MONTEREY BAY EMERGING TECHNOLOGY WORKFORCE SKILLS DEMAND STUDY

DART
DRONE, AUTOMATION & ROBOTICS TECHNOLOGY

CITRIS AND THE BANATAO INSTITUTE

CITRIS Initiative for Drone Education and Research
UC SANTA CRUZ

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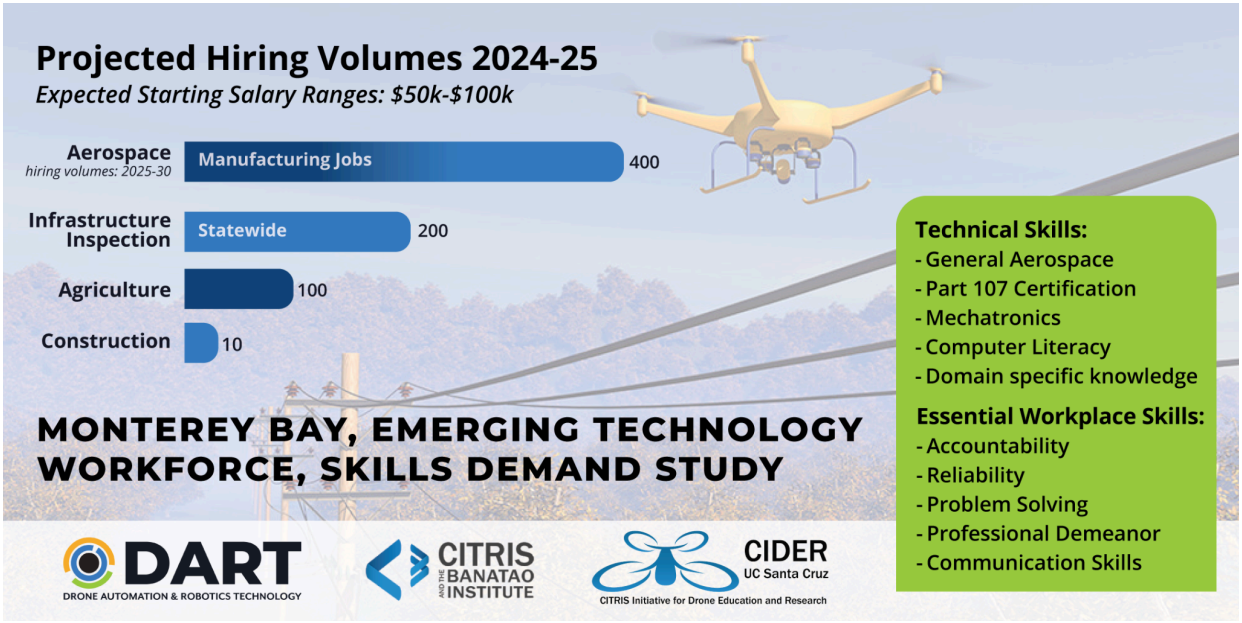

October 1, 2024

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Executive Summary

The Monterey Bay Drone, Automation, and Robotics Technology (DART) Workforce Skills Demand Study illuminates the intersection of traditional practices and cutting-edge technologies, particularly in the agricultural, infrastructure management, construction, and emerging aerospace industries within the Monterey Bay region. Key findings underscore the challenges of attracting and retaining skilled workers amidst the rapid integration of automation and data-driven decision-making processes. However, opportunities abound in upskilling/skills expansion for the existing workforce, attracting younger talent, and harnessing data insights for sustainable growth. Hiring projections for the April 2024- March 2025 within interviewed employers range from 2-30 new hires per employer, and starting salaries from $50-$100k plus benefits.

With the emergence of novel technologies involving automation and other advanced information technologies, combined with workforce induced changes driven by the 2020-2023 COVID pandemic, the need to prepare local communities for emerging jobs and in-demand skills is a high priority[1]. This study aims to better understand job skills demands within established and emerging economic sectors in support of workforce development planning and programming.

Agricultural Industry:

The agricultural sector stands at a pivotal moment, grappling with the integration of drone, automation, and robotics technologies while facing challenges in workforce acquisition and retention. There's a pressing need for training programs to equip workers with technical skills in automation and data analysis, alongside essential workplace skills like communication and critical thinking.

Infrastructure Industry:

PG&E's UAS Program exemplifies the evolving landscape of infrastructure inspection, emphasizing technical skills like Part 107 certification and data management. Essential

[1] Santa Cruz County Workforce Development Board. (2021). Santa Cruz County State of the Workforce. BW Research Partnership.

workplace skills such as reliability and accountability are equally valued, indicating a commitment to safety. Challenges include fostering diversity and standardizing training, and collaboration with educational institutions presents promising avenues for growth.

Construction Industry:

The integration of drones into construction projects is reshaping project management and execution. Success hinges on cultivating skilled professionals proficient in drone operation and data analysis. Investment in talent development is crucial for driving innovation and efficiency across different sub-sectors of construction.

Aerospace Sector:

The nascent aerospace industry within the Monterey Bay region is led by the continuing growth of Joby Aviation, which is projected to hire 300-500 advanced manufacturing workers between 2025 and 2030. Other aerospace firms are also conducting R&D operations within the region. Non-technical essential workplace skills paired with hands-on manufacturing, mechanical, and mechatronics experience will be important for successful job seekers.

Skills Demand:

There's a significant need for expanding workers' skills in data analysis, equipment operation, and drone technology across industries. Training programs must bridge the gap between mechanical engineering concepts and field experience, emphasizing both technical and non-technical essential workplace skills. The challenge with technical training is to develop approaches that reach a population that often has no formal technical education—so programs must start with digital literacy and build on translatable experience with other equipment and systems. Important to note, field experience is highly valued across industry sectors, offering a promising outlook for incumbent workers following some technical training.

Hiring and Wages:

Centralized training resources for drone operators are lacking, necessitating comprehensive skill development initiatives. Skills expansion for the existing workforce and attracting young talent are imperative for industry success. Competitive wages offered by companies like PG&E

and contractors like CES Utility Solutions Inc. reflect the value placed on skilled professionals in the drone industry.

Recruitment and Challenges:

Efforts to attract young professionals to agriculture and infrastructure industries must highlight career advancement opportunities and competitive wages. Providing enhanced skills development opportunities for existing workers is also key, capitalizing on their valuable industry and field experience and creating avenues for them to use that experience with new toolsets, including drones and other automated systems. Collaboration with educational institutions and diversity initiatives are crucial for workforce development. Challenges include developing flexible and affordable training programs and promoting diversity and inclusion in STEM.

Opportunities:

Opportunities to drive significant progress are abundant through multisector collaborations between employers, educational institutions, and community organizations. These partnerships can enhance training outreach and implementation efforts, facilitate smooth transitions across educational pathways, promote diversity and inclusion in STEM fields, attract students to STEM majors, and equip existing workers with expanded skills—all while ensuring broader accessibility. Moreover, partnering with community organizations is crucial for tailoring workforce training programs to the unique cultural and socioeconomic landscape of the Monterey Bay region, maximizing their relevance, community impact, and effectiveness in meeting industry skill demands. For example, to meet the unique demands of the regional agricultural workforce, developing training programs that are customized to local industries' seasonality and participant affordability can more effectively align the needs of both workers and employers to have meaningful impact.

In conclusion, this study illuminates central workforce themes across sectors and underscores the need for targeted training initiatives, collaborative efforts, and inclusive policies to address skills gaps and foster sustainable, inclusive growth in emerging technology sectors across the Monterey Bay region. By prioritizing workforce development and embracing innovation,

stakeholders can navigate the evolving technological landscape and seize opportunities for economic development. We also provide an overview of the current training landscape, indicating enthusiasm and some capacity to make progress towards meeting skills demand and elevating opportunities for community workers.

Background

The CITRIS Initiative for Drone Education and Research (CIDER) at UC Santa Cruz and the Monterey Bay DART Initiative collaborated on the design and implementation of the DART Workforce Skills Demand Study, to assess the current and future skills demand and inform workforce development planning and programming for the use of drones and robotics in agriculture, infrastructure inspection, construction monitoring, and emerging aerospace industries within Santa Cruz, Monterey, and San Benito Counties (the tri-county region).

The study was funded with support from the James Irvine Foundation, Priority Communities Initiative: a seven-year, $135 million initiative in Fresno, Salinas, Riverside, San Bernardino, and Stockton which aims to create and protect more good jobs that offer family-sustaining wages, benefits, and advancement opportunities for workers in low-wage jobs — and support communities as they create economies that work for all residents.[2] The emergence of drone, automation and robotics use in the fields of agriculture, infrastructure inspections and an emerging aerospace sector has been identified as both opportunities and challenges for communities in the tri-county region[3,4].

About CIDER

CIDER at UC Santa Cruz offers educational training and research support for the development and use of drone technology across all academic disciplines and many industry sectors. The initiative operates within the context of increasing and supporting DEI in the drone industry, providing students career-enhancing experiential learning opportunities, hands-on field

[2] The Irvine Foundation, Priority Communities Initiative.
[3] Monterey County. (2021). Monterey County Comprehensive Economic Development Strategy (CEDS). Beacon Economics and National Development Council.
[4] MBEP, CAFWD, and Sankofa Consulting. (2021). Regions Rise Together: Salinas. Investment Plan Blueprint.

research, flight time, and FAA licensure, in addition to internships and field training opportunities with CIDER industry partnerships.

About Monterey Bay DART

DART's mission is to establish and facilitate a premier next-generation technology and innovation cluster in the Monterey Bay Region. By supporting climate-smart DART businesses, DART aims to stimulate job growth and enhance community vitality through innovative workforce development programs, critical infrastructure access, entrepreneurship and business development initiatives, and education and policy advocacy efforts. Central to its mission, DART operates by convening stakeholders, managing new projects and programs, securing funding for programs and infrastructure, hosting educational forums, and advocating for safe and equitable access to markets, facilities, and airspace.

Geography

The tri-county region of California's Central Coast is predominantly rural with urban centers clustered along the coastline and stringing along the Hwy 101 corridor through the Salinas Valley. Monterey County is the largest of the three, with a 3281 square mile area, followed by San Benito and Santa Cruz respectively (Table 1). The predominance of rural land highlights the region's value of its working and natural landscapes. The largest economic sector for employment across the tri-county region is agriculture, followed by health care, then tourism and hospitality. Technology driven innovation is affecting all sectors, while the emergence of an aerospace, automation and robotics innovation ecosystem is driving the creation of new career pathways and skills demands from regional employers.

Table 1. County land area and rural/urban land use of Tri-County Monterey Bay Region[5].

County	Land Area (Sq Mi)	% Rural	% Urban
Monterey	3,281	97.4%	2.6%
San Benito	1,388	99.1%	1.0%
Santa Cruz	445	83.3%	16.7%

[5] United States Census Bureau, December 2023.

Demographics

As of 2022, the tri-county population was 764,807, from which 51.9% identify as Latino, 37.9% Non-Hispanic White, 5.6% Asian/Pacific Islander, 1.7% African American, and 2.9% Other.[6] It is also critical to note that across all three counties, nearly half of all youth identify as Latino and 39% identify as African American, Asian/Pacific Islander, American Indian/Alaska Native, or other.[7] Not surprisingly, regional demographics are not uniformly distributed; coastal cities such as Santa Cruz and Monterey have a higher proportion of white residents, while more inland cities such as Salinas, with economies centered around agriculture, have a higher presence of immigrant communities and communities of color.[8] In contrast, the region boasts a 79.9% Prime-Age Labor Force Participation Rate (Appendix A).[9]

Industry Snapshots

The largest sector in the tri-county region is Agriculture, Forestry, Fishing and Hunting, employing 66,094 workers. The next-largest sectors in the region are Health Care and Social Assistance (42,500 workers) and Accommodation and Food Services (36,505).[10] Regional sectors with the best job growth (or most moderate job losses) over the last five years are Administrative and Support and Waste Management and Remediation Services (+2,214 jobs), Health Care and Social Assistance (+2,089), and Construction (+1,342).

[6] Alvarez, G., Benner, C., Sasson, T. (2023). Building an Inclusive Economy in the Monterey Bay Region: A Progress Report.
[7] Ibid
[8] Benner, C., Pastor, M. (2022) MBEP SOTR 2022 Presentation; CA State Controller's Office data.
[9] JobsEQ® American Community Survey 2017-2021.
[10] JobsEQ® Economic Overview, Monterey Bay Region.

Table 2. Industry Snapshot across the Tri-County (Sant Cruz, Monterey and San Benito counties) through Q2 2023.

Monterey Bay Region, 2023Q2[1]

		Current			5-Year History		1-Year Forecast				
NAICS	Industry	Empl	Avg Ann Wages	LQ	Empl Change	Ann %	Total Demand	Exits	Transfers	Empl Growth	Ann % Growth
11	Agriculture, Forestry, Fishing and Hunting	66,094	$51,030	15.11	935	0.3%	8,535	3,719	4,668	147	0.2%
62	Health Care and Social Assistance	42,500	$71,644	0.86	2,089	1.0%	4,804	2,013	2,361	430	1.0%
72	Accommodation and Food Services	36,505	$34,720	1.24	436	0.2%	6,376	2,888	3,496	-9	0.0%
44	Retail Trade	30,196	$44,063	0.89	-1,220	-0.8%	4,081	1,826	2,432	-176	-0.6%
61	Educational Services	30,182	$68,591	1.11	109	0.1%	2,847	1,406	1,557	-116	-0.4%
92	Public Administration	19,328	$89,701	1.24	408	0.4%	1,900	790	1,125	-15	-0.1%
31	Manufacturing	16,891	$77,188	0.61	493	0.6%	1,859	680	1,159	21	0.1%
23	Construction	16,879	$67,009	0.83	1,342	1.7%	1,642	594	1,055	-7	0.0%
56	Administrative and Support and Waste Management and Remediation Services	16,348	$47,375	0.75	2,214	3.0%	1,984	802	1,171	11	0.1%
81	Other Services (except Public Administration)	13,397	$43,682	0.92	264	0.4%	1,624	676	941	7	0.1%

The industry cluster in the Monterey Bay Region with the highest relative concentration is Agricultural with a location quotient (LQ) of 14.44. This cluster employs 66,183 workers in the region with an average wage of $51,143. Employment in the Agricultural cluster is projected to expand in the region about 0.2% per year over the next ten years.[11]

[11] Ibid

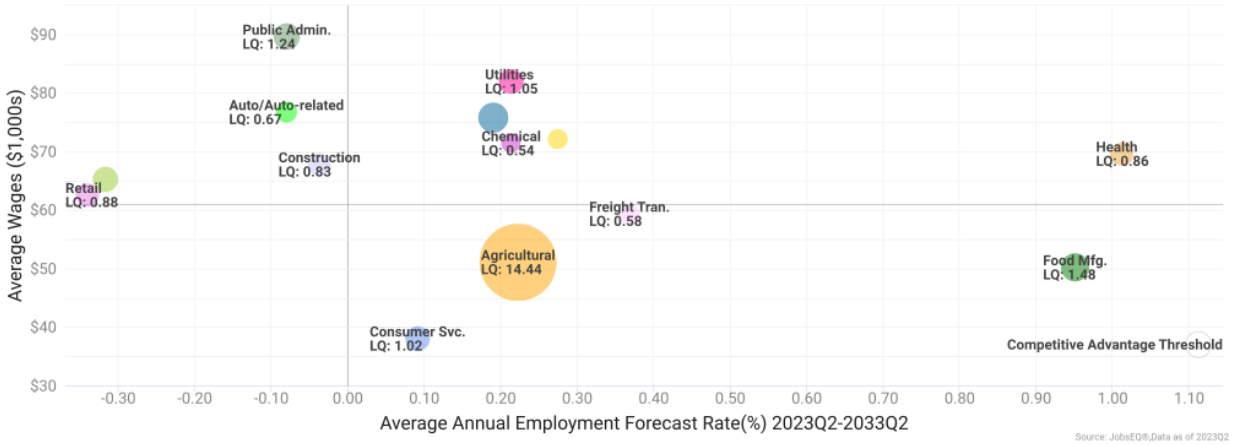


Figure 1. Industry Clusters for the Monterey Bay Region as of Q2 2023.

Within the tri-county region, the combined industries of Construction, Crop Production, and Manufacturing account for $8.8 billion GDP produced for the region and 59,630 jobs, as of 2022 (Appendix B).

Methods

We deployed a multi-source research approach that included digital surveys, one-on-one interviews, and national workforce data analysis. Initial background research looking at comparative efforts in San Bernardino County[12] and the North State region[13] provided insights into research methods and questionnaire development.

Digital Surveys

Survey Development

The research team developed an initial survey (Appendix C) that incorporated logic to allow for sub-surveys depending on how the respondent identified themself. The following surveys were developed to identify in-demand skills:

[12] Doan, H. (2023) Food and Agriculture Needs Assessment of the Inland Empire of Southern California. UC Cooperative Extension.
[13] Metz, J., Cummings, J., Fenwick, B., Matkin, M. (2021) Drone Forestry Career Pathways. MBEP and the California Stewardship Network.

- **Business Owner Survey** in Infrastructure Inspection, Construction or a Related Field (in English) which contains 27 questions (Appendix D)
- **Farm Owner Survey** (in English and Spanish) which contains 23-33 questions[14] (Appendix E)
- **Worker Survey** (in English and Spanish) which contains 17 questions (Appendix F)

Targeted surveys were developed to collect data on i) jobs anticipated in each sector and ii) associated skills necessary to fulfill these job demands. Once the initial survey questions were developed and compiled internally, we consulted with local community based organizations and industry experts to collect and incorporate their feedback. In May 2023, the study framework, goals, and objectives were presented at a Salinas Inclusive Economic Development Initiative (SIEDI) convening to i) inform participants of the research objectives and proposed course of action and ii) seek feedback on the study approach and questionnaires.

The key feedback we received from SIEDI pertained to the Spanish versions of the questionnaire. Specifically, the SIEDI feedback helped us accurately translate the intentions of the questionnaire and create more appropriate Spanish versions with vocabulary commonly used in the community. Subsequently, we received additional input from members of SIEDI around our outreach and engagement approach that resulted in moving from digital outreach to in-person, curated focus groups and data collection.

Digital Survey Outreach

The research team designed and implemented a key regional employers outreach program that involved contact database development, digital survey distribution and in-person survey opportunities. A large contact database was compiled categorized by sector affiliation. Identified sectors included Public Agencies, Industry, Drone Service Providers, Community Based Organizations, and Academia. In total, over 200 potential interview subjects were identified. Candidates were further sorted according to their primary and secondary interest categories including: Aerospace, Agriculture, Construction, Infrastructure, Public Safety, Transportation, and Conservation.

[14] *Actual number of questions varies according to the size of the farm in acres.*

Digital surveys were distributed via the web, social media, and targeted email campaigns. In order to maximize survey accessibility and sample size, we also created a digital process for individuals with a demonstrated or vested interest in this Study to register to receive the Survey. Additionally, we published a Study Press Release online and shared this content to Twitter/X, Linkedin, and the Monthly DART Newsletter. In September 2023, DART had a central presence at the FIRA USA Agricultural Robotics show in Salinas, which brought together key leaders in agricultural drone technology and robotics. Our team was on-site for three days: promoting our survey, sourcing strategic survey participants, and collecting survey responses. Additionally, our Senior Project Manager led a presentation in San Francisco to a large Construction Industry conference, where the survey was displayed for participants. In September and October 2023, our team sent targeted emails to 100 stakeholders.

One-on-one Interviews and Focus Groups

The research team organized one-on-one interviews with fresh produce industry representatives including agtech developers, agricultural service providers, farm managers, and packer-shippers (Table 3). These interviews yielded rich information about expected near-future hiring, wage scales, and current demand for both technical and essential workplace skills in the agtech and drone related jobs.

Table 3. Agtech Developers, Agricultural Service Providers, Farm Managers, and Packer-Shippers Interviewed from December 2023 through March 2024 in the 2024 DART Skills Demand Study.

Company	**Industry Role**	**Size (Employees)**	**Location (HQ)**
Farm-NG	Agtech Developer	40	Watsonville, CA
Guardian Ag Drones	Agtech Developer	60-70	Salinas, CA Boston, MA
Aero Systems West	Aviation and Aerospace Component Manufacturing	20	San Martin, CA
Wilbur Ellis	Agronomy Service Provider	2500	Milbank, SD
Taylor Companies	Food and Beverage Manufacturing	20000	Salinas, CA

D'Arrigo	Agricultural Grower/Shipper	2500	Salinas, CA
Western Growers	Non-profit organization	250	Salinas, CA

Labor Data Analysis

The research team utilized the JobsEQ™ platform to query bundled Bureau of Labor Statistics (BLS) data to project jobs growth in the tri-county region across relevant Standard Occupational Classification Codes (SOCC), including agriculture/forestry, construction, and manufacturing. The research team utilized the JobsEQ platform Job Postings Time Series (RTI) tool to assess skills demand in actual online job postings from within the tri-county regions. We compared 12-month (04/2023 - 04/2024) and 3-year (04/2021 - 04/2024) datasets to detect skills demand trends across the following occupations selected based on Bureau of Labor Statistics' categories with high volume and most likely to include drone applications:

- Manufacturing Engineers (17-2112.03),
- Agricultural Technicians (19-4012.00),
- Agricultural Inspectors (45-2010),
- Agricultural Equipment Operators (45-2091),
- Construction Equipment Operators (47-2070),
- Operating Engineers and Other Construction Equipment Operators (47-2073),
- Construction and Related Workers, All Other (47-4099)

Results

Digital Surveys

The digital survey and outreach yielded insufficient respondents, and following these outcomes and incorporating feedback from SIEDI about successful outreach strategies, the team therefore pivoted efforts towards One-on-one Interviews, Focus Groups and Labor Data Analysis. In-person surveys were collected during the FIRA USA Agricultural Robotics show in Salinas, Construction Conference, during a SIEDI convening, and during subsequent scheduled one-on-one sessions.

Shifting from digital to in-person survey collection highlighted several valuable learnings that will be useful towards future studies involving workforce surveys in these fields. In-person surveys (and one-on-one interviews as well as focus groups described below) facilitated a deeper understanding of respondents' perspectives such that they can foster meaningful engagement, encouraging respondents to provide more candid and nuanced feedback on complex or sensitive topics that they may be less forthcoming in digital surveys. The quality of responses also tends to be higher as participants are typically more invested in the subject matter, leading to richer qualitative data. Importantly, in-person surveys allow for real-time clarification of questions and unexpected insights that can arise from personal interactions. Overall, while digital surveys can offer efficiency and scale, in-person surveys can foster meaningful engagement, capturing deeper insights and obtaining high-quality data for comprehensive analysis, as we believe was the case in our survey results.

One-on-One Interviews and Focus Groups

Agriculture

Hiring & Wages

Seven agricultural industry companies across technology developers, service providers, and vertical integrated packer shippers operating in the Salinas Valley were interviewed (Table 4). Current and near-term projected hiring at the interviewed companies ranged from 2-30 new positions over the coming 12-month period for those companies willing and able to share projections. Starting salaries ranged from $50,000 to over $100,000 per year depending on specific positions. Factors including industry role, maturity stage, legacy or emerging market focus, product and/or service models were raised as important factors affecting hiring projections and compensation packages. In general higher technical skills and skills scarcity within incumbent workforce drove compensation.

Table 4. Current and Near-Term Projected Hiring and Starting Wages at Agtech Developers, Agricultural Service Providers, Farm Managers, and Packer-Shippers Interviewed from December 2023 through March 2024.

Company	Industry Role	Size (Employees)	Location	Projected 12-month hiring count	Expected starting annual salaries[15]
Farm-NG	Agtech Developer	40	Watsonville, CA	30	$62-73K
Guardian Ag Drones	Agtech Developer	20	Salinas, CA Boston, MA	2-5	$60-$100K
Aero Systems West	Aviation and Aerospace Component Manufacturing	20	San Martin, CA	3-6	$50-$100K
Wilbur Ellis	Agronomy Service Provider	2500	Milbank, SD	20	$65K
Taylor Companies	Food and Beverage Manufacturing	20000	Salinas, CA	N/A	$42 - $52k
D'Arrigo	Agricultural Grower/Shipper	2500	Salinas, CA	N/A	$42 - $52k
Western Growers	Non-profit organization	250	Salinas, CA	N/A	$42 - $52k

Along with the data summarized above, the interviews and focus groups provided nuanced insights into how these companies are approaching meeting their current and near-term talent acquisition needs.

Technical Skills

Guardian Ag Drones, a domestic drone manufacturer focused on the agricultural spray market, emphasized that building a qualified workforce was challenging, particularly sourcing individuals adept at both traditional agricultural work and drone technology. The existing agricultural workforce, while experienced, faces challenges related to technological adaptability and language barriers. There is a workforce need for people who are hands-on and know how to work in the fields, but are also interested in the technology, able to understand it,

[15] *Total expected starting annual salaries, potential seasonality not captured.*

and able to use it. Additionally, a significant challenge on the application side is finding qualified individuals willing to embrace drone-based spraying as a profession.

Aero Systems West sees automotive skills as a valuable prerequisite, sharing many similarities with the skills required in drone engineering. To address the need for skilled professionals, ASW suggests the development of a certificate or training program covering core skills/competencies. They predict this will minimize the need for extensive on-the-job training and will better equip individuals for roles in the emerging field of UAS technology.

Wilbur Ellis, a national agricultural service contractor, emphasized that the skilled labor shortage is exacerbated by the complexity of operating drones and knowledge required regarding chemical mix orders, drift risks, and unique policies across counties for different buffer zones, contexts, and micro-environments. Additionally, Wilbur Ellis cited there is no centralized system of curriculum or resources to serve as a guide for the step-by-step process of becoming minimally viable certified to be a drone spray pilot for agriculture.

Farm-ng cited increased demand for a readily-accessible tech support team capable of the "tinkering" that comes with daily operations of a farm *and* the ability to understand how to properly diagnose failures at the sub-component level (not just the component level). A central need for their near-term and future workforce is a deep understanding of the software platform and troubleshooting processes, particularly for issues like loose connectors or errant wires. Farm-ng also emphasized a noticeable gap between mechanical engineering teams and those *with field experience*. The company acknowledges the value of capitalizing on existing agricultural experience, providing basic technical training to workers, and fostering skill development in areas such as assembly, wire harness building, GIS, CANVAS, circuitry, metalworking, electrical distribution, and software engineering.

Focus group participants cited logistics and engineering as top hiring priorities for tech positions in agriculture. They also emphasized the need for user-friendly data frameworks and skilled workers who can manage and interpret data. Overall, the interviews highlighted the complex challenges and opportunities facing the agriculture industry in the wake of automation, data-driven decision making, and the need for a skilled and adaptable workforce.

Embracing automation, upskilling the workforce, attracting young talent, and leveraging data-driven insights will be crucial for the industry's future success.

The agricultural industry is at a pivotal juncture, where traditional practices intersect with rapidly evolving technological advancements, particularly in the realm of drone technology. Various stakeholders across the industry have identified common workforce demands and challenges that need to be addressed to effectively leverage these innovations.

Training and Skill Development

Aero Systems West suggested the creation of focused certificate or training programs to equip individuals with the core competencies required for roles in small Unmanned Aircraft Systems (sUAS) technology. Farm-ng advocated for a comprehensive approach to skill development, combining agricultural experience with technical training in various disciplines such as assembly, wire harness building, and software engineering.

Challenges and Opportunities

The agricultural industry stands at the nexus of tradition and innovation, with the integration of drones and other field-based automation technologies offering immense potential for efficiency and sustainability. However, realizing this potential hinges on overcoming workforce challenges through targeted training, skill development initiatives, and a holistic approach to talent acquisition. By addressing these challenges head-on, the industry can position itself for future success in the era of agricultural automation and data-driven agriculture.

Essential Workplace Skills

Across several interviews, we heard consistent demand for workers with well-developed essential workplace skills such as strong communication, critical thinking, and problem-solving. Specifically, Farm-ng cited the demand for innovative employees with a strong attention to detail, processes, and procedures. Emphasis was also given to the importance of critical thinking and troubleshooting in order to operate and maintain complex equipment and adapt to changing technologies. On the other hand, Guardian places a high importance on cultivating a culture of passion within the workforce, citing its central role in both individual and collective

performance. Focus group participants also cited the importance of internships and life skills training.

Infrastructure

Hiring & Wages

Our team interviewed the UAS Program Manager at PG&E, who confirmed that PG&E employs approximately 80 drone pilots through their multiple lines of business - including hydrogen, vegetation management, and electrical operations. PG&E intends to train an additional 20 drone pilots (all internal hires) by the end of 2024. PG&E is actively recruiting for additional trainers to perform flight safety reviews with excellent training abilities and expert-level knowledge.

PG&E has a unique model that hires contractors and vendors to assist with large scope projects and hiring. Our team interviewed the primary contractors for the PG&E Aerial Drone Program: CES Utility Solutions (CES). CES serves as a contractor for the PG&E, specializing in infrastructure inspections. Their core focus lies in assessing damage to crucial assets such as power lines, distribution lines, transmission lines, insulators, and substations. With a dedicated team of around 50 individuals in California, exclusively engaged in the PG&E contract, CES operates on a pilot-sensor operator model, with one individual piloting the drone and another operating the camera.

While the demand for CES services historically fluctuates seasonally (with the majority of inspection work concentrated between January through late summer or fall)*[16], this last year was the first time CES flew for PG&E all year round. Moreover, CES' inspection work is continuing to expand, including but not limited to contracts for agriculture mapping, windmill towers, and underwater remotely operated vehicle (ROV) work with the Pacifica Pier to provide for year-round work.

Wages for CES drone pilots on the PG&E contract range from $40 to $50 per hour plus overtime, which equates to an annual salary range of $120,000 to $150,000 (in addition to paid

[16] This schedule is front-loaded due to stringent deadlines set by fire threat districts.

travel, accommodations, and equipment expenses). This is consistent with the information provided by PG&E, which outlined the following internal pay scales: internal Associate level ($80,000 – $100,000); Associate Pilot ($110,000 – $120,000); and Senior Pilots ($170,000+).

Technical Skills

In terms of technical skills, CES places priority on individuals who possess a Part 107 certification, with a preference for extensive backgrounds in gaming, photography, and strong hand-eye coordination. PG&E places a heavy emphasis on data management, which entails not only the ability to collect quality data, but also the ability to properly organize and structure data for analysis. Moreover, PG&E seeks out specialists with a demonstrated ability to sort and write scripts, as well as set up background networks to make their data actionable. Both PG&E and CES emphasized the importance of data management skills and understanding how to take quality images. A consistent theme among these interviews was that the drone industry is shifting towards data management, not just drone operations.

PG&E emphasized the area that has helped the most in terms of transferable skills has been individuals with an aviation background, as they bring knowledge of federal regulations and troubleshooting skills. PG&E also cited the hardest skill to train is teaching offroad driving.

Essential Workplace Skills

Essential workplace skills such as reliability, accountability, and a strong work ethic are highly valued by CES, aligning with their priorities of safety, efficiency, and product quality.

Training and Skill Development

One of PG&E's aspirations is to develop a set of internal career pathways so that an employee who begins their career performing work such as running parts can easily upskill/expand their skills to a position that entails operating a camera sensor or drone, and ultimately take on a project management capacity. CES invests in workforce training by partnering with local STEM schools to assist students in obtaining their Part 107 certifications and providing internal training through various presentations covering safety, operations, and procedures.

Additionally, new hires undergo extensive on-the-job training, typically paired with experienced employees.

Challenges and Opportunities

Efforts are underway to foster gender diversity in the industry, with CES collaborating with the owner of Women Who Drone to encourage more female participation, and recently celebrated their first all-female team this past season. Another opportunity for more substantial workforce training would be for PG&E to establish relationships with community colleges and trainers, with the possible goal of establishing a drone curriculum, which has not been pursued yet. Therefore, the challenge brought on by competing training programs and the need for standardization across the industry remain.

Construction

Our team conducted an additional interview with employees at GraniteRock Construction, who made it powerfully clear that drones are revolutionizing the industry. GraniteRock highlighted the efficiency of drones in both tracking project progress and maintaining detailed records, while also confirming our findings from PG&E's interview in which drones play a crucial role in inspecting infrastructure and even facilitating worker training. However, the conversation underscored the necessity of having skilled personnel capable of both operating drones and analyzing the data they collect to fully leverage this technology.

Within construction, drones are proving indispensable for tasks such as progress tracking, time-lapse videos, initial project evaluations, and conducting inspections. Specialized operators are deployed for grading and surveying purposes, with an emphasis on training internal staff for drone operations. The diverse applications of drones, ranging from marketing endeavors to construction technology, underscore the versatility of this technology within the industry. Efforts are underway to cultivate a workforce equipped with the unique skill sets required for drone operation in construction, with an emphasis on internal talent development supplemented by partnerships with local colleges and workforce training organizations.

Aerospace

Our team also conducted an interview with the Joby Aviation Workforce Development Lead to identify industry-specific challenges and workforce skills demand in the near future. Joby's key areas of workforce focus include manufacturing and flight test operations, which are anchored by four primary roles:

1. Flight Test Pilots (typically for those with a military career background)
2. Flight Test Engineers (bachelor's degree required)
3. Flight Test Mechanics: (certification required)
4. Program Management/Support Staff (demonstrated understanding of airspace, eVTOL flight operations and regulations, and operational safety)

Within the industry, there is a significant demand for certificated aircraft mechanics. As drones become more complex and integrated with technical systems, the need for these roles will increase. Although a specific drone maintenance certification does not yet exist, Joby sees potential in this area as an entry point for professionals aiming to become aircraft mechanics. Developing such a certification could create apprenticeship opportunities, and institutions like Hartnell College are interested in partnering with Joby on this initiative.

Most notably for our focus, Joby noted the relevance of FAA Part 107 certification and drone flight operations training as a strong entry point to all employment paths within the company. Familiarity with FAA regulations, basic aeronautical knowledge and an understanding of airspace provide a solid basis for the specialized knowledge required for employment with the aviation field.

Joby agreed with other interviewees that there is a high demand for basic digital and workforce literacy skills which are in short supply and creating a significant gap in workforce readiness. This challenge is exacerbated by the reality that employers typically do not invest heavily in job readiness training because it does not yield immediate returns. Therefore, training in office programs (Google Workspace, Microsoft Suite), email composition, and basic computer skills would also be highly beneficial. By prioritizing basic digital literacy and

professional skills, Joby aims to enhance the overall competency and preparedness of their workforce, which is crucial for maintaining operational efficiency and safety.

The industry prefers to quickly bring employees up to speed with specific skills needed, as opposed to investing heavily in fundamental, entry-level training. Joby's in-house workforce training includes a variety of topics related to aircraft production and operations, including:

- Intro to manufacturing materials and processes
- Component design
- Quality control and quality assurance
- Statistical processes
- Intro to automation and robotics
- Lean manufacturing
- Supply chain and production life cycle
- Basic industrial safety
- Computer-aided design (CAD)

In summary, Joby's strategy in the Monterey Bay region is heavily focused on building a skilled workforce through targeted training programs in both technical and essential workplace skills, preparing for a future where the demand for pilot and maintenance roles will be substantial. Joby recognizes the evolving landscape of aircraft and drone maintenance, noting the increasing complexity of drones and their convergence with broader technical systems. They note the significant benefits to having candidates with the background knowledge of FAA regulations and aviation concepts imparted by drone pilot training. By advocating for the development of drone maintenance certifications and partnering with educational institutions like Hartnell College, Joby is proactively creating pathways for career entry and advancement, which will support the industry's future demands.

Labor Data Analysis

Projected Jobs Growth

The region can expect modest growth in the manufacturing sector and support activities for agriculture/forestry sectors, while stability is expected in the construction and crop production sectors. The State can expect slight growth in the construction, crop production, and agriculture/forestry sectors, while the manufacturing sector is expected to remain stable.

In the manufacturing sector, the industry has been growing in both the region and the State since 2021Q1, is projected to slightly increase over the next five years from 16,800 to 17,000 (regionally) and remain stable at 1,373,681 (statewide). The construction industry is projected to remain stable at 16,800 employed (regionally) and increase slightly from 1,071,378 to 1,079,048 (statewide) over the next five years. The crop production industry has been declining in both the region and the state since 2022Q3 and is projected to remain stable at 26,000 (regionally) and increase slightly from 169,581 to 171,496 over the next five years (statewide). Support activities for agriculture and forestry are projected to slightly increase from 39,500 to 40,200 (regionally) and from 229,034 to 234,317 (statewide) over the next five years[17].

Real-time Skills Demand

Terminology

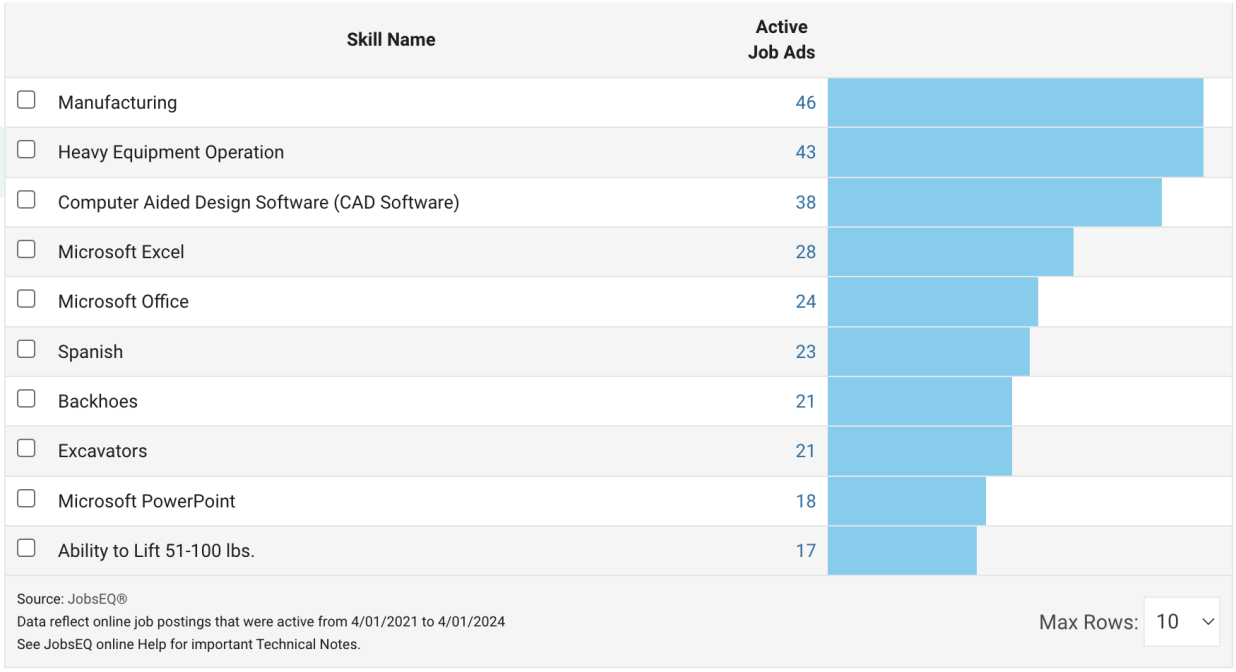
Essential workplace skills, formerly referred to as "soft skills," are now recognized for their complexity and difficulty to master compared to "hard skills," which are now commonly referred to as technical skills. Outdated terminology in the context of the following skills demand analyses are applied for consistency in data characterization with national data sets, such as from the National Labor Data and Bureau of Labor Statistics.

Technical Skills

Among the 249 job postings active from **2021-2024**, the top five technical skills in demand were: Manufacturing, Heavy Equipment Operation, Computer Aided Design Software, Microsoft Excel, and Microsoft Office (Figure 2). When compared to the 86 job postings active in the period **between April 2023 and April 2024**, the top five technical skills in demand were:

[17] JobsEQ Monterey Bay Region, Economic Snapshot, April 2024.

Manufacturing, Computer Aided Design Software, Microsoft Excel, Heavy Equipment Operation, and Process Development (Figure 3)[18]. While both datasets contain similar skills in demand, there appears to be less demand for Microsoft Office and related applications, while demand for Process Development skills have increased, between April 2023 and April 2024.



Skill Name	Active Job Ads
Manufacturing	46
Heavy Equipment Operation	43
Computer Aided Design Software (CAD Software)	38
Microsoft Excel	28
Microsoft Office	24
Spanish	23
Backhoes	21
Excavators	21
Microsoft PowerPoint	18
Ability to Lift 51-100 lbs.	17

Source: JobsEQ®
Data reflect online job postings that were active from 4/01/2021 to 4/01/2024
See JobsEQ online Help for important Technical Notes.

Max Rows: 10

Figure 2. Technical Skills (f.k.a. hard skills) demand based on JobsEQ Real-Time Intelligence Report tool (2021 – 2024).

[18] JobsEQ® Real-Time Intelligence (RTI) Report, Monterey Bay Region.

Skill Name	Active Job Ads
Manufacturing	17
Computer Aided Design Software (CAD Software)	13
Microsoft Excel	12
Heavy Equipment Operation	11
Process Development	11
Autoclaves	8
Microsoft PowerPoint	8
Ability to Lift 51-100 lbs.	7
Lean Manufacturing	7
Teaching/Training, Job	7

Source: JobsEQ®
Data reflect online job postings that were active from 4/27/2023 to 4/27/2024
See JobsEQ online Help for important Technical Notes.

Max Rows: 10

Figure 3. Technical Skills (f.k.a. hard skills) demand based on JobsEQ Real-Time Intelligence Report tool (04/2023 – 04/2024).

Essential Workplace Skills

Among the 249 job postings active from 2021-2024, essential workplace skills with highest demand included: Communication/Verbal and written skills (118), Cooperative/Team Player (61), and Organization (42) (Figure 4). These align precisely with the essential workplace skills in highest demand for job postings active in the last 12 months: Communication/Verbal and written skills (45), Cooperative/Team Player (25), and Organization (12) (Figure 5). Therefore, our data suggests that these specific skills should continue to be a central emphasis of ongoing workforce development, education curriculum, and job training.

Skill Name	Active Job Ads
Communication (Verbal and written skills)	118
Cooperative/Team Player	61
Organization	42
Problem Solving	29
Customer Service	28
Detail Oriented/Meticulous	24
Supervision/Management	21
Careful/Cautious/Alert/Safety Conscious	19
Self-Motivated/Ability to Work Independently/Self Leadership	17
Work Ethic/Hard Working	16

Source: JobsEQ®
Data reflect online job postings that were active from 4/01/2021 to 4/01/2024
See JobsEQ online Help for important Technical Notes.

Max Rows: 10

Figure 4. Essential Workplace Skills (f.k.a. soft skills) demand based on JobsEQ Real-Time Intelligence Report tool for the tri-county Monterey Bay region (2021 – 2024).

Skill Name	Active Job Ads
Communication (Verbal and written skills)	45
Cooperative/Team Player	25
Organization	12
Problem Solving	10
Customer Service	9
Detail Oriented/Meticulous	8
Supervision/Management	7
Ability to Work in a Fast Paced Environment	6
Careful/Cautious/Alert/Safety Conscious	6
Work Ethic/Hard Working	6

Source: JobsEQ®
Data reflect online job postings that were active from 4/27/2023 to 4/27/2024
See JobsEQ online Help for important Technical Notes.

Max Rows: 10

Figure 4. Essential Workplace Skills (f.k.a. soft skills) demand based on JobsEQ Real-Time Intelligence Report tool for the tri-county Monterey Bay region (04/2023 – 04/2024).

Discussion

The agricultural industry stands at a pivotal juncture, where traditional practices intersect with rapidly evolving technological advancements, particularly in drone technology. Moreover, the industry faces challenges in attracting and retaining skilled workers amidst the increasing integration of automation and data-driven decision-making processes. However, there are opportunities in upskilling/skills expansion for the existing workforce, attracting younger talent, and leveraging data insights for sustainable growth, indicating a pathway towards future success. Overcoming workforce challenges through targeted training and holistic talent acquisition approaches is essential for realizing the potential of automation and data-driven agriculture.

Within the infrastructure industry, our findings reveal a robust and evolving landscape within PG&E's UAS Program and their efforts to empower a skilled workforce for critical infrastructure inspections. The emphasis on technical skills like Part 107 certification and data management underscores the industry's shift towards comprehensive data utilization. Essential workplace skills are equally valued, indicating a commitment to safety and quality. While challenges persist, particularly in fostering diversity and standardizing training, opportunities for collaboration with educational institutions signify a promising avenue for future growth and skill development in the drone industry.

The integration of drones into the construction industry is uniquely reshaping the landscape of project management and execution. However, the success of this integration heavily depends on the cultivation of skilled professionals capable of navigating the intricacies of drone operation and data analysis. As these industries continue to harness the potential of drones, investing in the development of talent specialized in drone technology will be paramount for driving continued innovation and efficiency across various sectors.

It is also critical to note that national employment data has not yet incorporated metrics for jobs in emerging fields such as drone operations, maintenance and the data processing associated with their operations, as well as for other advanced automation tools. Figure 6

provides an illustration of key findings from this study which are discussed in more detail in the following sections.

Skills

Our interviews revealed a significant need across industries to invest in upskilling/skills expansion for current workers in areas like data analysis, equipment operation, as well as both traditional agriculture and emerging drone technology (Table 5). Specifically, the agriculture industry is in need of training programs that can equip workers with the necessary skills to thrive in a changing environment. This includes technical skills related to automation and artificial intelligence, as well as essential workplace skills like communication and critical thinking. Emphasizing training programs covering core competencies and bridging the gap between mechanical engineering concepts and field experience are vital for addressing these challenges, as well as successful implementation of new tools and technologies. Interview stakeholders identified similarities between automotive and drone engineering skills, suggesting the development of focused certificate or training programs to address the skill gap.

Several notable companies also recognized the value of capitalizing on existing agricultural experience while providing technical training in areas like assembly, wire harness building, GIS, and software engineering. Alongside technical competencies, there is a consistent demand for workers with strong essential workplace skills such as communication, critical thinking, and problem-solving. Companies also emphasized the importance of cultivating a culture of passion within the workforce and value innovative employees with attention to detail and adaptability.

The prioritization of Part 107 certification by CES and data management by PG&E underscore the infrastructure inspection industry's focus on regulatory familiarity and data management. The recognition of aviation background as a valuable transferable skill further emphasizes the importance of regulatory knowledge and troubleshooting capabilities. CES' emphasis on essential workplace skills, and work ethic aligns with safety and efficiency priorities, underscoring the importance of a strong ethical foundation in drone operations. Essential workplace skills also play a crucial role in maintaining a positive safety culture within the industry.

Table 5. Inventory of Technical Skills and Essential Workplace Skills in Demand, Identified from Interviews with agriculture, infrastructure inspection, and construction sectors during the 2024 DART Skills Demand Study.

	Technical Skills	**Essential Workplace Skills**
Agriculture	● agriculture field experience ● assembly ● automation ● automotive skills ● CANVAS ● *(knowledge of)* chemical mix orders ● circuitry ● *(knowledge of)* county-specific contexts, micro-environments, and policies ● data-driven decision making ● *(knowledge of)* drift risks ● drone technology ● electrical distribution ● GIS ● logistics and engineering ● manage and interpret data ● metalworking ● software engineering ● sub-component diagnostics ● technology support for daily farm operations ● traditional agricultural work ● technical troubleshooting ● wire harness building	● adaptability ● attention to detail, processes, and procedures ● communication ● critical thinking ● innovative ● life skills training ● passionate ● problem-solving
Infrastructure	● aviation background ● *(ability to)* collect quality data ● data management ● *(knowledge of)* federal regulations ● gaming experience ● hand-eye coordination ● off-road driving ● Part 107 certification ● photography ● *(ability to)* properly organize and structure data for analysis ● *(ability to)* set up background networks to make data actionable ● *(ability to)* sort and write scripts ● *(ability to)* take quality images ● technical troubleshooting	● honest ● strong work ethic ● trustworthy ● problem-solving
Construction	● civil engineering ● construction management	● communication

	• data analysis • project management	

Hiring

There is a significant lack of centralized training resources for drone operators, contributing to the complexity of becoming certified. As a result, the agriculture industry has a significant demand for individuals who can bridge the gap between mechanical engineering and field experience. Stakeholders have repeatedly advocated for comprehensive skill development initiatives that combine agricultural experience with technical training. Our conversations revealed a significant consensus around the need for skilled workers capable of managing and interpreting data, as well as embracing automation for efficiency and sustainability. Therefore, training programs need to cover a wide array of skills, from technical aspects to troubleshooting processes.

Upskilling the existing workforce and attracting young talent are crucial for both the agriculture and infrastructure industries' future success. PG&E's commitment to hiring and training additional drone pilots internally reflects a strategic investment in building an experienced workforce. The unique model of utilizing contractors like CES for large projects allows for flexibility and better service delivery. Additionally, the potential for PG&E to establish relationships with community colleges and create a drone curriculum presents an opportunity for standardized training, addressing a current hiring challenge in the industry. PG&E currently works with the UAS program at Orange Coast College in Costa Mesa, CA, to recruit drone pilots and expressed strong interest in creating a similar employment pipeline in the Central Coast region with Hartnell College and other institutions.

Wages

Based on the employer interviews, expected starting wages in the Agtech developer sector range from $60K to $100K per year, and include benefits. Similarly, in aviation and aerospace component manufacturing, companies like Aero Systems West offer starting wages between

$50K and $100K annually. Larger agronomy service providers such as Wilbur Ellis offer starting wages set at $65K per year. Lastly, a consistent trend across both the agricultural grower/shippers and food and beverage manufacturing sectors offer starting wages in the range of $42K to $52K per year.

CES drone pilots working on the PG&E UAS contract earn competitive wages ranging from $40 to $50 per hour, translating to annual salaries of $120,000 to $150,000, which align with industry standards and include compensation for travel and accommodations, contributing to a competitive salary range.

Recruitment

A consistent theme across our interviews was around the importance of agriculture being seen as a rewarding and innovative career path for young professionals seeking upward mobility. There is significant potential for the agriculture industry to enhance its efforts to attract young professionals by showcasing the exciting opportunities available and highlighting career advancement opportunities and competitive wages. Addressing these challenges and opportunities will be instrumental in positioning the agricultural industry for sustainable growth and success in the era of automation and data-driven decision-making.

CES's collaboration with STEM schools and internal training initiatives are a significant first step in addressing the infrastructure inspection industry's need for skilled professionals, emphasizing safety and operational procedures. PG&E's desire to establish internal career pathways highlights a commitment to employee professional development, as well as upskilling employees from entry level tasks to upper project management roles, serving as a foundation for further attention and investment. Efforts to foster gender diversity and expand workforce training opportunities, exemplified by CES's collaboration with Women Who Drone, represent a positive step towards enhanced inclusivity.

Challenges and Opportunities

Outreach and Implementation Efforts for Training Programs

Developing flexible and affordable training programs for emerging technology careers is a crucial opportunity to bridge the skills gap, promote inclusivity, meet the growing demands of different industries, and encourage continuous learning. However, creating such programs comes with its challenges. Managing costs, maintaining high-quality education standards, providing program flexibility, and keeping up with rapid technological advancements require significant effort. Addressing these challenges is essential to cultivating a diverse and well-trained workforce that can thrive in the ever-changing landscape of emerging technologies.

Promoting Diversity and Inclusion in STEM

Advancing diversity and inclusivity within STEM requires a multifaceted approach, especially in emerging technology domains. This includes targeted outreach campaigns, developing inclusive curricula and mentorship programs, providing financial aid opportunities, forging collaborative partnerships, fostering supportive environments, combating biases and stereotypes, and conducting robust research and data collection efforts. Specific efforts in this area include working with community-based organizations, planning training that removes barriers for target stakeholders (evening classes, direct compensation for training, etc). By collaborating with community-based organizations, we can ensure that the training programs are culturally relevant and accessible.

In the Monterey Bay region, collaborating with local community-based organizations ensures that training programs are tailored to the unique cultural and socioeconomic landscape of the area. Additionally, planning training sessions during evenings allows those with daytime commitments (such as agricultural and service workers) to participate, and providing direct compensation acknowledges the value of their time and effort, thereby reducing financial barriers. These combined efforts aim to remove barriers and provide unwavering support to

underrepresented groups, nurturing a more equitable and innovative community within the region.

As the agricultural, infrastructure, and construction industries grow, it is critical that a culture around diversity, equity, and inclusion be instilled at the outset to overcome historical barriers. Although people of color made up 38% of the US population between 2010 and 2020, they only made up ~ 29% of the science and engineering workforce (Green 2.0 Report). As these industries continue to grow and the application of drones becomes more widely utilized, it is critical that we introduce these career opportunities to people who have been historically excluded from these industries.

To that end, the US Department of Education, Hispanic Serving Institution (HSI) Designation provides unique grant funding for eligible institutions that enroll at least 25% Hispanic students. This designation is particularly relevant to universities and community colleges in California that host such a large Hispanic population. Numerous campuses on the Central Coast of California meet this criterion including UC Santa Cruz, CSU Monterey Bay, Hartnell College and many others.

These campuses are able to leverage access to Federal funds to improve STEM opportunities for their diverse student populations. For example, at UC Santa Cruz, the UCSC CITRIS Initiative for Drone Education and Research (CIDER) is working to create a drone education and research program aimed at educating students on the design, development, and application of drones, with an emphasis on targeting students traditionally underrepresented in STEM, to help create pathways for entry into the drone industry and application of drones.

Facilitating Transition Across Educational Pathways

Enabling a smooth transition between different educational pathways, such as moving from technical training to undergraduate programs and from high school to technical training is essential for promoting a culture of lifelong learning. This transition provides opportunities to acquire diverse skills, progress academically, enhance adaptability, and develop professional networks. However, challenges such as complicated credit transfer procedures, addressing skill

gaps, and financial constraints still exist. To overcome these challenges, implementing clear credit transfer policies, effective support programs, a range of financial aid options, and promoting collaborative efforts among educational institutions are needed. By addressing these challenges, we can ensure a seamless transition, fostering continuous lifelong learning.

Attracting Students to STEM Majors

Educational institutions must take a comprehensive approach to attract more students towards STEM majors, especially those leading to emerging technology careers. This involves increasing awareness, improving K-12 STEM education, expanding financial assistance, fostering industry partnerships, promoting diversity, customizing curricula, encouraging research initiatives, utilizing online education platforms, providing mentorship opportunities, and highlighting success stories. Hands-on training using drones and other robotics systems have been recognized as a highly effective pathway for students at all levels to gain mastery of complex STEM concepts and skills. These efforts are crucial to developing a skilled and diverse workforce well-equipped to excel in critical STEM fields.

Enhancing the Emerging Technology Workforce through Collaborations

Collaboration across sectors, such as industry, academia, government, and non-profit organizations, is essential to enhance the emerging technology workforce. Strategies like forming partnerships, hosting forums, funding joint projects, sharing knowledge, and offering mentorship programs are vital in developing a solid talent pool to address future challenges.

Facilitating STEM Pathways into Emerging Technology Fields

To pave the way for STEM pathways in emerging technology fields, it's essential to promote lifelong learning, encourage interdisciplinary collaboration, provide hands-on experience, foster an entrepreneurial mindset, establish industry partnerships, champion diversity, engage in ethical discourse, develop essential workplace skills, offer mentorship, and encourage public engagement. Combined, these elements create a supportive ecosystem that fosters a skilled and diverse workforce equipped to handle the complexities of future technological landscapes.

Current Training Landscape

Community Based Organizations

The tri-county region is characterized by an abundance of vibrant community-based organizations. In addition to Monterey Bay DART, these include - but are not limited to - Action Council, Building Healthy Communities (Monterey County), Digital NEST, Monterey Bay Economic Partnership (MBEP), Mujeres en Acción, Rancho Cielo, Santa Cruz Works, and Salinas Inclusive Economic Development Initiative (SIEDI).

Essential Workplace Skills Development

Our team collected information from local community based organizations (DigitalNEST and Rancho Cielo) to gain insights into the programs available for essential workplace skills development. DigitalNEST cited their remarkable success in developing essential workplace skills as an integral part of every branch of their programs. They are deeply committed to teaching technical skills and essential workplace skills that their community members will need to successfully navigate future employment opportunities. Specifically, their NESTed programming helps members learn to communicate and collaborate in the workplace, take on leadership roles, manage time effectively, and demonstrate accountability and flexibility when faced with changing circumstances. As members practice and acquire these important professional skills throughout their journey, they build confidence and the ability to advocate for their future.

The Career Exploration program for the youngest members of DigitalNEST (aged 14-17) gain valuable professional skills during weekly meetings and center events. Members have the opportunity to explore diverse career options, discover their interests and career goals, develop professional skills, connect with the NEST network of professionals, and learn about Digital NEST's Pathways technical training programs. They also engage in industry tours, panel discussions with alumni professionals, and meetings with guest speakers in the tech industry.

For members aged 17-24, the Career Pathways program provides opportunities to learn professional skills alongside technical skills through project–based learning. In this program, all members are encouraged to actively practice collaboration, give and receive feedback, demonstrate effective communication, and enhance their self-awareness as they create projects for their professional portfolio. Additionally, they attend workshops on developing a professional network, building a successful resume, and managing job searches and interviews. DigitalNEST also provides career coaching and access to industry-specific mentors.

Finally, members aged 18-24 have the opportunity to participate in the bizzNEST program, in which members are employed in a 12-month paid internship focused on professional development. As DigitalNEST interns work on client projects, they receive mentorship, have access to take on leadership roles, and are supported in 1:1 coaching to continue their professional skills growth. At the conclusion of the internship, members have not only grown their technical skills, but have mastered the necessary professional skills needed to thrive in a modern work environment.

Rancho Cielo also emphasized the importance of addressing and supporting essential workplace skills development. Specifically, their Joven Noble program is a comprehensive, healing-centered, indigenous-based youth leadership development initiative. This program supports and guides youth through a "rites of passage" process while also focusing on preventing issues such as substance abuse, teen pregnancy, relationship violence, gang violence, and school failure. Additionally, Rancho Cielo takes great pride in integrating essential workplace skills training into all of their career training programs. Rancho Cielo structures and models each program as an actual business, which helps students develop essential workplace skills such as timeliness, workplace character, and professionalism.

Education Institutions

The Monterey Bay Region is home to a multitude of educational institutions, including several community colleges as well as four-year universities: Cabrillo College, Gavilan College, Hartnell College, Monterey Peninsula College, California State University Monterey Bay, and University of California Santa Cruz. Several workforce training programs operate within these institutions;

as an example, CIDER is a specialized program at UC Santa Cruz. To uncover greater detail about other existing collaborative and novel workforce and educational training resources, with the aim of gaining insights and exploring how similar strategies could be effectively applied to support the Monterey Bay region, our team conducted an interview with ARKEN Strategies to discuss their F3 (Farms Food Future) Program. This Central Valley program was chosen for interview because of its similar economic drivers, such as agriculture, as well as comparable worker demographics and community college network. The F3 program was developed by a coalition of seven regional community colleges deliberately seeking to prevent farmworker displacement in response to the increasing automation in agriculture.

The F3 Program is an innovative educational initiative catered primarily to adult learners, though it has also attracted interest from high school students. To accommodate different learners, the program is offered in both Spanish and English, and is self-paced which allows students to progress according to their individual schedules. This program is structured into 12 comprehensive units, all of which are hands-on and mastery-based, utilizing a competency-based education model to ensure practical and effective learning. The content of the F3 Program is diverse, covering a wide range of subjects including mechanics, STEM disciplines, problem-solving techniques, and essential workplace skills. This variety ensures that learners are well-equipped with the knowledge and abilities needed for modern industries.

A significant feature of the F3 Program is its robust support system. Each community college that participates in the program provides a Pathway Navigator (PN). These navigators play a crucial role in guiding applicants through the entire process, from enrollment to completion, including offering exit counseling to ensure a smooth transition after the program.

The development of the F3 Program was heavily influenced by direct input from industry professionals. This collaboration highlights the necessity for foundational certificates and places a strong emphasis on training in essential workplace skills: e.g. problem-solving and communication, which are critical for success in the workforce.

ARKEN Strategies aims to secure additional funding to develop a comprehensive, replicable process for the program, ensuring its scalability and adaptability to meet industry demands and support workforce development in other regions. The F3 Program is set to launch in August 2024. The curricular modules are available to any interested educators and the ARKEN team expressed strong enthusiasm for sharing and supporting the use of any relevant material.

Workforce Training Opportunities

Workforce training initiatives, such as apprenticeships and internships, were identified as valuable tools for attracting and nurturing young talent. Continuing to develop training with existing and new community partners and utilizing their professional networks to secure paid training opportunities is a key opportunity in developing employment pathways in the region. Below is a list of identified regional organizations that represent opportunities for collaboration on apprenticeship or internship programs, or other workforce development resources.

- Action Council
- Building Healthy Communities
- California Department of Transportation (CalTrans)
- California Employment Training Panel
- Digital NEST
- Mujeres en Acción
- Rancho Cielo
- Salinas Inclusive Economic Development Initiative (SIEDI)
- Bob Hoover Academy
- Cabrillo College
- California State University Monterey Bay (CSUMB)
- Gavilan College
- Hartnell Community College
- Monterey County Office of Education
- Monterey Peninsula College
- UC Santa Cruz

This training landscape overview illustrates invested interest in advancing skills demand through community-based organizations, educational institutions, and workforce training providers. Organizations such as DigitalNEST and Rancho Cielo are cultivating essential workplace skills among youth through structured programs that blend professional skill-building with technical training. Community colleges and universities are expanding their offerings with innovative programs like the F3 Program, designed in partnership to meet current industry needs through competency-based education and practical experience. Workforce training providers emphasize apprenticeships and internships as key tools for nurturing young talent and establishing sustainable career pathways aligned with regional workforce demands. These synergistic efforts aim to meet skills demand and drive economic growth. By applying significant learnings from this skills demand study and implementing a coordinated, collaborative approach, together we can address challenges and opportunities and make meaningful progress towards a thriving future community.

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