Housing and Sustainable Communities (AHSC) Program	Finance	Yes
Farm Worker Housing	US	USDA Rural Development	Finance	Yes
Farm Worker Housing	US	U.S. Department of Housing and Urban Development (HUD)		Yes
Farm Worker Housing	CA	California Infrastructure and Economic Development Bank (IBank)	Finance	No
Farm Worker Housing	US	U.S. Department of Labor		Yes
Farm Worker Housing	CA	Agricultural Labor Housing Assistance Program (ALHAP)	Finance	No
Farm Worker Housing	CA	California Workforce Housing Grant Program	Grants	Yes
Farm Worker Housing	US	U.S. Department of Health and Human Services	Grants	Yes
Farm Equipment Electrification	CA	Agricultural Energy Efficiency Program (AgEE)	Rebates	Yes
Farm Equipment Electrification	CA	Self-Generation Incentive Program (SGIP)	Incentives	No
Farm Equipment Electrification	CA	Environmental Quality Incentives Program (EQIP)	Grants	Yes
Farm Equipment Electrification	CA	State Energy Program (SEP)	Grants	Yes
Farm Equipment Electrification	CA	Advanced Technology Vehicles Manufacturing (ATVM) Loan Program	Loan	No
Farm Equipment Electrification	CA	Energy Upgrade California	Rebates	No
Carbon and Sequestration	CA	California Climate Investments (CCI) Agricultural Lands	Grants	No
Carbon and Sequestration	CA	Healthy Soils Program	Grants	Yes
Carbon and Sequestration	CA	California Department of Food and Agriculture (CDFA) Alternative Manure Management Program (AMMP)	Grants	Yes
Carbon and Sequestration	CA	CDFA Healthy Soils Demonstration Project	Grants	Yes
Carbon and Sequestration	CA	USDA Natural Resources Conservation Service (NRCS) Conservation Stewardship Program (CSP)	Grants	Yes
Carbon and Sequestration	US	USDA Climate Smart Agriculture and Forestry (CSAF) Program		Yes
Carbon and Sequestration	US	USDA Regional Conservation Partnership Program (RCPP)	Grants	Yes
Carbon and Sequestration	US	USDA Agricultural Conservation Easement Program (ACEP)	Grants	Yes

Carbon and Sequestration	US	USDA Natural Resources Conservation Service (NRCS) - Climate-Smart Mitigation Activities		Yes
Water Conservation	US	USDA Agricultural Water Enhancement Program (AWEP)	Grants	No
Water Conservation	US	Environmental Quality Incentives Program (EQIP)	Grants	Yes
Water Conservation	US	Bureau of Reclamation (BOR) WaterSMART	Project Funds	Yes
Water Conservation	CA	Sustainable Agricultural Water Stewardship Program (SAWS)	Grants	Yes
Water Conservation	CA	Agricultural Water Management Council (AWMC)		Yes
Water Conservation	CA	Central Valley Project (CVP) Water Management Fund	Grants	Yes
Water Conservation	US	USDA Natural Resources Conservation Service (NRCS) – Nat'l Water Management Center (NWMC)		Yes
Water Conservation	US	USDA Rural Development	Grants and Finance	Yes
Water Conservation	CA	State Water Efficiency and Enhancement Program (SWEEP)	Grants	Yes
Water Conservation	CA	California Climate Investments (CCI) Agricultural Water Management	Grants	Yes



Tierra Resource Consultants, LLC

- 1501 N. Broadway, Suite 300
 Walnut Creek, CA 94596
- **925.949.8791**
- hello@tierrarc.com
- tierrarc.com