

AGRICULTURAL JOB MARKET REPORT

March 2022 Report



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Executive Summary

PURPOSE

Purdue University's Department of Agricultural Economics started collecting data on agricultural job postings during the summer of 2021. This data is collected monthly and this report represents an overview of the agricultural job market over time. The data extends from June 2021 to February 2022. The Agricultural Job Market Report creates a measurement of the current state of agricultural job openings.

ABOUT THIS REPORT

Google's job search engine pulls job postings from thousands of separate job boards. These job boards can be company specific as well as common job posting sites like LinkedIn and Glassdoor. On Google's job search engine, LinkedIn is the most popular job board for agricultural jobs that are found in the data.

JOB TRENDS

On average there are around 1,415 new agricultural job openings posted each month and the second half of February experienced 996 new job openings on Google. The second half of February reported a 30% decrease in new job openings over early February.

SALARY

The median agricultural job salary is \$52,000, slightly below the median salary for all jobs in the United States. Jobs in sales, academics, and lending and finance are among the highest paid average salaries in agriculture. The Midwest has the highest average salary compared to all U.S. regions.

DESCRIPTION ANALYSIS

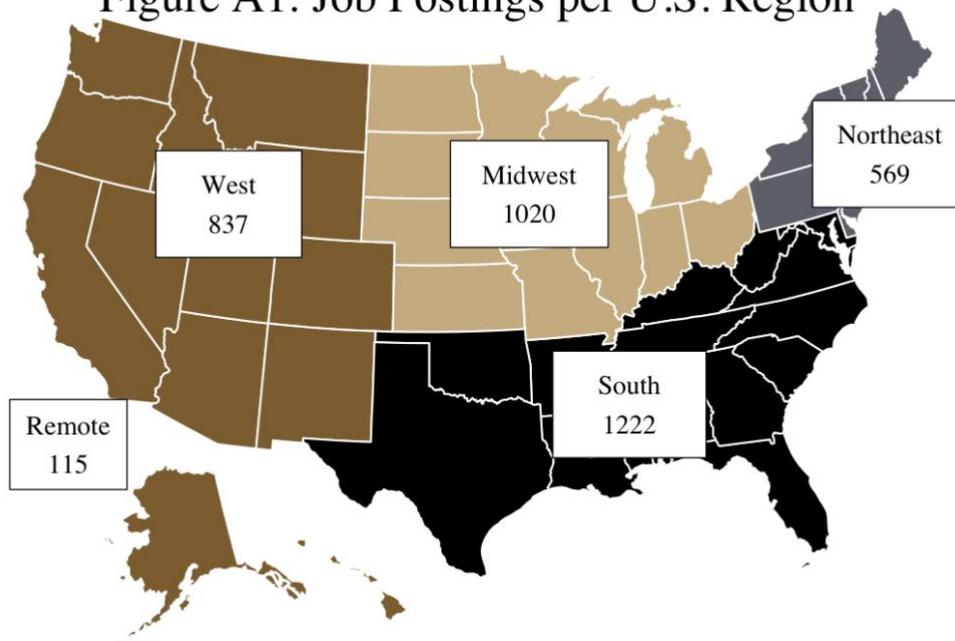
Agricultural jobs require a fair amount of experience. It is calculated that 88% of agricultural job postings mention experience in some form. In terms of job openings, the top 5 agricultural subsectors are business administration, engineering, sales, lending and finance, and agronomy. Overlap of knowledge in subsectors is also evident. Terms related to farming, natural resources, sales, agronomy, and economics appear often in the same job postings.

Job Postings

In the report, “job posting” refers to any separate occurrence of a job advertisement for an individual job. Any representation of a single specific job opportunity of a company will always be phrased as a “job opening”.

Some companies have existing career pages on their website but continue to post to job boards like LinkedIn and ZipRecruiter. Companies post to multiple job boards to cast a wider net for potential hires. Figure A1 illustrates the amount of job openings for each region of the United States. As of February 23rd, 2022, there were 3,763 agricultural job postings. Since January and early February, fully remote job postings experienced an increase.

Figure A1: Job Postings per U.S. Region

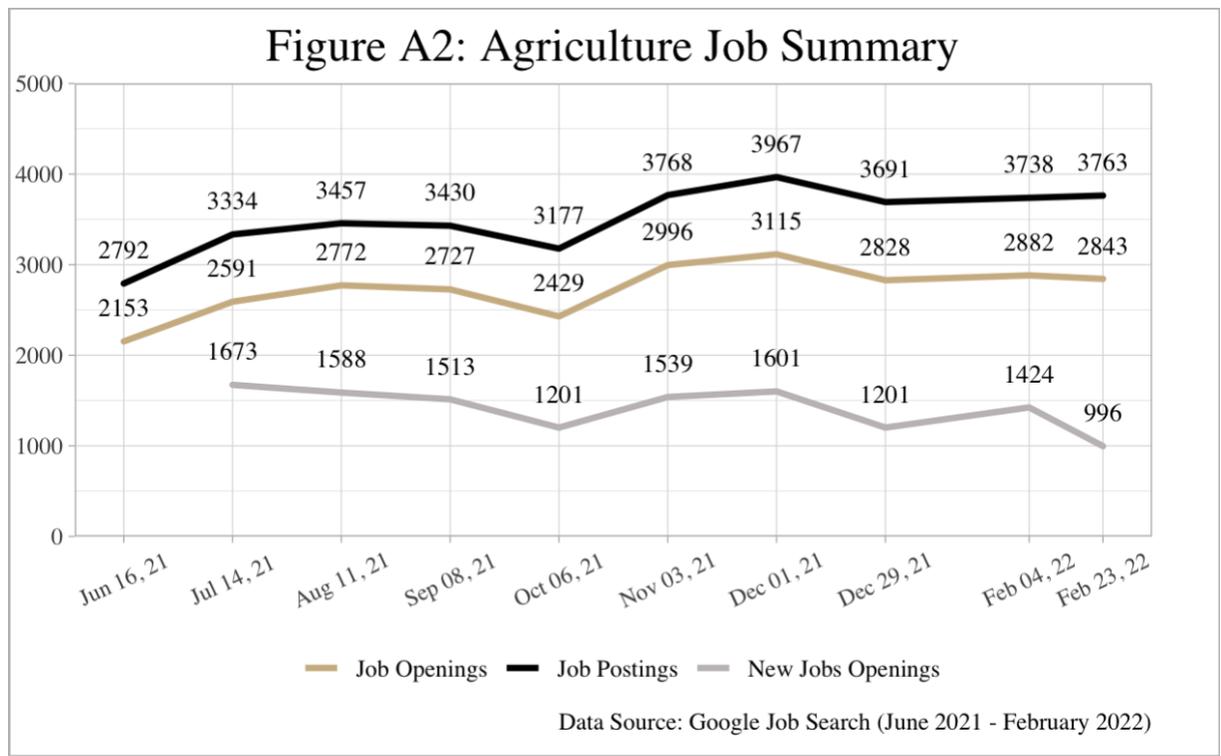


Data Source: Google Job Search (June 2021 - February 2022)

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Job Trends

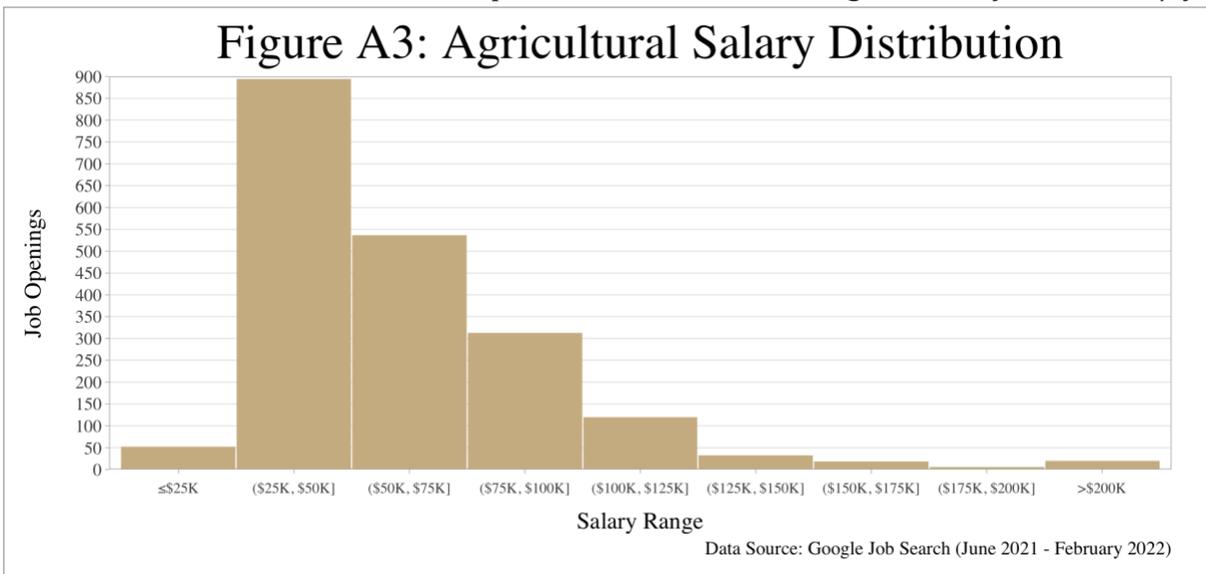
Figure A2 represents job trends for each month since data collection began in June 2021. Notice that new job openings are omitted for June 2021 as this is the first collection period. On average around 1,415 new job openings are posted each month. The total number of agricultural job postings has generally increased over the data collection period, while the amount of new job opening has remained relatively flat. This could signal that employer are having a harder time filling existing jobs that have been posted for an extended amount of time. Late February experienced a decrease in new jobs, but this is cause by a change in the time interval between data collections. The latest report experienced a shorter interval period due to an API issue. On average there are 51 new jobs opening per day and late February had 52 job openings per day. The decrease in new jobs is caused by a shorter time-period for new jobs to be posted.



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Salary

The national median salary computed from the data was \$52,000/year and the average salary was \$57,235/year. Figure A3 illustrates the distribution of salary among agricultural job postings. According to ZipRecruiter, the national average salary for agricultural related jobs is \$56,183/year. The U.S. Bureau of Labor statistics reported a median weekly income of \$1,001 for all industries in the first quarter of 2021 annualizing to a salary of \$52,052/ year.



SALARY BY CATEGORY

The job openings in this data are not equally distributed across all subsectors of agriculture and salary varies among subsectors. Jobs in sales (\$84,586/year), academics (\$71,588/year), and lending and finance (\$69,974/year) have the highest paid average salaries. Jobs in farming rank last with an average salary of \$40,167/year.

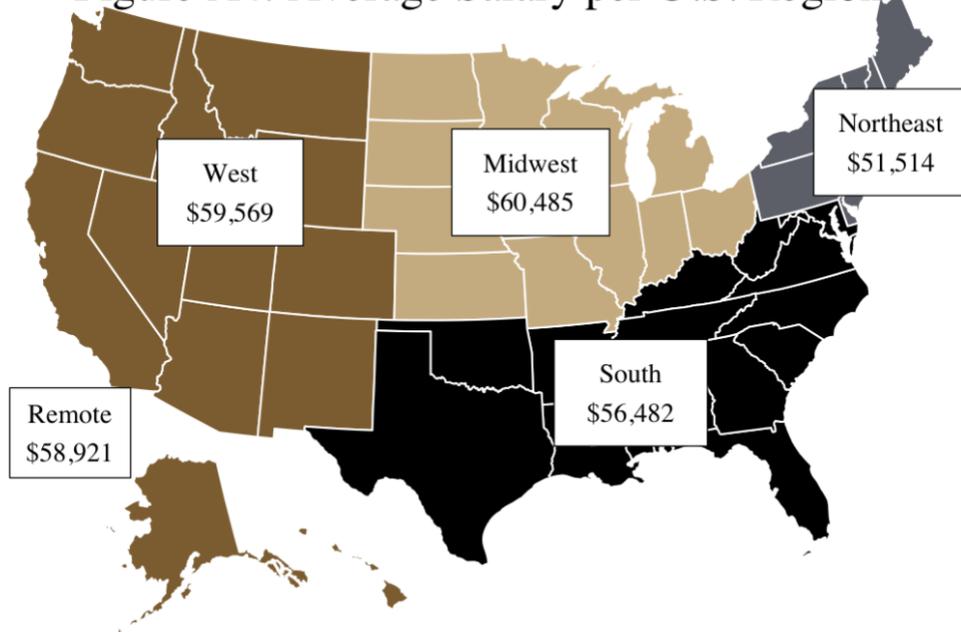
Table 1 Job Category by Title	Average Salary	Median Salary
Academic	\$71,588	\$65,993
Agronomy	\$61,168	\$54,538
Animal Science	\$52,711	\$37,165
Business Administration	\$69,482	\$53,230
Economics	\$64,125	\$58,860
Education	\$55,599	\$51,000
Engineering	\$69,114	\$59,556
Farming	\$40,167	\$36,400
Food Science	\$65,544	\$45,760
Lending and Finance	\$69,974	\$70,000
Natural Resources	\$56,596	\$43,683
Nondescript Titles	\$60,589	\$47,787
Research	\$55,392	\$45,000
Sales	\$84,586	\$65,000
Non-Specialized Work	\$55,362	\$40,324
Google Job Search (June 2021- February 2022)		

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SALARY BY REGION

Average salaries vary by region. Figure A4 illustrates the variation in average salaries across the U.S. The Midwest has the highest average salary listed in job postings at \$60,485/year followed by the West at \$59,569/year. Fully remote jobs have the third highest listed salary at \$58,921/year. The fourth highest average salary by region is the South at \$56,482/year, followed by the Northeast at \$51,514/year.

Figure A4: Average Salary per U.S. Region



Data Source: Google Job Search (June 2021 - February 2022)

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Description Analysis

KEYWORDS

The data can be grouped by mentions within job descriptions. Table 2 reports the percent of job openings that include each word or some variation of it. The top 5 terms are farming, natural resources, sales, agronomy, and economics. Job types that fit this description include seed and equipment sales positions, both of which require knowledge of the top 5 keywords to recommend and market products to farmers and consumers.

Table 2 Keywords	Job Openings that Mention
Academic	9.8%
Economics	29.2%
Ag Education	8.1%
Engineering	16.2%
Sales	54.6%
Agronomy	45.9%
Animal Science	24.3%
Farming	64.4%
Food Science	21.2%
Natural Resources	60.1%
Google Job Search (February 2022)	

REQUIRED SKILLS

Table 3 shows the average percentage of mentions for specific job requirements. Most agricultural jobs require experience, leadership, communication, education, teamwork, and travel, with experience being the most sought after quality. As Table 2 shows, agricultural jobs require knowledge and experience in multiple disciplines. Communication is an important agricultural job characteristic, referenced in the descriptions of 74% of job openings. We can infer that communication is a core competency for completing day-to-day work in agriculture. Overtime, this table could illustrate changes in skills requirements within the agricultural sector. Though data related skills are only required for 31% of current job openings, demand for these skills by employers may grow as agriculture continues to innovate.

Table 3 Requirements	Job Openings that Mention
Communication	74.0%
Critical Thinking	21.7%
Data	31.3%
Education	68.2%
Experience	88.1%
Leadership	78.1%
Microsoft	42.8%
Public Speaking	36.0%
Programming	9.5%
Quantitative	34.6%
Remote Work	11.9%
Teamwork	53.0%
Travel	54.6%
Google Job Search (February 2022)	

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DESIRED EDUCATION

Table 4 reports the percent of jobs postings in agriculture that mention each desired level of education by applicants. To be included, the educational term must be explicitly written in a job description. Generally, a low share of agricultural jobs indicate a required educational attainment. According to Table 4, a bachelor's degree, the most commonly cited degree requirement, is only mentioned in 17% of agricultural job postings.

Table 4 Desired Education	Job Openings that Mention
High School	14.6%
Associates	2.4%
Bachelors	17.4%
Masters	10.0%
PhD	8.3%
Google Job Search (February 2022)	

JOB BENEFITS

The data for key terms related to job benefits are in Table 5. These include the broad terms of benefits, diversity, equal opportunity, tuition reimbursement, and 401(K). Companies may not report all the relevant benefits in an online job description. These numbers should serve as guides to understand what is being displayed in job descriptions, but are unlikely to fully capture the benefit packages offered by agricultural employers. We can see that most agricultural job postings use the general term “benefits” in the description but few reference specific benefits such as 401(K) and tuition reimbursement.

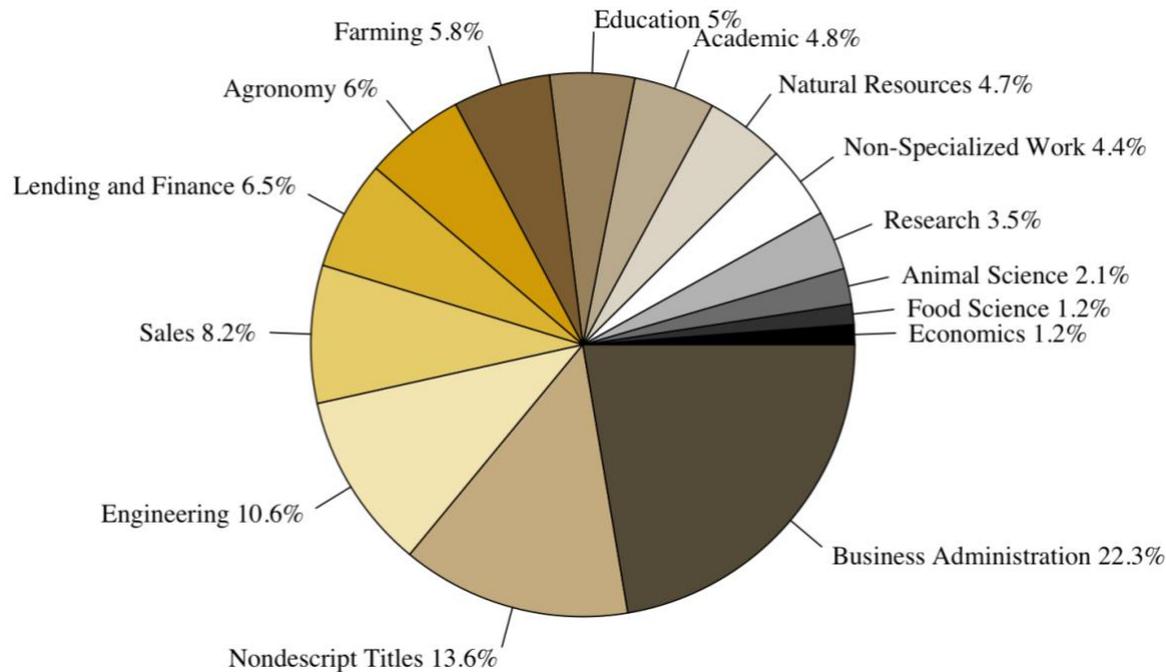
Table 5 Benefits	Job Openings that Mention
Benefits	65.6%
Diversity	31.6%
Equal Opportunity	86.0%
Tuition Reimbursement	5.8%
401(K)	9.5%
Google Job Search (February 2022)	

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JOB CATEGORIES

Jobs can be classified based upon terms written in job posting titles. The pie chart in Figure A5 shows the breakdown of agricultural job categories from June 2021 to February 2022. The most common job types are business administration

Figure A5: Job Categories by Keywords in Title



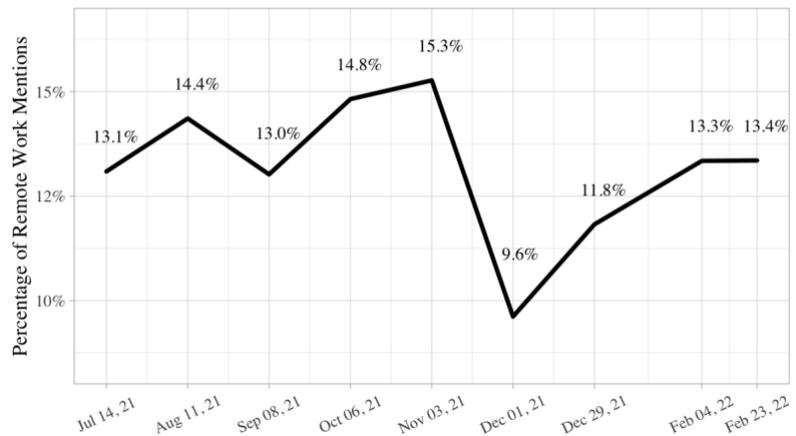
Data Source: Google Job Search (June 2021 - February 2022)

(22%), engineering (11%), and sales (8%). Job titles that could not be classified make up nearly 14% of agricultural job postings.

REMOTE WORK

At the beginning of 2020, the Covid-19 pandemic disrupted in-person and office-based work. To slow the spread, companies that were able to work remotely pushed for the safer alternative of tele-work. It is worth knowing how common remote work is in agriculture and the trend in agricultural remote work over time. Mentions of remote work has stayed steady throughout February 2022.

Figure A6: New Jobs that Mention Remote Work

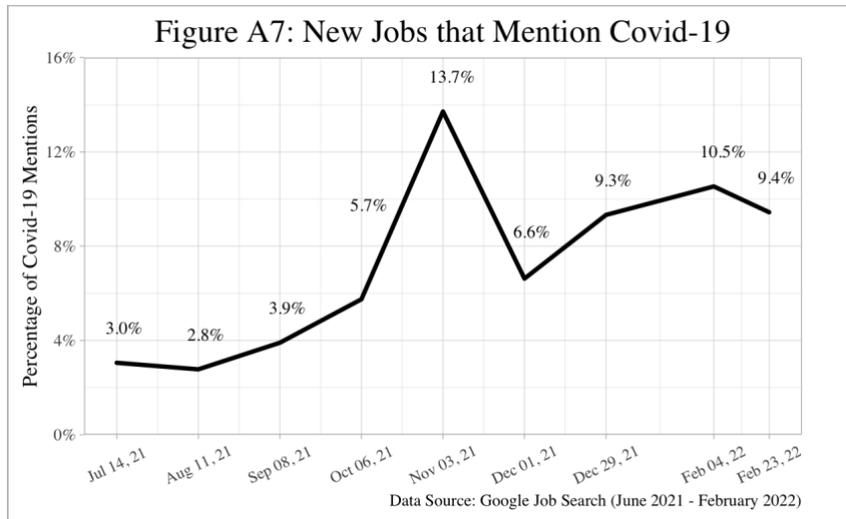


Data Source: Google Job Search (June 2021 - February 2022)

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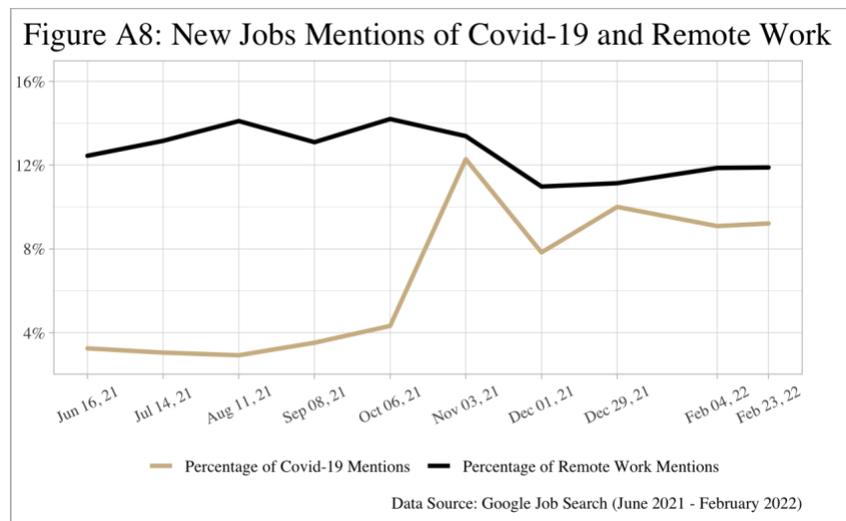
MENTION COVID-19

To further understand the effects of Covid-19 on the agricultural job market, we examined the data for any mentions of the Covid-19 virus. Over time, new job postings are increasingly mentioning Covid-19, with a noticeable spike in mentions during November 2021. However, the change from January to February of 2022 was relatively flat.



COVID-19 AND REMOTE WORK

Figure A8 graphs both mentions of Covid-19 and remote work in new job advertisements overtime. We wanted to investigate any trends in remote work that may be related to mentions of Covid-19. Prior to November 2021, mentions of remote work and Covid-19 did not follow similar trends. Initially, Covid-19 was mentioned in few new job listings, while mentions of remote work was more common. Covid-19 mentions have been increasing within job descriptions, likely the result of employers explaining new company policies related to the pandemic. Additionally, Figure A8 suggests that although Covid-19 is still present, employers are developing strategies to mitigate risk and keep employees in on-site work settings.



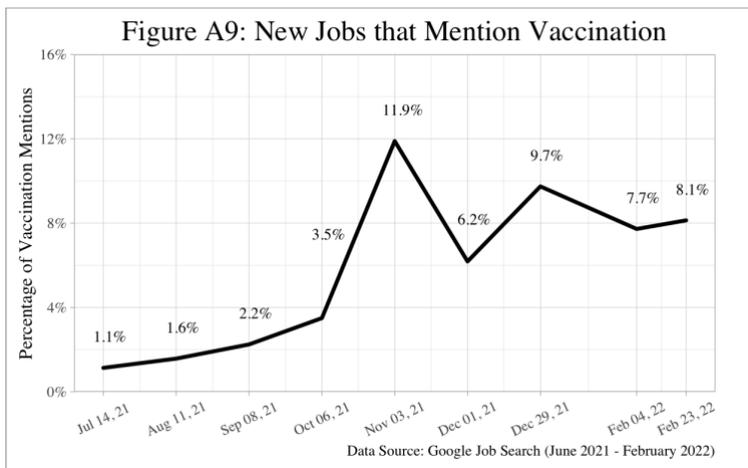
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MENTION VACCINATION

We also track mentions of Covid-19 vaccines within new job openings each month. This data followed an almost identical trend as mentions of Covid-19 in new jobs up until February. Table 6 reports the percentage of vaccine mentions in job postings by each job category throughout the lifetime of the data. The top 3 categories that mention vaccination are Natural Resources (15%), Animal Science (12%), and Economics (12%).

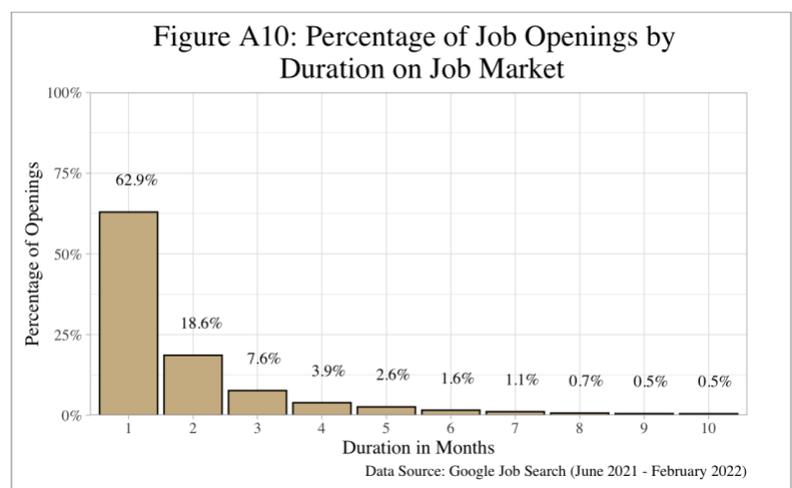
Table 6 Job Category by Title	Job Openings that Mention Vaccines
Academic	5.4%
Agronomy	6.2%
Animal Science	11.6%
Business Administration	8.2%
Economics	11.5%
Education	8.7%
Engineering	1.5%
Farming	3.6%
Food Science	7.0%
Lending and Finance	2.1%
Natural Resources	14.5%
Nondescript Titles	6.2%
Research	5.7%
Sales	2.0%
Non-Specialized Work	2.9%

Google Job Search (June 2021 - February 2022)



DURATION ON JOB MARKET

The amount of time that a job opening is listed can be an indicator of how fast agricultural jobs are filled and how long agricultural employers search for potential candidates. Throughout this study, 62.9% of agricultural jobs are removed from job posting sites within one month while over 18.5% of job opening have been posted for 3 months or longer.

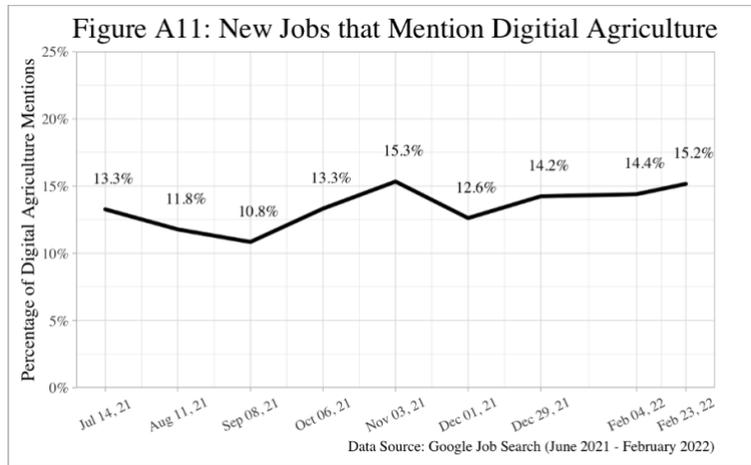


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DIGITAL AGRICULTURE

For this report, we investigate the growing trend of digital agriculture. Digital agriculture jobs are characterized by careers focused on technology and data usage for innovation and discovery within agricultural production. These jobs require skills from drone piloting and software development to data-driven farm management and sales of digital tools.

Figure A11 illustrates the steady rate of new digital agriculture jobs, averaging around 13% of new jobs each month.



REGION AND SALARY

From June 2021 to February 2022, we found that digital agriculture jobs are most common in the Midwest (636) followed by the South (560).¹ Typically, digital agriculture is focused on large-scale commercial operations like those found within the Midwest and South. Constantly emerging technologies and new access to data means jobs in digital agriculture require innovation. We found that digital agriculture jobs on average pay \$63,085/year compared to non-digital agriculture jobs at \$56,539/year.

Figure A12: Digital Agriculture Jobs per U.S. Region

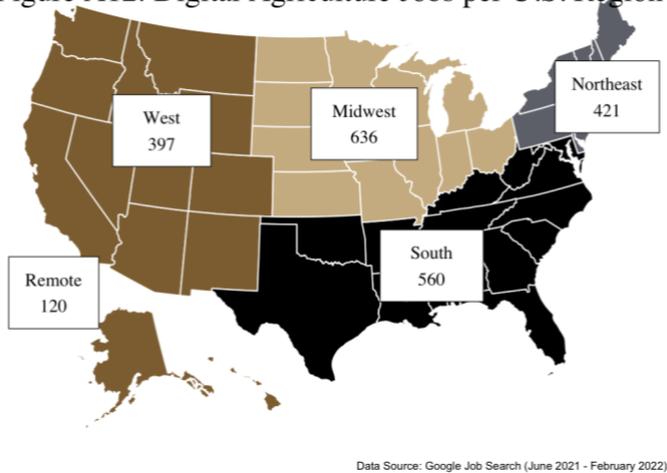
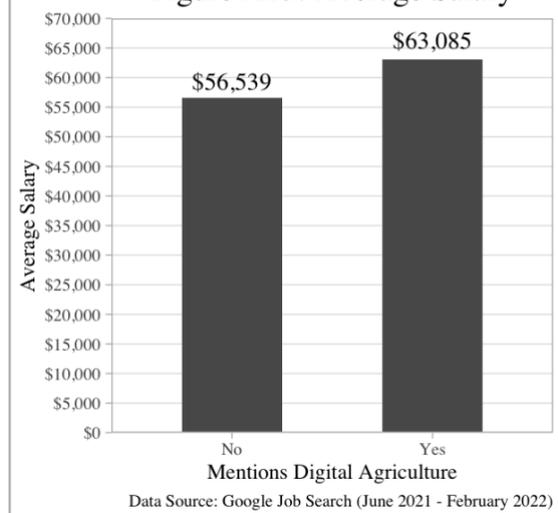


Figure A13: Average Salary



¹ Figure A12 was edited after the report submission due to an issue in interpretation.

Appendix

DATA COLLECTION

For this research, data was collected through Google's job search engine utilizing an Application Programming Interface (API) provided by SerpApi. The data collected for the report includes job title, company name, description, salary (if posted), posting date, and original job board site name.

Not all online job postings appear on Google's job search engine and as a result the data discussed in the report should be treated as a sample of job openings existing within the agriculture industry. Indeed.com, the number 1 job site in the world, does not share job posting data with Google. Google's job search engine represents only a fraction of jobs posted online. Job postings can be posted on multiple job boards such as LinkedIn, Glassdoor, as well as company websites that allow Google's Cloud Talent Solution to analyze their job postings and display them on Google's job search engine.

Job postings that are available on Google's job search engine are curated to best fit the search terms of the user. The data in this report was collected using a general search term of "agriculture". Data presented in this report could impose bias that is specific to Google's job search engine data. Although possible, we believe the data collected is valuable for industry employers as a metric for comparing company hiring to the agricultural industry. Therefore, this report is an analysis of Google's data and is not fully representative of the agricultural job market.

Note that not all online job postings appear on Google's job search engine. Job postings can be posted on multiple job boards such as LinkedIn, Glassdoor, as well as company websites that allow Google's Cloud Talent Solution to analyze their job postings and display them on Google's job search engine. Job postings that are available to Google's Cloud Talent Solution are curated to best fit the search terms of the user. For this study, the search term included: "agriculture." This allows for a broad variety of jobs to be collected that exist within the agricultural job market. The data discussed in this report represents all job postings in the United States collected from Google's job search engine from June 2021 to February 2022. Google's job search engine is a conglomerate of multiple online job boards. Within the data, no jobs were collected from Indeed.com. Indeed.com does not allow Google access to their job board unlike other

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popular job sites. Google must be granted access to a company's job posting before advertising on Google's job search engine. Many job openings appear on multiple job boards at a given time to get more advertising to potential employees.

Google's job search engine hosts thousands of job boards' data. Due to the immense amount of job boards available, job advertising is a competitive market. Companies seeking premium talent should post to the more popular job boards which produce more traffic.

DESCRIPTION ANALYSIS

From the data, each job posting has a description. Text mining was used to pull information from these descriptions, and it is possible to quantify the amount of mentions of specific characteristics. We were able to extract salary if not already mentioned, subsector information, requirements, and education. The categories were found using the "bag of words" technique. A list of words was created to represent any similar phrases and synonyms that represent a characteristic of interest. For example, quantitative skills would be marked as appearing in a job posting if terms appear in the description such as "quantitative", "analysis", "prediction", "mathematics", and "statistics." These terms are represented as nouns, verbs, and adjectives to catch all forms of context that might be represented in written language. Descriptions are then searched to evaluate if any of these terms were mentioned. If a term was mentioned once or more, the description was tallied as mentioning those specific characteristics.

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Keywords (Related to Table 2)	Word List
Academic	Company name must contain "college", "university" and Description must contain "professor", "dean", "university", "academic"
Economics	"ag economics", "agriculture economics", "economic", "ag business", "agricultural business", "agri-business", "econometric", "market", "market research", "market analysis", "loan", "credit", "lending"
Ag Education	"ag education", "agricultural education", "ag ed", "extension educator", "ffa", "future farmers of america", "4-h", "ag teacher", "agricultural teacher"
Engineering	"ag engineering", "agricultural engineering", "ag systems management", "agricultural systems management", "asm", "mechanic", "diesel mechanic"
Sales	"ag sales", "agricultural sales", "sales", "sell", "customer", "account", "seller", "buyer", "selling", "buying", "commission"
Agronomy	"agronomy", "agronomist", "corn", "soybeans", "soil", "seed", "crop", "crop adviser", "row crop"
Animal Science	"animal science", "animal", "veterinarian", "sheep", "cattle", "dairy", "swine", "pig", "pork", "beef", "livestock", "breed", "poultry", "equestrian", "horse"
Farming	"farming", "farmhand", "planting", "plant", "harvest", "harvester", "farm", "forage", "combine", "farmer"
Food Science	"food science", "food production", "meat packing", "butcher", "food distribution", "food handling", "food processes", "food product", "meat", "produce"
Natural Resources	"natural resources", "conservation", "wildlife", "environment", "environmental", "ecosystem", "forest", "raw materials", "nature", "energy", "pollution", "renewable"

Requirements (Related to Table 3)	Word List
Communication	"communication", "communicate", "talk", "call", "email", "explain", "present", "speak"
Critical Thinking	"critical thinking", "problem solving", "analysis", "deliberate", "brainstorm", "reasoning"
Data	"data", "data analysis", "big data", "data analyst", "data wrangling", "data collection"
Education	"degree", "degrees", "college", "graduate", "undergrad", "doctorate", "phd", "bachelor", "bachelors", "education", "gpa"

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Experience	"work experience", "experience", "training", "prior job", "familiarity", "practice", "knowledge", "background", "exposure to", "understanding of"
Leadership	"leadership", "lead", "leading", "leader", "manager", "management", "mentor", "supervision", "supervisor", "supervise"
Microsoft	"excel", "spreadsheet", "microsoft", "word", "powerpoint", "outlook"
Public Speaking	"public speaking", "speaking", "speech", "speeches", "speak", "present", "presentation"
Programming	"coding", "code", "python", "r", "sql", "java", "c", "computing", "algorithm"
Quantitative	"quantitative", "analysis", "analyze", "analyst", "insight", "predict", "prediction", "predictive", "math", "mathematics", "statistics", "statistical", "optimization", "optimize", "regression"
Remote Work	"remote", "remote working", "home office", "work from home", "work at home"
Teamwork	"collaboration", "team", "teams", "teamwork"
Travel	"travel", "drive", "driving", "fly", "flying"

Desired Education (Related to Table 4)	Word List
High School	"high school"
Associates	"associate's", "associate degree", "associates's degree"
Bachelors	"bachelors", "bachelor's degree", "bachelor degree"
Masters	"masters", "master's degree", "master degree", "grad school", "gradschool", "graduate degree", "advanced degree"
PhD	"phd", "p.h.d", "ph.d", "doctorate", "doctoral degree"

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Other Requirements (Related to Table 5)	Word List
Benefits	"medical", "dental", "vision", "ad&d", "ad and d", "accidental death and dismemberment", "std", "short term disability", "short-term disability", "ltd", "long term disability", "long-term disability", "vacation", "holiday", "disability", "health insurance", "health savings account", "life insurance", "paid time off", "pto", "referral program", "retirement planning", "retirement"
Diversity	"diverse", "diversity"
Equal Opportunity	"equal opportunity", "without regard", "religion", "sex", "color", "age", "race"
Tuition Reimbursement	"tuition"
401(K)	"401k", "401 k", "401(k)"

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Category (Related to Figure A5 and Table 1)	Word List
Academic	"professor", "dean", "academic", "college", "adjunct", "tenure", "chair", "post doc", "postdoc", "faculty"
Agronomy	"agronomy", "agronomist", "corn", "soybeans", "soil", "seed", "crop", "grain", "cultivation", "greenhouse", "irrigation", "appraiser", "horticulture", "fertilizer", "pesticide", "fungicide", "herbicide", "applicator", "sprayer", "botanist"
Animal Science	"animal science", "animal", "veterinarian", "veterinary", "sheep", "cattle", "dairy", "swine", "pig", "pork", "beef", "livestock", "breed", "poultry", "equestrian", "horse", "bovine", "ranch", "farrowing", "feedlot", "grazing", "dairies", "milking", "egg gatherer", "herdsman", "herdsperson"
Business Administration	"business", "market", "administration", "manager", "management", "admin", "program tech", "supervis", "retail", "coordinator", "operation", "purchas", "bookkeeper", "human resource", "customer service", "receptionist", "executive assistant", "product specialist", "recruit", "executive director", "inventory specialist", "it specialist", "legal", "attorney", "law", "corporate", "commercial", "secretary", "consultant", "trader"
Economics	"economic", "economist", "econometric", "statistician", "risk", "economy", "commodity", "price", "pricing", "policy specialist", "policy analyst", "policy"
Education	"ag education", "agriculture education", "agricultural education", "educator", "teach", "teacher", "class", "classroom", "ffa", "4-h", "4h", "ag teacher", "teaching", "extension educator", "future farmers of america", "ext agent", "extension"
Engineering	"engineering", "engineer", "mechanic", "diesel", "equipment", "service tech", "service manager", "maintenance tech", "production tech", "electrical tech", "precision tech", "repair", "construction", "mechan", "weld", "precision", "digital ag", "technology"
Farming	"farming", "farmhand", "planting", "plant", "harvest", "harvester", "farm", "forage", "combine", "farmer"

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Food Science	"food science", "food production", "meat packing", "butcher", "food distribution", "food handling", "food processes", "food product", "meat", "produce", "food", "nutrition", "sugar"
Lending and Finance	"loan", "credit", "lender", "lending", "bank", "finance", "accountant", "accounting", "tax", "budget", "financial", "investment", "insurance", "account", "underwriter", "audit", "collateral"
Natural Resources	"natural resources", "conservation", "wildlife", "environment", "environmental", "ecosystem", "forest", "tree", "raw materials", "nature", "energy", "pollution", "renewable", "fire", "climate", "natural", "sustainable", "resources", "surveyor", "fish", "microbiologist", "geologist", "biologist", "biological"
Nondescript Titles	All jobs that do not match any of the other categories. Top 2 titles shown include: "Agriculture Technician" and "Agricultural Program Specialist"
Research	"research", "laboratory", "science", "scientist", "chemistry", "chemist", "lab", "chemical"
Sales	"sale", "seller", "buyer", "selling", "buying"
Non-Specialized Work	"operator", "manufactur", "packag", "production", "transport", "driving", "driver", "cdl", "labor", "seasonal", "worker", "forklift", "process", "inspector", "investigator", "pest control", "security", "yard person", "quality assurance", "clean", "mow", "lawn", "assembler", "helper", "warehouse", "landscape", "landscaping", "yard"

States in Each Region from Figure A1 and A4

Midwest	IN, IL, MI, OH, WI, IA, KS, MN, MO, NE, ND, SD
Northeast	CT, ME, MA, NH, RI, VT, NJ, NY, PA
South	DE, FL, GA, MD, NC, SC, VA, WV, AL, KY, MS, TN, AR, LA, OK, TX
West	AZ, CO, ID, NM, MT, UT, NV, WY, AK, CA, HI, OR, WA

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Digital Agriculture Search Terms

Digital Agriculture	"agritech", "algorithm", "analytics", "arcgis", "artificial intelligence", "big data", "bioinformatic", "computational", "computing", "data management", "data science", "digital agriculture", "farm data software", "farm management software", "geographic information system", "geospatial", "global navigation satellite system", "gnss", "informatic", "java", "machine learning", "precision ag", "precision agriculture", "prediction", "python", "simulation", "statistician", "sql"
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