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Labor Market Analysis

Agriculture Engineering



Prepared by Central Valley/Mother Lode Center of Excellence



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Summary

The Central Valley/Mother Lode Center of Excellence developed this report for San Joaquin Delta College to determine whether there is demand in the local labor market that is not being met by the supply from postsecondary programs. This report summarizes labor market demand, wages, skills, and postsecondary supply for:

- Industrial Engineering Technologists and Technicians (SOC 17-3026)
- Agricultural Technicians (SOC 19-4012)
- Agricultural Workers, All Other (SOC 45-2099)
- Industrial Machinery Mechanics (SOC 49-9041)
- Food Processing Workers, All Other (SOC 51-3099)

Key Findings

- **Occupational Demand** — *Agriculture engineering* occupations have a labor market demand of 617 annual job openings in the North Central Valley/Northern Mother Lode (NCV/NML) subregion. Between 2022 and 2027, *agricultural workers, all other* are projected to have the most demand with 236 annual job openings.
- **Wages** — The average entry-level wage (25th percentile) for the five occupations is \$19.97/hour, which is higher than the living wage in the NCV/NML subregion.¹ *Industrial Machinery Mechanics* earn the highest entry-level wage, \$26.76/hour.
- **Employers** — Employers in the NCV/NML subregion include Foster Farms, Aerotek, and Aramark.
- **Skills and Certifications** — The top baseline skill is communication; the top specialized skill is machinery; and the top software skill is Microsoft Excel.
- **Education** — A high school diploma or equivalent is typically required for *Industrial Machinery Mechanics*. No formal educational credentials are required for *agricultural workers, all other* and *food processing workers, all other*. An associate degree is typically required for *Industrial Engineering Technologists and Technicians* and *Agricultural Technicians*.
- **Supply and Demand Analysis** — Based on 617 annual openings (i.e., demand) and 10 postsecondary degrees awarded (i.e., supply), an analysis of supply and demand suggests there is an undersupply of 607 workers in the NCV/NML subregion. In the CVML region, 110 awards were conferred suggesting an undersupply of 1,609 workers (based on 1,719 annual openings in the CVML region).

Recommendation

Based on a comparison of demand and supply, there is an undersupply of trained workers in the NCV/NML subregion and the CVML region. The Center of Excellence recommends that San Joaquin Delta College work with the regional directors, the college's advisory board, and local industry in the creation or expansion of programs to address the shortage of *agriculture engineering* workers.

¹ The term "living wage" in Center of Excellence reports is calculated by averaging the self-sufficiency wages from the Insight Center's California Family Needs Calculator for each county in the subregion: <https://insightcced.org/tools-metrics/self-sufficiency-standard-tool-for-california/>

Introduction

The Central Valley/Mother Lode Center of Excellence developed this report to provide San Joaquin Delta College with labor market information for *agriculture engineering*. The geographical focus for this report is the North Central Valley/Northern Mother Lode (NCV/NML) subregion, but regional demand and supply data has been included for broader applicability and use. Analysis of the program and occupational data related to *agriculture engineering* is included in the report. The Standard Occupational Classification (SOC) System codes and occupational titles used in this report are from the Bureau of Labor Statistics and O*NET OnLine.

Industrial Engineering Technologists and Technicians (SOC 17-3026)

- **Job Description:** Apply engineering theory and principles to problems of industrial layout or manufacturing production, usually under the direction of engineering staff. May perform time and motion studies on worker operations in a variety of industries for purposes such as establishing standard production rates or improving efficiency.
- **Knowledge:** Mechanical, Engineering and Technology, Production and Processing, Mathematics, Design
- **Skills:** Reading Comprehension, Active Listening, Critical Thinking, Complex Problem Solving, Monitoring

Agricultural Technicians (SOC 19-4012)

- **Job Description:** Work with agricultural scientists in plant, fiber, and animal research, or assist with animal breeding and nutrition. Set up or maintain laboratory equipment and collect samples from crops or animals. Prepare specimens or record data to assist scientists in biology or related life science experiments. Conduct tests and experiments to improve yield and quality of crops or to increase the resistance of plants and animals to disease or insects.
- **Knowledge:** Mathematics, Biology, Chemistry, Administration and Management, English Language
- **Skills:** Reading Comprehension, Active Listening, Complex Problem Solving, Critical Thinking, Writing

Agricultural Workers, All Other (SOC 45-2099)

- **Job Description:** All agricultural workers not listed separately.
- **Knowledge:** N/A
- **Skills:** N/A

Industrial Machinery Mechanics (SOC 49-9041)

- **Job Description:** Repair, install, adjust, or maintain industrial production and processing machinery or refinery and pipeline distribution systems. May also install, dismantle, or move machinery and heavy equipment according to plans.
- **Knowledge:** Mechanical, English, Production and Processing, Engineering and Technology, Design
- **Skills:** Equipment Maintenance, Operation and Control, Operations Monitoring, Repairing, Troubleshooting

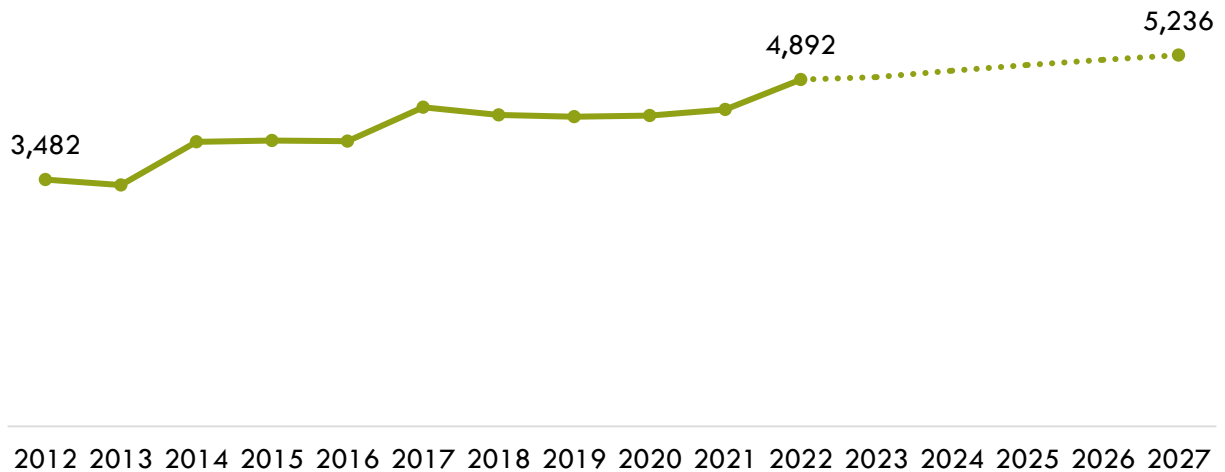
Food Processing Workers, All Other (SOC 51-3099)

- **Job Description:** All food processing workers not listed separately.
- **Knowledge:** N/A
- **Skills:** N/A

Employment

Exhibit 1a shows employment trends for *agriculture engineering* occupations in the NCV/NML subregion. Between 2022 to 2027, the number of jobs for these *agriculture engineering* occupations is projected to increase by 344, growing by 7%.

Exhibit 1a. Historical employment and projected demand for agriculture engineering occupations in the NCV/NML subregion, 2012-2027



The five occupations included in this report employed 4,892 workers in 2022 in the NCV/NML subregion (Exhibit 1b). Of the five occupations, *agricultural workers, all other* are projected to have the most annual openings, 236.

Exhibit 1b. Current employment and projected demand for agriculture engineering occupations in the NCV/NML subregion, 2022-2027

Occupation	2022 Jobs	2027 Jobs	5-Year Change	5-Year % Change	Annual Openings
Industrial Engineering Technologists and Technicians	82	101	19	24%	12
Agricultural Technicians	232	234	2	1%	32
Agricultural Workers, All Other	1,621	1,573	(48)	(3%)	236
Industrial Machinery Mechanics	2,114	2,422	308	15%	235
Food Processing Workers, All Other	843	906	63	7%	102
TOTAL	4,892	5,236	344	7%	617

Wages

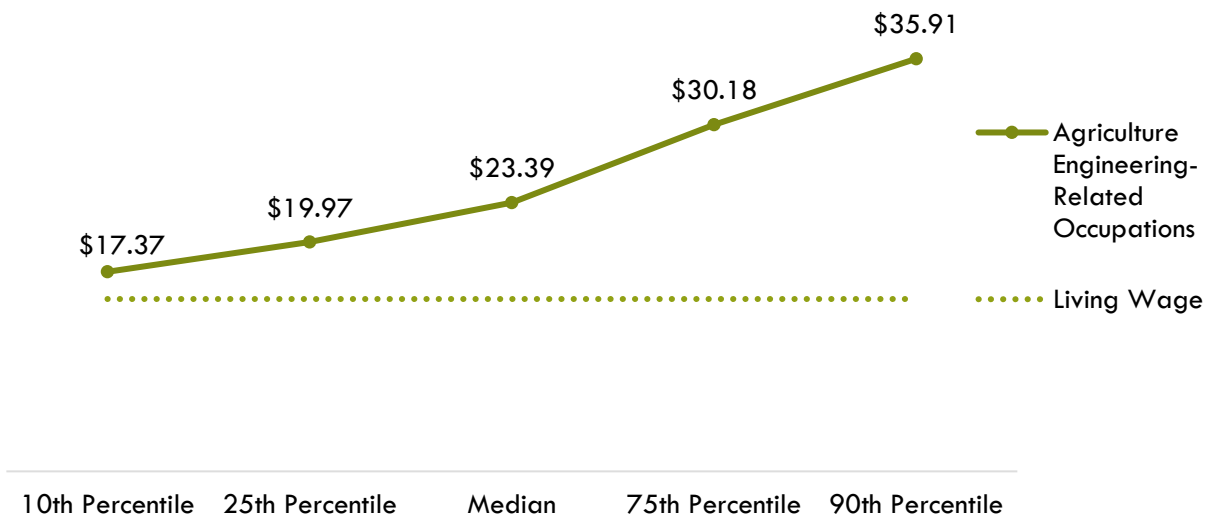
Exhibit 2a shows the hourly wages for each occupation studied in this report.

Exhibit 2a. Hourly wages for agriculture engineering occupations in the NCV/NML subregion

Occupation	25 th Percentile Hourly Earnings	Median Hourly Earnings	75 th Percentile Hourly Earnings
Industrial Engineering Technologists and Technicians	\$25.54	\$33.32	\$42.42
Agricultural Technicians	\$17.91	\$19.06	\$24.09
Agricultural Workers, All Other	\$14.09	\$16.27	\$25.36
Industrial Machinery Mechanics	\$26.76	\$31.11	\$37.31
Food Processing Workers, All Other	\$15.54	\$17.21	\$21.70

Exhibit 2b shows the average hourly wages for *agriculture engineering* occupations; all five average entry-level wages are above the living wage for the NCV/NML subregion.

Exhibit 2b. Average hourly wages for agriculture engineering occupations in the NCV/NML subregion



Job Postings

There were 520 unique job postings for the five *agriculture engineering* occupations in the NCV/NML subregion from May 2023 to April 2024.²

Top Employers

The employers with the most job postings are listed in Exhibit 3. The top employers in online job postings were Foster Farms, Aerotek, and Aramark.

Exhibit 3. Top employers

Employer
Foster Farms
Aerotek
Aramark
Tesla
Niagara Bottling
Delicato Family Vineyards
University of California
Merced College
Hilmar Cheese Company
Plastipak

Top Job Titles

Exhibit 4 shows the top job titles for *agriculture engineering* workers in the NCV/NML subregion. Common job titles in postings include industrial maintenance technicians, process technicians, and production technicians.

Exhibit 4. Top job titles

Job Title
Industrial Maintenance Technicians
Process Technicians
Production Technicians
Food Service Technicians
Journeyman Installers
Industrial Mechanics
Agricultural Technicians
Journeyman Mechanics
Laboratory Technicians
Agricultural Specialists

² Other than occupational titles and job titles, the categories below can be counted one or multiple times per job posting, and across several areas in a single posting. For example, a skill can be counted in two different skill types, and an employer can indicate more than one education level.

Salaries

Exhibit 5 shows the “Market Salaries” for *agriculture engineering* workers. These are calculated by Lightcast using a machine learning model built from millions of job postings every year. This accounts for adjustments based on location, industry, skills, experience, education, among other variables.

Exhibit 5. Market salaries for agriculture engineering workers

Market Salary	Job Postings
\$31,000-\$36,999	27
\$37,000-\$42,999	57
\$43,000-\$48,999	59
\$49,000-\$54,999	34
\$55,000-\$60,999	39
\$61,000-\$66,999	30
\$67,000-\$72,999	25
\$73,000-\$78,999	26
\$79,000-\$84,999	14
\$85,000+	23

Education

Of the 520 unique job postings, 335 listed a preferred or minimum educational requirement for the position being filled. Among those, 59% requested a high school or GED, 17% requested an associate degree, and 16% requested a bachelor’s degree (Exhibit 6).

Exhibit 6. Education levels requested in job postings for agriculture engineering workers

Education Level	Job Postings	% of Job Postings
High school or GED	197	59%
Associate degree	56	17%
Bachelor's degree	55	16%
Master's degree or higher	27	8%

Baseline, Specialized, and Software Skills

Exhibit 7 depicts the top baseline, specialized, and software skills in job postings. The most common baseline skill is communication. The most common specialized skill is machinery. The most common software skill is Microsoft Excel.

Exhibit 7. In-demand baseline, specialized, and software skills for agriculture engineering in job postings

Baseline Skills	Specialized Skills	Software Skills
Communication	Machinery	Microsoft Excel
Troubleshooting	Food Safety and Sanitation	Microsoft Office
Operations	Preventive Maintenance	SAP Applications
Sanitation	Good Manufacturing Practices	Microsoft PowerPoint
Management	Agriculture	Microsoft Word

Education, Work Experience, & Training

A high school diploma or equivalent is typically required for *Industrial Machinery Mechanics*. No formal educational credentials are required for *agricultural workers, all other* and *food processing workers, all other*. An associate degree is typically required for *Industrial Engineering Technologists and Technicians* and *Agricultural Technicians* (Exhibit 8).

Exhibit 8. Education, work experience, and training for agriculture engineering workers

Occupation	Typical Entry-level Education	Work Experience Required	Typical On-The-Job Training
Industrial Engineering Technologists and Technicians	Associate degree	None	None
Agricultural Technicians	Associate degree	None	Moderate-term on-the-job training
Agricultural Workers, All Other	No formal educational credential	None	Short-term on-the-job training
Industrial Machinery Mechanics	High school diploma or equivalent	None	Long-term on-the-job training
Food Processing Workers, All Other	No formal educational credential	None	Moderate-term on-the-job training

Supply

An analysis of program data from the Integrated Postsecondary Education Data System (IPEDS) for the last three program years shows that, on average, 10 awards were conferred in the NCV/NML subregion and 110 in the CVML region (Exhibit 9 and 10).

Exhibit 9. TOP and CIP codes for related programs

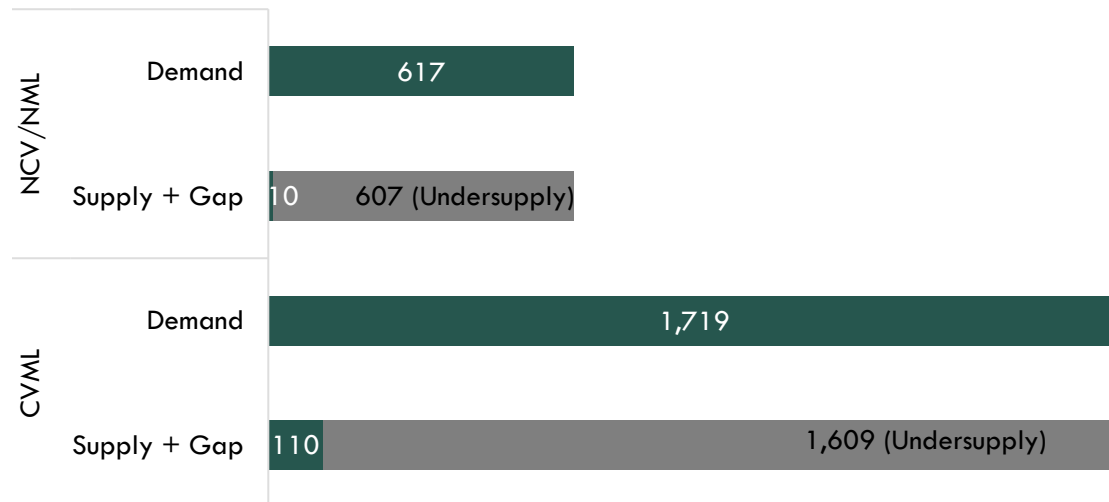
TOP Titles	CIP Titles
0113.00 - Food Processing and Related Technologies	01.0401 - Agricultural and Food Products Processing. 01.1002 - Food Technology and Processing.
0956.00 - Manufacturing and Industrial Technology	15.0613 - Manufacturing Engineering Technology/Technician.

Exhibit 10. Regional Community College Awards, 2020-2023

TOP Code	Program	College	2020-2021 Awards	2021-2022 Awards	2022-2023 Awards	3-Year Award Average
0113.00	Food Processing and Related Technologies	Bakersfield	1	2	5	3
		Sequoias	1	1	1	1
		West Hills Coalinga	-	-	2	1
		SCV/SML Subtotal	2	3	8	4
		Program Total	2	3	8	4
0956.00	Manufacturing and Industrial Technology	Modesto	6	5	19	10
		NCV/NML Subtotal	6	5	19	10
		Bakersfield	4	4	7	5
		Fresno City	24	29	34	29
		Madera	2	16	1	6
		Porterville	9	3	-	4
		Reedley College	55	53	47	52
		SCV/SML Subtotal	94	105	89	96
		Program Total	100	110	108	106
		CVML Total	102	113	116	110

There is an undersupply of 607 *agriculture engineering* workers in the NCV/NML subregion, and an undersupply of 1,609 workers in the larger CVML region (Exhibit 11).

Exhibit 11. Workforce demand (annual job openings), postsecondary awards (supply), and additional students needed to fill gap in the NCV/NML subregion and CVML region



Recommendation

This report suggests there is a shortage of 607 workers in the NCV/NML subregion and a shortage of 1,609 workers in the CVML region for *agriculture engineering* workers. Based on these findings, it is recommended that San Joaquin Delta College work with the regional directors, the college's advisory board, and local industry in the creation or expansion of programs to address the shortage of *agriculture engineering* workers in the region.

Appendix: Methodology & Data Sources

Data Sources

Labor market and educational supply data compiled in this report derive from a variety of sources. Data were drawn from external sources, including the Economic Modeling Specialists, Inc., the California Community Colleges Chancellor's Office Management Information Systems Data Mart and the National Center for Educational Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS). Below is the summary of the data sources found in this study.

Data Type	Source
Labor Market Information/Population Estimates and Projections/Educational Attainment	Economic Modeling Specialists, Intl. (Lightcast). Lightcast occupational employment data are based on final LIGHTCAST industry data and final Lightcast staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates also affected by county-level Lightcast earnings by industry: economicmodeling.com .
Typical Education Level and On-the-job Training	Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education and typical on-the-job training to each occupation for which BLS publishes projections data: https://www.bls.gov/emp/tables/educational-attainment.htm .
LaunchBoard	Chancellor's LaunchBoard. https://www.calpassplus.org/LaunchBoard/SWP.aspx
Labor Force, Employment and Unemployment Estimates	California Employment Development Department, Labor Market Information Division: labormarketinfo.edd.ca.gov .
Job Posting and Skills Data	Lightcast. https://lightcast.io/ .
Additional Education Requirements/Employer Preferences	The O*NET Job Zone database includes over 900 as well as information on skills, abilities, knowledge, work activities and interests associated with specific occupations: onetonline.org .

Key Terms and Concepts

Annual Job Openings: Annual openings are calculated by dividing the number of years in the projection period by total job openings.

Education Attainment Level: The highest education attainment level of workers age 25 years or older.

Employment Estimate: The total number of workers currently employed.

Employment Projections: Projections of employment are calculated by a proprietary Economic Modeling Specialists, Intl. (LIGHTCAST) formula that includes historical employment and economic indicators along with national, state and local trends.

LaunchBoard (Attained the Living Wage): Among SWP students who exited college and did not transfer to any postsecondary institution, the proportion who attained the district county living wage for a single adult measured immediately following academic year of exit.

LaunchBoard (Median Annual Earnings): Among SWP students who exited the community college system and who did not transfer to any postsecondary institution, median earnings following the academic year of exit.

LaunchBoard (Median Change in Earnings): Among SWP students who exited and who did not transfer to any postsecondary institution, median change in earnings between the second quarter prior to the beginning of the academic year of entry and the second quarter after the end of the academic year of exit from the last college attended.

LaunchBoard (Job Closely Related to Field of Study): Among SWP students who responded to the CTE Outcomes Survey and did not transfer to any postsecondary institution, the proportion who reported that they are working in a job very closely or closely related to their field of study.

Living Wage: The cost of living in a specific community or region for one adult and no children. The cost increases with the addition of children.

Occupation: An occupation is a grouping of job titles that have a similar set of activities or tasks that employees perform.

Percent Change: Rate of growth or decline in the occupation for the projected period; this does not factor in replacement openings.

Replacements: Estimate of job openings resulting from workers retiring or otherwise permanently leaving an occupation. Workers entering an occupation often need training. These replacement needs, added to job openings due to growth, may be used to assess the minimum number of workers who will need to be trained for an occupation.

Total Job Openings (New + Replacements): Sum of projected growth (new jobs) and replacement needs. When an occupation is expected to lose jobs, or retain the current employment level, number of openings will equal replacements.

Typical Education Requirement: represents the typical education level most workers need to enter an occupation.

Typical On-The-Job Training: indicates the typical on-the-job training needed to attain competency in the skills needed in the occupation.