Carbon-Neutral Transition Plan for the Regional

Agricultural Sector of Central San Joaquin Valley

Joshua Kim, Heeseung Sa, Angela Chan, Hugo Sappington, and Theo Wyss-Flamm

April 2024

Introduction

As the globe hurtles into a future plagued by rising temperatures, warming oceans, and climate catastrophe, urgent and drastic change is necessary to preserve the livelihood of our communities. Climate catastrophe mitigation efforts must be enacted at all scales of industry. In the San Joaquin Valley, a quarter of the nation's food is grown and raised, so the possibility of this region's climate collapse would have drastic consequences on the resilience of the nation and bode poorly for the human race's capacity for overcoming the climate crisis.

1. Theory of Change: Plan

The Theory of Change (TOC) for decarbonizing agriculture in the Central San Joaquin Valley (CSJV) region is developed to be realistic, targeted, and with the potential to expand to other polluting sectors within the region. The TOC seeks to decarbonize the agriculture industry because it is the largest emitter within the region and its complex value chain ties into transportation, land use, and sourcing, making it an intersectional industry that, should it be decarbonized, could become a model for ensuring the sustainability of other industries within the CSJV. Additionally, the TOC targets large farms because these corporations produce the vast majority of emissions from the sector in the region and, while small farms deserve resources too, the most impact can be achieved by targeting these large entities. Finally, the TOC acknowledges that it is likely impossible to realize a zero-carbon future for the agricultural sector in CSJV because of its complexity and critical purpose in providing food for the country. Despite this limitation, the TOC recommends purchasing carbon offsets to fill this gap, with a cap of 15% of total emissions reduced through this strategy.

1.1. Objectives

1. Engage all parts of the agricultural value chain (workers, employers, small/large farms, manufacturers) in the Central San Joaquin Valley to transition to carbon neutral by 2045. This includes both livestock and plant farms.

2. Educate communities, agencies, and businesses on the positive impact of reaching carbon neutrality for their businesses, local communities, and the planet.

1.2. Operation Plan: Theory of Change

1.2.1. Inputs

(1) Identify the largest agricultural players in the region in terms of land, water usage, labor, and revenue.
(2) Gather knowledge on scalable agricultural techniques to decarbonize the industry by using less water and energy.
(3) Find data on which populations of workers could be left behind in this carbon-free transition.
(4) Identify federal and state tax credits and subsidy programs for corporations to incentivize reducing carbon emission reductions.
(5) Analyze the value chains of large agricultural corporations to identify where the most emissions are produced and how they could be reduced.
(6) Research high-quality, effective carbon offsetting programs that could be utilized if achieving carbon neutrality is impossible.

1.2.2.   Outputs

(1) Assemble a guide for large agricultural corporations on how they can use public programs to save money by becoming more environmentally friendly.
(2) Develop an intervention plan to target specific pieces of the agricultural value chain in CSJV to reduce carbon emissions at the most polluting parts of the chain.
(3) Generate an informative, comprehensive guide for corporations on utilizing environmentally friendly farming practices within their business models.
(4) Develop a carbon offset program guide to encourage the region's largest emitters to pursue if they struggle to adjust their practices to a carbon-neutral model.
(5) Plan and execute a public outreach program to engage vulnerable agricultural workers whose expertise does not align with carbon-neutral efforts and offer them training and resources to find high-quality jobs.
(6) Consolidate these points into a long-range development plan for 2045 that can be enforced by local government entities.

1.2.3.   Outcomes

(1) Reduce carbon emissions from the agricultural sector in CSJV by 50% by 2032 and by 100% by 2045. This includes both direct carbon emission reduction and the purchasing of offsets, however, offsets cannot account for more than 15% of total emission reductions.

(2) Enact these plans in partnership with at least 75% of large farms in CSJV by 2032 and 100% by 2045.
(3) Engage with 75% of agricultural workers at the largest agricultural corporations to ensure that their job security is guaranteed and their needs are met.

2. Developing Toolkit for Operation Plan

2.1. Tools, Data Systems, and Methods

In order to actualize the plan mentioned in the above section, it is important to identify two main audience sectors that the plan will need to engage with: (1) businesses and procedures within the agricultural value chain and (2) the individual workers within them.

Focusing first on the businesses and procedures within the agricultural value chain, it would be necessary to identify the agricultural value chain and the list of businesses associated with it. Looking at Figure 2.1.1, we can see a brief overview of the value chain and its parts. In the first stages of the plan we look to focus on inputs, production/farming, and harvesting procedures in particular.

| Inputs | Production/ Farming | Harvesting | Food Processing | Packaging | Retail |

- Scarcity of resources
- Scope to improve yield

- Too many intermediaries and lack of transparency and traceability
- High amount of food wastage
- Trends moving towards F&V and pulses

Figure 2.1.1 Agricultural Value Chain

Inputs	Production/Farming	Harvesting
- Seeds - Fertilizer - Irrigation - Equipment	- Planting - Irrigation - Growing	- Equipment - Storing - Transporting

Table 2.1.1 Properties in Value Chain

As seen in Table 2.1.1, the agricultural value chain of the above 3 parts contains businesses and procedures such as seeds, fertilizer, irrigation, equipment, storing, and transporting. In order to best target these sectors, data on the agricultural farm businesses in California is necessary. Identification of smaller local farms can be obtained from the California Farm Directory toolkit created by CAFF (Community Alliance with Family Farmers), and larger business farms can be found from PPIC's (Public Policy Institute of California) Farm Sizes in the San Joaquin Valley: Land Uses dataset. Combining these two assets, we can create a data toolkit with information on all farms in the Central San Joaquin Valley. Based on the size of the farmland and the type of product that is being produced, we can sort the dataset for the most significant producers in each category. Furthermore, data on the number of employees (size of business), yearly revenue, and total farmland area will help to distinguish business goals and gather similar-sized businesses together.

In order to best engage with this audience, utilizing the CBO network will be helpful such as California Association Of Agricultural Labor, Kings County Farm Bureau, National Latino Farmers and Ranchers, or California Farm Worker Foundation.

Method:
Reaching out through these local third-party sources will help with engaging businesses and opening symposiums on carbon neutrality in the agricultural industry would help to increase awareness of the above operation plan and its advantages. Furthermore, after hosting these symposiums and conversations, surveys can be completed to find out the most used fertilizer, equipment, storing, and transporting methods in the agriculture industry that can be further aimed at carbon-neutrality goals.

Data Collection:
After talking with businesses, in order to reach carbon-neutrality goals, data must first be preemptively collected in the agricultural industry to find current carbon emissions and their future prospects. These data include but are not

limited to, carbon footprint data, energy usage data, resource efficiency metrics, supply chain analytics, and technological adoption rates.

1. Carbon Footprint Data: This includes detailed assessments of greenhouse gas (GHG) emissions from all activities such as production, harvesting, storage, and transportation. Such data are critical in pinpointing major emission sources and formulating strategies to mitigate them.
2. Energy Usage Data: Information on energy consumption is crucial, particularly data concerning the types and quantities of energy used. This encompasses electricity use, fuel consumption by machinery and transport vehicles, and the integration of renewable energy sources.
3. Resource Efficiency Metrics: These metrics include data on water usage, chemical usage (such as fertilizers and pesticides), and waste management practices. Optimizing these resources not only reduces environmental impact but also aids in cutting operational costs.
4. Supply Chain Analytics: Understanding the provenance and lifecycle impacts of agricultural inputs such as seeds and fertilizers is essential. This data helps in assessing the sustainability practices of suppliers and in making informed procurement decisions.
5. Technological Adoption Rates: Keeping track of how current technologies are being utilized and the rate at which new technologies are being adopted can guide investments in innovations that enhance efficiency and reduce environmental footprints.

In order to collect the above data points, specific measures will be needed such as energy audits, IoT sensors, surveys, and market analysis.

1. Carbon Footprint Data
    a. Life Cycle Assessment (LCA): Perform LCAs to measure the environmental impacts associated with all the stages of a product's life from cradle to grave. This includes direct and indirect emissions across the supply chain.
    b. Greenhouse Gas Inventories: Use standardized protocols, such as those from the GHG Protocol, to quantify emissions and track reductions.
2. Energy Usage Data
    a. Energy Audits: Conduct comprehensive audits to assess energy consumption patterns and identify opportunities for energy-saving and shifting to renewable sources.

b. Smart Metering and IoT Sensors: Implement smart meters and IoT solutions to continuously monitor and optimize energy use in real time.
3. Resource Efficiency Metrics
   a. Resource Audits: Similar to energy audits, these focus on water and chemical use, assessing efficiency and waste. Recommendations for sustainable management practices can be derived from these audits.
   b. Sustainability Reporting: Develop and adopt sustainability reporting frameworks to regularly disclose resource usage and waste management practices.
4. Supply Chain Analytics
   a. Supplier Surveys and Certifications: Engage with suppliers to gather data through surveys and require sustainability certifications that ensure adherence to environmental standards.
   b. Blockchain Technology: Utilize blockchain for traceability throughout the supply chain to ensure transparency and accuracy in sourcing data.
5. Technological Adoption Rates
   a. Surveys and Interviews: Regularly survey businesses to gather qualitative and quantitative data on the adoption of new technologies.
   b. Market Analysis: Conduct market analysis to evaluate the penetration of sustainable technologies within the industry.

With these carbon-neutrality transitions in the agricultural industry, it is also important to note the possible changes needed in worker skills. Effective engagement with the current workforce will require data on worker demographics, areas of residence, and spoken language. This data is accessible using the California Community and Place-Based Data Toolkit under the NAICS Agriculture, Forestry, Fishing and Hunting occupation. Through these data points, locations can be chosen to host educational sessions on upcoming changes and new opportunities in the industry. Furthermore, after first engaging with the businesses, businesses can be encouraged to send employees for training at the planned sites as well.

In order to better transition workers in the industry, data will have to be collected on additional points such as education and training data, employee feedback and engagement scores, health and safety metrics, and economic impact data.

1. Education and Training Data: It is important to gather data on the availability and effectiveness of training programs that educate workers on sustainable practices and carbon-neutral technologies. This data will help in customizing training initiatives to meet the specific needs of the workforce.
2. Employee Feedback and Engagement Scores: By collecting feedback on worker satisfaction and engagement with new practices, businesses can gain insights into the effectiveness of these initiatives and identify areas needing further support or adjustment.
3. Health and Safety Metrics: Monitoring the impact of new practices on worker health and safety is crucial. This ensures that changes in farming procedures do not adversely affect those implementing them.
4. Economic Impact Data: Data on how shifts towards sustainable practices impact the economic aspects of workers' lives, including changes in wages, job stability, and opportunities for employment in emerging green sectors, is vital.

Similar to business practices, specific methods will be needed to collect the above data points.

1. Education and Training Data
    a. Training Records and Feedback Forms: Keep detailed records of training programs and gather feedback using structured forms to assess their effectiveness and areas for improvement.
    b. Focus Groups: Conduct focus groups with workers to discuss training content, delivery, and applicability.
2. Employee Feedback and Engagement Scores
    a. Regular Surveys: Implement periodic surveys to measure worker satisfaction and engagement with sustainability initiatives.
    b. Engagement Workshops: Hold workshops to actively engage workers in discussions about new practices and collect qualitative data on their experiences.
3. Health and Safety Metrics
    a. Health and Safety Audits: Regular audits to ensure that new practices comply with health and safety regulations and do not adversely affect worker health.
    b. Incident Reporting Systems: Develop systems for reporting and analyzing health and safety incidents related to new agricultural practices.
4. Economic Impact Data

a. Economic Impact Assessments: Conduct assessments to evaluate how transitions in practices affect employment, wages, and job stability.
b. Employee Income Tracking: Monitor changes in income and job roles as new technologies and practices are implemented.

2.2. Toolkit Selection Considerations[2]

The toolkit is designed to be broad in its scope of data but specific in its application in industry. It targets the farm and its technology, as well as the workforce and their capabilities in order to identify both the present state of things, and the future outcome of an industry-wide shift to carbon neutrality. This toolkit will enable a choice CBO to engage farms of the CSJV, on all scales of their value chain and workforce, with actionable carbon neutrality plans.

We also acknowledge, however, that the effectiveness of the tool is entirely dependent on its usability – if no CBO can figure out how to, for example, spatialize the data to produce a compelling regional plan, or analyze data to realize key insights from aggregation, and so on, then the toolkit is a failure. While many of these considerations of usability are ultimately the matter of a user interface to make actionable, there are key considerations in the production of the toolkit that can further improve the ease, effectivity and ethicality of use.

Tool Capabilities:

To maximize capability, we have proposed a variety of existing data tools to regionalize and effectively map the agricultural industry in the CSJV, including:
- California Community and Place-Based Data Toolkit
- California Farm Directory toolkit by CAFF (Community Alliance with Family Farmers)
- PPIC's (Public Policy Institute of California) Farm Sizes in the San Joaquin Valley Land use Dataset

Within the bounds of the region we defined, we further proposed the collection of numerous additional datasets, to help the CBO achieve the program goals for two primary communities affected in the transition: the corporation, and its workers. Industry:
- Carbon footprint data,
- Energy usage data,
- Resource efficiency metrics,

- Supply chain analytics
- Technological adoption rates.

Workforce
- Education
- Training
- Employee feedback Engagement scores
- Health and safety metrics
- Economic impact

This scale of data permits us to make claims about the environmental improvement or degradation following implementation and long term analysis of industry growth or decline as well as workforce transition viability and its long term impact. However the use of this existing data and the requirement of collecting new data present numerous challenges to the CBO.

Organization's Capacity:

While the tool aspires for ease of use by an average CBO focused on carbon neutrality in the context of the agricultural industry, as described on the central website of the Central San Joaquin Valley's CERF, the region has a very limited collective of CBOs.[1] Of the CBOs that could be activated to carry out the framework of our Theory of Change, there is one with significant resources and an accordant thematic focus, the Fresno-Merced Future of Food Innovation Initiative.[2]

In accordance with an assessment of the organization's capacity conducted following a literature analysis of (Afzalan et al., 2017),[3] we propose an upscaling of the Fresno-Merced Future of Food Innovation collective.

We have identified several organizations, definitionally non-CBOs, in the Central San Joaquin Valley that could contribute effectively to the climate-neutral transition of these major agricultural industries in the region. Necessarily a massive undertaking, we invite these organizations to partner with the Fresno-Merced Future of Food Innovation to aid in the larger mission of the carbon neutral transition of farms in the CSJV, as well as key organizational capacities in the CBO.

Workforce:

[1] "Partners." Valley CERF Community Economic Resilience Fund, 2023. https://www.valleycerf.org/partners.

[2] "Fresno-Merced Future of Food (F3) Innovation Project Booklet." Central Valley Community Foundation, 2011. https://centralvalleycf.org/wp-content/uploads/2022/11/F3_CompleteBooklet-1.pdf.

[3] Afzalan, Nader, Thomas W. Sanchez, and Jennifer Evans-Cowley. "Creating Smarter Cities: Considerations for Selecting Online Participatory Tools." Cities 67 (July 2017): 21–30. https://doi.org/10.1016/j.cities.2017.04.002.

Given the breadth of our proposed data collection, we provide numerous suggestions to the actioning CBO in order for them to have the necessary staffing to effectively make use of the toolkit.

- To collect data, the CBO will need to hire and educate a workforce of auditors, surveyors, and community engagement specialists with the communication skills to engage industry professionals and the agricultural workforce.
- To effectively make use of all of this data, the CBO will require a small team of data analysts and a project manager. For these employments, we suggest hiring and educating local data practitioners. Following the dictum, "to work with outside organizations to more effectively use new technologies," (Palfrey and Gasser 2022), we propose partnerships with the local organizations: the Tulare County Office of Education, Kings County Jobs Training Office, and Madera Community College for both assistance in job outreach as well as training through specially designed coursework.

Data Management Policy:

Borrowed Data Sources:

We will contact the administrative sources of our borrowed data toolkits: California Community and Place-Based Data Toolkit, California Farm Directory toolkit and PPIC's (Public Policy Institute of California) Farm Sizes in the San Joaquin, to gain permission and devise proper method of attribution granting.

Self-Collected Data:

Ethical considerations:
Due to the breadth of our plan concerning data collected within the designed CBO, we can assert a level of ethicality from the outset. Data ethicality will be applied in the context of both data acquisition and data publication within the toolkit. Privacy considerations should be regarded uniquely for our two data sources: corporations, which necessarily have a vested interest in making some things public, and others private, as well as the community, which always deserves a high degree of privacy depending on the nature of their personal information.

Data Sharing

We proceed with the dictum of Schweitzer & Afzalan of "open data as an ethic"[4]– public sharing of data is beneficial to all communities on many scales. At all points, we will strive to publicize and make accessible our data *when it is not sensitive or PII data*. Furthermore, depending on the source of our programs funding, different data management policies will be legally required. Assuming the program receives federal funding, the dissemination of our collected data will fall in line with those use rites as set forth in [OMB Uniform Guidance Section 200.315](), granting the federal government full and unfettered access to our collected data.

> Corporation Data:
> Beyond publicly accessible data, as published in the SEC EDGAR database, participating agricultural corporations will necessarily have total rights to their data and the policy of sharing they desire.

> Community / Worker Data:
> The program will maintain a strict PII policy. Special privacy considerations must also be taken into consideration for specific communities, and our commitment to PII will be reiterated at all levels of data use and collection. Of the groups in need of special data protection are the large undocumented population.

Method of Collection

Broadly, the program's method of data collection will be performed through numerous surveys that invite the corporations and community members to self-report.

> Corporation Data:
> Corporate data will be collected using audits and self-reporting surveys.

> Community / Worker Data:
> Surveyors and community engagement specialists in the CBO will have to engage the community, either during symposiums or opportunities for requesting surveyor participation.

---

[4] Schweitzer, Lisa A., and Nader Afzalan. "Four Reasons Why AICP Needs an Open Data Ethic." *Journal of the American Planning Association* 83, no. 2 (April 3, 2017): 161–67. https://doi.org/10.1080/01944363.2017.1290495.

Community Capacity:
While we acknowledge that building an infrastructure for the broader community to engage with the tool could relay into greater benefits of a different nature: i.e., access to internet, access to data and information, and thus opportunity for greater engagement, due to the nature of our plan, involving the community in the data toolkit is not a stated goal. However, it is necessary to make the toolkit accessible to the CBO as well as leaders and other stakeholders in the corporations we seek to carbon neutralize. In those instances, wifi access, computer literacy, and a CBO member skilled in interpersonal communications and computer education will be necessary to have on-staff.

> Extra-Data Engagement:
> That said, the toolkit alone cannot supply the CBO with anything beyond the data and a mode of analyzing data. In order to produce compelling and actionable plans for transitioning farms to meet carbon neutrality goals, we provide an additional set of suggestions both for CBO leadership and mobilization as described in 3.2.

3. Analysis and Strategy
3.1. Data Analysis

In this part we suggest a profile of the agricultural worker communities and farming industry, analyzing California Community and Place-Based Data Toolkit and PPIC's Farm Sizes in the San Joaquin Valley Land use Dataset. The analysis can guide the local CBOs to employ targeted community engagement strategies for carbon emission reduction.

Community Profile

In order to create a community profile of the agricultural workers, we analyzed the indicators of demographics, economic conditions, and education levels of workers for underserved communities. The charts and tables in this part are created based on California Community and Place-Based Data Toolkit.

Economic conditions

Labor Force	Agriculture	Transportation	Food-Related	Total Labor Force	Share of total - Ag	Share of total - Ag value chain
Tulare County	50921	26761	17525	272881	18.66%	34.89%
Fresno County	51050	58020	43849	588551	8.67%	25.98%
Madera County	21293	16015	16912	198732	10.71%	27.28%
Kings County	21607	16748	13901	180425	11.98%	28.96%
CSJ Valley Total	144871	117544	92187	1240589	11.68%	28.58%

(Table 3.1.1)

Table 3.1.1 suggests that the workers in the agricultural industry make up 11.68% of the total labor force in the Central San Joaquin Valley area; of which, Tulare county shows an especially high share at 18.66% of the total labor force. However, considering that many of those working in the agriculture industry include foreign immigrants, the census data may fail to include many working in this sector as well.

When considering the jobs related to the agricultural value chain such as those working in the transportation sector or food-related sector, the share of the total labor force goes up to 28.58% of the CSJ valley region.
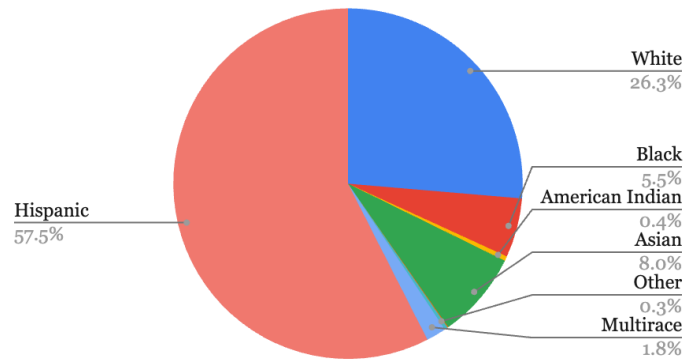
Average Wages	Agriculture-hour	Average-hour	Agriculture-annual	Average-annual
Tulare County	$14.21	$24.71	$29,563.94	$51,391.64
Fresno County	$14.27	$25.34	$29,674.87	$52,711.15
Madera County	$14.21	$25.41	$29,559.91	$52,855.51
Kings County	$14.24	$25.43	$29,615.01	$52,892.47
CSJ Valley Total	$14.23	$25.22	$29,603.43	$52,462.69

(Table 3.1.2)

Of the 23 occupation categories, agricultural workers consistently proved to show the **lowest** earnings in both hourly and annual in all four counties. This number was on average close to $22,000 below the average annual earnings per occupation and over $10 below the hourly rate per occupation. This amount of dismal earnings is only closely followed by food-related services.
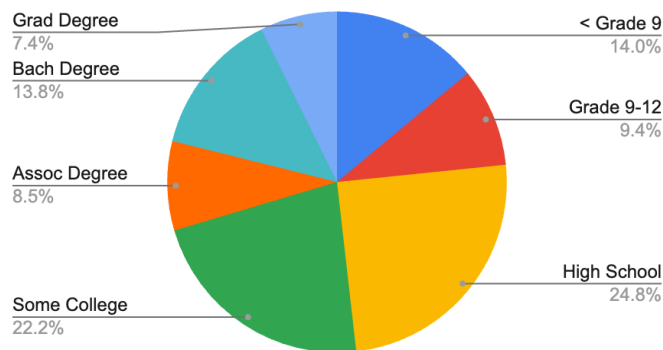
Demographics and Education Levels

CSJ Valley Ethnic Distribution (2023)

White
26.3%

Black
5.5%

American Indian
0.4%

Asian
8.0%

Other
0.3%

Multirace
1.8%

Hispanic
57.5%

(Chart 3.1.1)

CSJ Valley Education Attainment (2023)

Grad Degree
7.4%

Bach Degree
13.8%

Assoc Degree
8.5%

Some College
22.2%

< Grade 9
14.0%

Grade 9-12
9.4%

High School
24.8%

(Chart 3.1.2)

While we couldn't find the specific distribution of data for the average education attainment of the agricultural workers, the dataset suggests that CSJ valley region is predominantly Hispanic at 57.5% with an average education attainment of high school or lower at 48.2%. Considering the low wages of agricultural workers and the high relation between education and wage, while we cannot be conclusive, we can infer to some degree that many of the workers in the agricultural industry are Hispanic with low education attainment (high school or lower).

Industry and Transition Profile

In order to suggest the agricultural industry profile, we analyzed the scale of the farm industry in CSJ Valley: the table in this part is created based on PPIC's Farm Sizes in the San Joaquin Valley Land use Dataset.

Reasons and Benefits of the Transition

The report from Central Valley Community Foundation[5] spotlights the food production industry of Fresno-Merced region (CSJ Valley and Kings County), adding that 25% of the nation's food is produced in California's vast Central Valley using only 1% of total U.S. farmland. 60% of the nation's fruits and nuts and 30% of its vegetables are produced in Fresno-Merced region, with 10~30 times greater industry concentration compared to the rest of the United States. The total revenue of the annual output of this region's agriculture economy is about $70B, with over 13,500 farming enterprises and over 350 commodities produced.

Industries: the Number and Location of Farms

| | FARM SIZE (CROPPED ACRES) | | | | | | | | | | | | Region Total Farms | Region Total Acreage | Average Farm Size |
| | 1-49 | | 50-99 | | 100-219 | | 220-499 | | 500-1999 | | ≥2,000 | | | | |
	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres	Farms	Acres			
FRESNO	4,815	80,201	943	63,661	730	101,826	553	172,365	530	421,514	58	310,732	7,629	1,150,299	151
MADERA	775	13,657	232	15,965	198	28,226	117	37,085	119	102,770	36	130,664	1,477	328,367	222
KINGS	779	11,181	186	12,555	184	26,329	124	39,464	113	94,183	14	42,607	1,400	226,319	162
TULARE	3,311	47,686	634	42,910	558	77,996	398	122,340	242	201,790	29	248,047	5,172	740,769	143
TOTAL	9,680	152,725	1,995	135,091	1,670	234,377	1,192	371,254	1,004	820,257	137	732,050	15,678	2,445,754	156

(Table 3.1.3)

This dataset includes a summary of the numbers of farms, irrigable acreage, and major crops grown by irrigated farms of different sizes in the San Joaquin Valley, using parcel data from 2021–22 county assessor records and 2018 land use data from the California Department of Water Resources. It provides an overview of farm sizes for the valley as a whole and for 14 of the valley's groundwater subbasins, and a comparison of results by county with USDA's latest Agricultural Census (2017). It accompanies the August 2023 blog post, "Mapping Farms by Size in the San Joaquin Valley."[6]

Focusing on the counties in the Central SJ Valley – Fresno, Madera, Kings, Tulare – the community engagement strategy can impact a total of 15,678 regional farms, with their total acreage of around 2,446,000 acres. Fresno county covers the largest total acreage as well as the most number of farms among CSJ Valley, followed by Tulare county.

Since our strategy is to target large farms in priority, we plan to implement policy intervention on 137 large farms (farm size greater than or equal to 2000 acres) which cover over 730,000 acres, one-third of the total acreage. Since the most

[5] "Fresno-Merced Future of Food (F3) Innovation Project Booklet." Central Valley Community Foundation, 2011. https://centralvalleycf.org/wp-content/uploads/2022/11/F3_CompleteBooklet-1.pdf.
[6] Joaquín Morales, Zaira and Andrew Ayres. 2023. *PPIC Farm Sizes in the San Joaquin Valley: Land Uses.* Public Policy Institute of California.

impact can be achieved by targeting the large farms, we suggest profiling 137 farms to conduct carbon emission reduction strategies.

<u>Career Transitions</u>

While the datasets or toolkits that directly deal with the career transition needs and opportunities were not publicly available, we identify some of the areas that are needed to address those parts: Supply chain analytics, Technological adoption rates, Education and training data, and Employee feedback and engagement scores.

- Supply Chain Analytics: Utilizing supply chain analytics, we can identify key areas within the agricultural sector where interventions could significantly reduce carbon emissions. By examining data points like transportation logistics, production methods, and resource utilization, we can pinpoint inefficiencies and areas with high emission; for instance, implementing greener transportation options, optimizing production schedules, or adopting sustainable farming practices can be developed.
- Technological Adoption Rates: The technological adoption rates data is crucial for planning and executing initiatives aimed at enhancing productivity and sustainability, since it provides insights into the sector's readiness to new tech and the appropriate pace. We can target communities with higher adoption rates of new green agricultural tools in priority.
- Education and Training Data: The data aligns workforce skills with the evolving demands of the agricultural sector. By analyzing current educational outcomes and training program effectiveness, we can identify gaps in skills and knowledge, leading to targeted training programs for the agricultural workers.
- Employee Feedback and Engagement Scores: Employee feedback and engagement scores act as direct indicators of policy effectiveness. This can give us insight for better communication channels and management practices.

3.2. Summary and Strategy

In response to the analysis results above, it is crucial to outline specific strategies for how to operationalize the community engagement process that was developed previously. After gathering data and flagging areas of potential concern, the following community engagement proposals incorporate recommendations that will further improve the experience of agricultural workers during the transition to carbon neutrality in CSJ Valley.

(1) Disproportionately Low Wages for Agricultural Workers

As seen in Table 3.1.2, it is clear that there is a major wage disparity that agricultural workers experience in CSJV. Considering the agricultural-related sectors such as transportation and food, workers in this occupational category make up 28.58% of the labor force of the region. In this sense, a large percentage of the CSJV population falls $22,000 below the average annual earnings per occupation. In order to engage agricultural workers and lessen the occupational wage gap in the region, it is important to implement the following strategies to provide support:

    a. Community Outreach and Campaigns:
- Organize community forums, town hall meetings, or workshops to raise awareness about the current issue of low wages among workers in the agricultural sector.
- Collaborate with local media outlets and community organizations to disseminate important information regarding the positive impact that the carbon-neutral transition will have on wages.

    b. Grassroots Mobilization:
- Engage with existing labor unions and advocacy groups to bring together a greater coalition of people supporting higher paying jobs within the agricultural sector relating to carbon-neutral transition.
- Encourage agricultural workers to share their experiences, specifically on media platforms or at community events, to foster a sense of collective need for action.

    c. Policy Advocacy and Employer Engagement:
- Identify key policymakers who can influence wage regulations at various levels of government and develop a set of recommendations that outlines an agenda wage increases and additional measures that serve to protect workers.
- Initiate dialogue with farm owners and large-scale employers to discuss potential remedies to the issue of low wages that the carbon-neutral transition will bring.

(2) Intersection Between Education Attainment Levels and Ethnicity in the CSJ Valley Population

As mentioned previously, the CSJ Valley population is predominantly Hispanic at 57.5% with an average education attainment of high school or lower at 48.2%. These numbers can effectively be used to characterize the

region to some level, and are important to consider when attempting to humanize the entire regional agricultural sector. In order to engage these workers and further understand the intersection between ethnicity, education attainment levels, and occupational sector, it is important to incorporate the following community engagement strategies:

    a. Culturally Responsive Outreach
- Conduct outreach through trusted community leaders to build credibility and relationships in the region.
- Develop outreach strategies and materials in Spanish and other relevant languages, encouraging cultural sensitivity throughout all materials.

    b. Accessible Educational Programs and Workforce Training:
- Collaborate with the agricultural workforce to understand their needs, possibly developing school programs with flexible hours for trainings and/or classes in convenient locations, at convenient times.
- Offer language classes, financial literacy workshops, and other relevant skills to provide opportunities for professional and personal development.

    c. Community Asset Mapping
- Conduct a comprehensive mapping of existing resources and organizations within communities of agricultural workers.
- Leverage the existing assets and establish partnerships among community organizations to optimize the distribution of resources during the carbon-neutral transition.
- Increase investment in educational programs, scholarships, and support services specifically targeting agricultural worker communities to foster a higher level of educational attainment.

(3) Concentration of Regional Farms in CSJ Valley

The Central Valley produces 25% of the nation's food using only 1% of U.S. farmland. While this number provides evidence of the efficiency and concentration of crops in the region, it also brings up questions about the intensification of agricultural production in the region. The following engagement methods are important when considering the long-term environmental impact of the agricultural sector in the CSJ Valley:

a. Environmental Impact Assessment and Sustainable Farming Practices
- Collaborate with research institutions in the area to assess the environmental impacts of intensive agricultural production in the CSJ Valley to better understand the associated impacts of current agricultural practices.
- Promote the adoption of sustainable agricultural practices, on every scale/type of farm.
- Facilitate strong communication pathways between farmers in CSJ Valley regarding ways to provide support and build partners through the transition of the agricultural sector to carbon neutrality.
b. Local Economic Development Strategies
- Engage with local authorities to evaluate the adequacy of existing infrastructure, such as water supply, transportation networks, sustainable farming capabilities, etc. and assess possible areas where greener strategies can be implemented.
- Assess the workforce needs of the agricultural sector and implement training programs to develop skilled labors in areas that support the transition to new farming techniques and technologies.

The following engagement methods summarize the techniques that will be implemented on a more general basis, with the same goal of easing the transition to carbon neutrality for people in the agricultural sector in CSJ Valley:

- Develop and implement training records & feedback forms to track feedback and measure effectiveness of engagement processes.
- Hold focus groups to raise awareness about the transition to carbon neutrality and offer a network of resources for community and individual support.
- Distribute regular surveys from employers to assess employee satisfaction and engagement with sustainability initiatives during the transition period.
    - Engage workers in discussions about new practices and receive helpful community feedback.
- Establish partnerships with local organizations for assistance in job outreach and training.
    - The Tulare County Office of Education
    - Kings County Jobs Training Office
    - Madera Community College

- Identify clear parameters to evaluate the impact of these transitions on employment, wages, and job stability in the CSJ Valley region.

3.3 Conclusion

All in all, the data analysis conducted heavily informs the toolkit we've developed for the CSJ Valley region to successfully engage the community through the transition of the agricultural sector to carbon-neutral. Through the engagement strategies listed above, this plan effectively achieves the main objectives put forth in the beginning of the report, which aimed to:

1. Engage all parts of the agricultural value chain (workers, employers, small/large farms, manufacturers) in the Central San Joaquin Valley to transition to carbon neutral by 2045. This includes both livestock and plant farms.
2. Educate communities, agencies, and businesses on the positive impact of reaching carbon neutrality for their businesses, local communities, and the planet.

Ultimately, the agricultural sector is the most urgent occupational sector for the transition to carbon neutrality in this region due to the size of the agricultural labor force and the environmental concerns raised by current agricultural practices. However, it is our hope that this framework can be applied to other sectors, eventually moving all fossil fuel-emitting sectors in the Central San Joaquin Valley towards a carbon neutral state.

Works Cited

Afzalan, Nader, Thomas W. Sanchez, and Jennifer Evans-Cowley. "Creating Smarter Cities:

Considerations for Selecting Online Participatory Tools." *Cities* 67 (July 2017): 21–30.

https://doi.org/10.1016/j.cities.2017.04.002.

"Fresno-Merced Future of Food (F3) Innovation Project Booklet." Central Valley Community

Foundation, 2011.

https://centralvalleycf.org/wp-content/uploads/2022/11/F3_CompleteBooklet-1.pdf.

Joaquín Morales, Zaira and Andrew Ayres. 2023. *PPIC Farm Sizes in the San Joaquin Valley:

Land Uses.* Public Policy Institute of California.

"Partners." Valley CERF Community Economic Resilience Fund, 2023.

https://www.valleycerf.org/partners.

Schweitzer, Lisa A., and Nader Afzalan. "Four Reasons Why AICP Needs an Open Data Ethic."

Journal of the American Planning Association 83, no. 2 (April 3, 2017): 161–67.

https://doi.org/10.1080/01944363.2017.1290495.