Sustainable Agriculture Skill Panel Forums

AGRICULTURE LABOR MARKET AND CAREER INFORMATION
State and O‘ahu

Prepared by:
DLIR Research & Statistics Office

informative innovative intelligent insightful

I. U. S. Census Bureau

A. Agricultural and Total Civilian Employment in Hawai‘i
American Fact Finder Survey

B. Quarterly Workforce Indicators for the Agriculture Industry
Local Employment Dynamics

II. DLIR Research & Statistics Office

A. Long-Term Projections 2008 - 2018

www.hiwi.org

B. Characteristics of the Insured Unemployed
Total Unemployment Rate

www.hawaii.gov/labor/rs

C. Career Kōkua Agriculture, Food, and Natural Resources Occupations
(preparation information, wages, and outlook)
Career Kōkua Local Agriculture Programs of Study and Training
(program intent, coursework, degree and certificate programs by island)

www.careerkokua.org

www.hawaiicrcs.org

III. Other Resources:

- Hawai‘i Agricultural Labor, U.S. Department of Agriculture, August 2011
- Towards a New Professionalism, AgriSkills Forum, UK, February 2011
- College of Tropical Agriculture and Human Resources (CTAHR), University of Hawai‘i

BRIEFING VERSION

(Please Refer to Tables and Charts for Technical Details Starting Page 1)

I. Counting Hawaii's Agricultural Workers and Wages

A. *Accounting Methods*

The number of agriculture sector workers has been counted in several ways for different purposes. In State of Hawaii Department of Agriculture accounting, workers in Hawaii's Agriculture Sector include self-employed farm operators, unpaid workers, and hired workers. In the U.S. Department of Labor Bureau of Labor Statistics accounting, workers in Hawaii's Farming, Fishing & Forestry occupational group includes self-employed, unpaid family and hired workers but covers only the Agriculture, Forestry, Fishing and Hunting sector (NAICS Code 11) and made up of establishments primarily engaged in growing crops, raising animals, harvesting forest products, and harvesting fish and other animals from a farm, ranch, ocean and other natural habitats. The U.S. Bureau of Census LED Quarterly Workforce Indicators includes hired workers only, but excludes state and federal workers. The U.S. Bureau of Census Fact Finding Survey aka American Community Survey accounts for both self-employed and hired workers. In special studies by the University of Hawaii College of Tropical Agriculture and Human Resources, agricultural-related or agriculture-relevant workers extend to dozens of industry sectors that the agriculture sector has backward and forward linkages to. This count is estimated based on Hawaii Input-Output (I-0) model.

B. *Statewide Data*

Hawaii's total farm workforce was estimated at 12,200 during the survey week of July 10-15, 2011 of which 4,100 were self-employed operators and 1,100 were unpaid labor workers. The total number of workers was up by 10% from the year before, self-employed operators up by 3% and unpaid workers by 22%. The average paid worker wage for farms that hired 1 to 9 workers was $ 14.91 per hour and up by 18% last year. (**Hawaii Agricultural Labor, State Department of Agriculture, August 24, 2011**)

The total State civilian labor force in Hawaii in 2010 was estimated at 629,050 of which 587,400 were employed and 41,600 were unemployed. This is up from a count of 609,000 in 2000. In 2010, 11,200 or 1.9% of the total labor force were estimated to be in Agriculture industry jobs which represents a decline of 700 workers from 11,900 in 2000. (**U.S. Census Data, Extracted by DLIR R&S Office, October 2011**)

Another US Census dataset estimates Hawaii's total agriculture industry workforce in 2010 at 6,278. This is down from 7,394 and 8,255 in 2005 and 2000, respectively. This number

represents only 1.3% of total employment for all industries. The 2010 net job flow was 32 with 385 jobs created, 729 new hires, 859 separations, and 7.7% turnover rate. The average monthly earnings was estimated at $2,833 and average new hire monthly earnings at $1,989. The job creation is slightly higher at 6.1% for the industry compared to over 4.5% for all industries. The average earnings in the agriculture industry are 83% of average monthly earnings for all industries. The average new hire earnings are 89% of average new hires earning for all industries. **(U.S Census LED QWI Online, Extracted by DLIR R&S Office, December 12, 2011**).

Online research leads only to a 1992 study of agricultural-related or agriculture-relevant workers via the I-O model estimation and therefore not provided here. However, a study on the economic impact of increasing Hawaii's Food Self-Sufficiency estimates employment multipliers between 24.2 to 31.20 for selected food and agricultural industries. For example, a million-dollar increase in final farm-gate sales of locally grown fresh vegetable will generate 26.3 jobs. (**UH CTAHR**, **Economic Impacts of Increasing Hawaii's Food Self-Sufficiency December 2008**).

Based on recent trends, the 2008 baseline estimate of 5,080 farming, fishing, and forestry occupations is projected to increase only 0.02% by 2018. The number made up of supervisors, farming, fishing, and forestry workers will increase from 360 to 400 or 11.1%. The count for agricultural workers will decline from 4,330 to 4,290 or negative growth at -0.9%. This is a contrast to projections for occupations in all industries at 685,920 to 733,180 or 6.9% growth. The mean annual wage for agriculture industry occupations as of May 2010 was $33,180 which is 75.8% of the $43,740 mean annual wage for all occupations. (**Hawaii DLIR R&S Office Long-term Occupational Projections 2008-2018, August 2011**).

C. Honolulu City and County Data

Standard data that are available for State level are not readily available at the county level. Often, funding cuts in standard data gathering activities are reasons cited by the State agencies for this.

Oahu's total agriculture industry workforce in 2010 was estimated at 1,668 which is down from 2,372 and 2,656 in 2005 and 2000, respectively. This number represents only 0.05% of employment in all industries. The 2010 net job flow was 26 with 104 jobs created, 235 new hires, 244 separations, and 7.0% turnover rate. The average monthly earnings were estimated at $2,329 and average new hire monthly earnings at $1,862. The job creation to current employment level is 6.2% which is slightly higher than the 6.1% state agricultural industry level and 4.3% Oahu all industries level. The average earnings in the agriculture industry are 82.2% of State average earnings in for the agriculture industry. These average earnings are 66% of

$3,521 average wage for all industries in Oahu. (**U.S. Census LED QWI Online as extracted by DLIR R&S Office, December 12, 2011**).

In terms of long-term projections, the Honolulu Metropolitan Statistical Area (MSA) is projected to have 9.7% more jobs in farming, fishing, and forestry occupations in 2018 than 2008. This rate if increase is higher than the 5.9% increase for total Honolulu occupations. Supervisory, farming, fishing and forestry workers will increase by 25% from 80 to 100 and agricultural workers by 11% from 1,180 to 1,310. **(Hawaii DLIR R&S Office Long-term Occupational Projections 2008-2018, September 2011**).

II. Selected Characteristics and Profiles of Employed and Unemployed Agriculture Industry Workers

A. Statewide Data

Filipinos and part-Filipinos make up the largest number of workers in the agriculture industry. The 2010 data shows that 32% are Filipino or part-Filipino. The other large groups are Japanese, Polynesian, and Native Hawaiians at 18.4%, 17.8%, and 16.6%, respectively. This proportion is more than the 29.8% Filipinos for all industries and lower for the rest at 25.9% for Japanese, 22.8% for Polynesians 20.1% for Hawaiians. Of the insured unemployed in the agriculture industry, 299 or 57.7% of the unemployed in August 2010 were Filipino and 158 or 54.1% in August 2011. (**U.S. Census Data, DLIR R&S Office Characteristics of the Insured Unemployed August 2005-2011)**

Ilocano, a Philippine language, is the most prevalent language among Hawaii agricultural workers, including contract workers and workers obtained by contract, who handle pesticides or work in the field where pesticides are applied. A total of 2,560 or 40% of estimated 6,410 workers speak Ilocano and 2,280 or 36% speak English. Of those who speak Ilocano as a first language, 80% understand written instructions in Ilocano, 59% in English, and 89% comprehend English verbal instructions. **(USDA Language Study of Hawaii Agricultural Workers, July 14, 2006).**

In terms of gender, 38.8% of 2010 workers were female which is higher than the 33.1% level of 2000 and slightly more than the 37.1% of 2005. In terms of age, 40.4% are between 35 to 54 years old, 34.2% are from 55 to over 65 years old, 20.6% are 22 to 34 years old and 4.8% are between the ages of 14-18. In terms of education, 25% of workers ages 25 and over have less than a high school education, 26.2% have a high school diploma or equivalent, 26.2% have some college or associate degrees, and 22.6% have a bachelor's degree or more. **(U.S Census LED QWI Online, Extracted by DLIR R&S Office, December 12, 2011**).

B. Honolulu City and County Data

In terms of gender, age distribution, and education levels, the profiles of workers in Oahu are not radically different from the overall State profile.

III. Exploring Careers and Programs

At least 29 broad occupations in Hawaii fall under the O*NET's list of Agriculture, Food and Natural Resource Occupations. The median annual wages for the occupations range from $21,970 (farm and ranch workers including acquacultural) to over $ 60,000 (e.g., farmers and farm managers, food scientists). Of these occupations, at least nine occupations require one to 12 months on-the-job training, another eight require longer than 12 months of on-the-job training (OJT) or some post-secondary vocational training or associate degree, eight more require a bachelor's degree, three require work experience in a related occupation, and one requires work experience in addition to a bachelor's degree or more. In terms of outlook, some of these occupations have been identified to grow more than 10% (e.g., water treatment plant operators), others will be stable, and a few will decline (e.g., farm ranch workers). The State outlook of some of these occupations have not been projected due to lack of data. **(DLIR R&S Office Career Kokua Occupational Profiles, 2011**).

There are different education and training programs that support workforce preparation for agriculture industry occupations. The Career Kokua list of programs identifies recognized and accredited programs while the Department of Agriculture and UH CTAHR websites offer a glimpse of other existing programs including pilot ones. There continues to be a need for a standardized list of all workforce preparation programs for the agricultural industry workforce development. (www.careerkokua.org, www.hawaii.gov/doa, www.ctahr.hawaii.edu).

Additional research or data-mining will be required to extract data that is specific to Honolulu.

IV. Peeking into Progressive Agriculture - Quotes

"*As pressures are placed on agriculture to produce sufficient high quality food in ways that are sensitive to the environment, there is critical need to attract and retain the people most capable of delivering, not only against the food agenda but against the sustainability agenda. The agriculture has an aging workforce, with a high proportion of older key decision makers. Many do not have successors in place*."

-Towards a New Professionalism for Food Security and a Sustained Environment: The Skills Strategy for Agriculture and Horticulture, UK AgriSkills Forum, February 2010-

"Agriculture is not for the faint of heart….To be successful, farmers must possess knowledge, information, and skills combined with practical expertise in a wide range of day-to-day tasks required to produce food or fiber products. The requirements vary greatly with each farm enterprise; a farmer needs to know about selecting, planting, and harvesting multiple crops; animal husbandry; controlling pest and diseases; managing soil and water resources; and operating, maintaining, and repairing farm equipment and facilities. Many of these skills are acquired only through experience. Generally, people with farming background (raised on a farm with a farm family) already have many of these skills. Those from a non-farm background can "catch up" through research, reading, taking courses, and farm employment or apprenticeship.

In addition to the practical production skills needed, the successful farmer today must possess (or have access to) strong farm management skills. Farm business, financial, and marketing abilities cannot be overemphasized as requirements in today's agribusiness climate."

-Toward Sustainable Agriculture: A Guide for Hawaii's Farmers, UH Manoa CTAHR, 2006-

Skills For Entry, Mid-Level and Leadership Sustainability Positions based on a survey of 208 interns and young professionals, interview of nine host organizations, and several focus groups.

Skills

1. *Staff and team management*
2. *Long-Term Planning*
3. *Project Management*
4. *Financial Skills*
5. *Donor or client relations*
6. *Communication Skills*
7. *Translating Complex ideas*
8. *Analytical rigor*
9. *Knowledge management*
10. *Influencing strategy*
11. *Awareness of stakeholders roles*
12. *Geo-political awareness*
13. *Facilitation skills*
14. *Network management*
15. *Systems approach*
16. *Understanding the private sector*
17. *Managing unpredictability*
18. *Bridging disciplines or sectors*
19. *Bridging cultures*
20. *Managing diversity in the workforce and socially*

Beliefs

1. *Global mindset*
2. *Rooted in community*
3. *Thirst for global awareness*
4. *Equity*
5. *Sense of urgency*
6. *Passion for sustainability*
7. *Capacity for innovation*
8. *Embrace a learning culture*
9. *Accept trade-offs*
10. *Tenacity*
11. *Warmth in human relationships*
12. *Respect for diversity*
13. *Science as part of the solution*
14. *Value integrated thinking*
15. *Commitment to sustainable living*

-International Society for Sustainable Professionals, 2007-

New Business/Industry Development Indicators

The State of Hawaii is ranked third overall in the *first release* of a progressive agriculture ranking. Vermont and Maine are ranked #1 and , respectively . The overall ranking is based on six area indicators that are available from 2007 USDA data. The six areas and Hawaii's rank in them are:

Conservation Rank	Percent of farms reporting conservation practices *Measures commitment to environmental stewardship*	HI rank #36
Farm Energy Rank	Percent of Farms Generating Energy *Measures commitment to environmental stewardship*	HI rank #1
Value Added Rank	Percent of Farms with Value-Adding Activity *Entrepreneurial Aptitude*	HI rank #9
CSA Rank	No. of farms participating in CSA (community-supported ag) *Social capital (trust)*	HI rank #7
Female PO Rank	Percent of Farms with Females as Principal Operators *Social equity (equal opportunity)*	HI rank#1
Organic Rank	Percent of Farms with Organic Acreage (including farms Making conversion *Commitment to environmental stewardship and Entrepreneurial Aptitude*	HI rank#2

- agdevonline.com-

Agricultural and Total Civilian Employment in Hawai‘i
American Fact Finder Survey
U. S. Census Bureau

AGRICULTURAL EMPLOYMENT IN HAWAII

Agricultural employment fell by about 37 percent from 2000 to 2005 and then increased by 35 percent in 2010.
In 2010, 1.6 percent of the workforce was employed in agriculture, up slightly from 1.3 percent in 2005 but lower than the 2.3 percent in 2000.
Workers of Filipino descent constitute the largest ethnic group employed in the agricultural industry throughout the 10-year period, followed by Native Hawaiians.

2000 Employment

Subject	Hawaii											
	Total		Chinese alone or in any combination		Filipino alone or in any combination		Japanese alone or in any combination		Polynesian alone or in any combination		Native Hawaiian alone or in any combination	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
INDUSTRY												
Civilian employed population 16 years and over	537,909		72,329		118,397		136,647		102,381		93,593	
Agriculture, forestry, fishing and hunting, and mining	12,119		869		3,920		2,234		2,162		2,015	
Percent of workers employed in agriculture	2.3%		1.2%		3.3%		1.6%		2.1%		2.2%	

2005 Employment

Subject	Hawaii											
	Total		Chinese alone or in any combination		Filipino alone or in any combination		Japanese alone or in any combination		Polynesian alone or in any combination		Native Hawaiian alone or in any combination	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
INDUSTRY												
Civilian employed population 16 years and over	582,731	+/-6,807	77,887	+/-5,221	133,437	+/-6,639	139,059	+/-5,928	110,659	+/-5,465	101,727	+/-5,401
Agriculture, forestry, fishing and hunting, and mining	7,576		389		2,669		1,112		1,439		1,424	
Percent of workers employed in agriculture	1.3%	+/-0.2	0.5%	+/-0.4	2.0%	+/-0.8	0.8%	+/-0.3	1.3%	+/-0.6	1.4%	+/-0.7

2010 Employment

Subject	Hawaii											
	Total		Chinese alone or in any combination		Filipino alone or in any combination		Japanese alone or in any combination		Polynesian alone or in any combination		Native Hawaiian alone or in any combination	
	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error	Estimate	Margin of Error
INDUSTRY												
Civilian employed population 16 years and over	638,191	+/-8,660	86,039	+/-6,041	160,402	+/-8,852	139,402	+/-6,529	122,462	+/-5,598	108,093	+/-5,600
Agriculture, forestry, fishing and hunting, and mining	10,211		688		3,689		1,255		1,959		1,946	
Percent of workers employed in agriculture	1.6%	+/-0.3	0.8%	+/-0.4	2.3%	+/-0.6	0.9%	+/-0.6	1.6%	+/-0.6	1.8%	+/-0.7

Source: U.S. Census Bureau, American Fact Finder Survey

Note: Data up until 2006 contained only household population data. From 2006 onward, the data included both household and group quarters data. Group quarters are living quarters such as nursing homes, college dormitories and prisons.

Quarterly Workforce Indicators for the Agriculture Industry
Local Employment Dynamics
U. S. Census Bureau

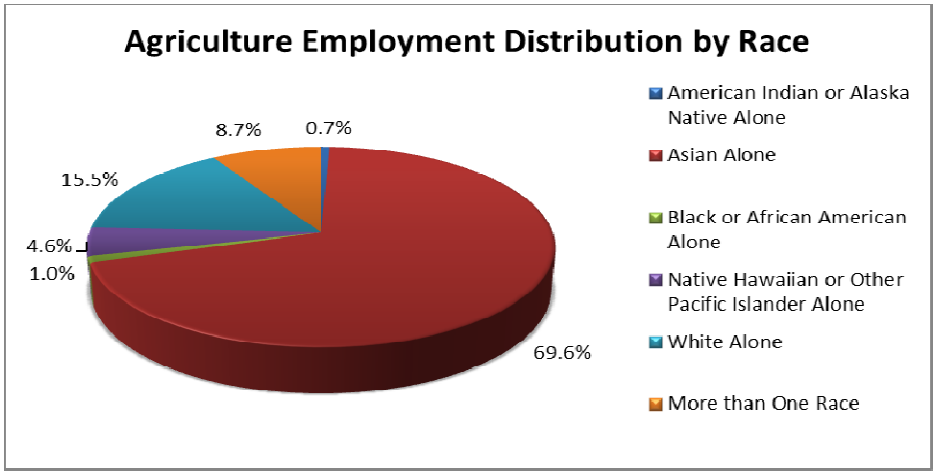
Quarterly Workforce Indicators* for Agriculture Industry

Honolulu County (Oahu), 2010 Annual Average

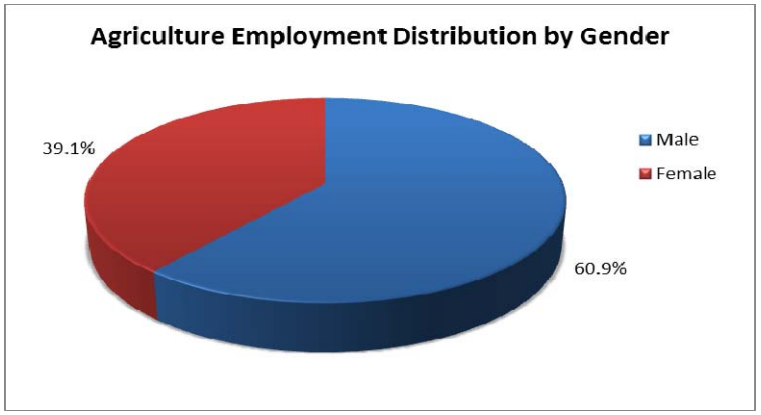
Agriculture Workforce in 2010:	Oahu . . .	0.5% of total	**Change from 2000:**	Oahu . . .	down 37.2%
	State . . .	1.3% of total		State . . .	down 23.9%

Highlights of the Oahu agricultural workforce in 2010

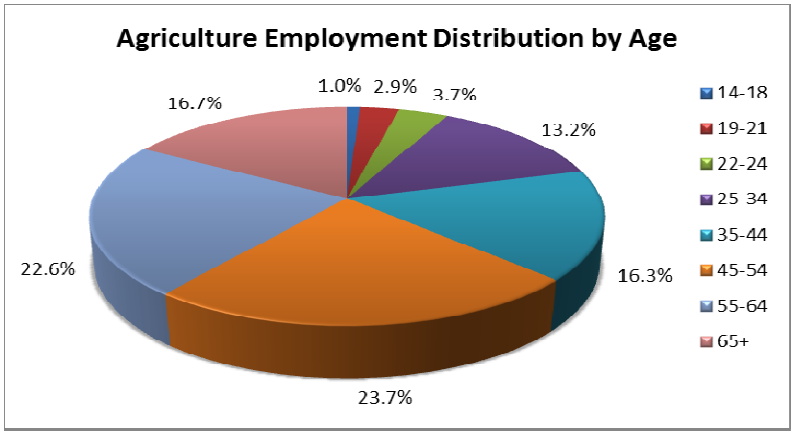
Agriculture employees are dominated by Asians, with nearly 70%.



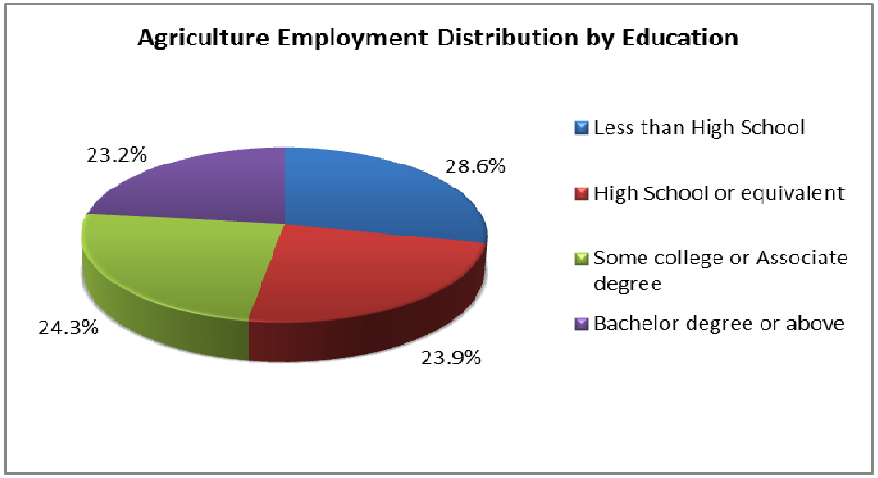
Males account for nearly 61% of Agriculure workforce.



Agriculture workers tend to be older with 63% aged 45+.



Agricultural employment crosses through all levels of education.



**Data does not include state and federal government employment.*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.html

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Race, Honolulu County

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	349,800	1,668	11	1,159	17	76	258	145
Net Job Flows	492	26	N/A	-1	2	-2	20	6
Job Creation	15,024	104	1	50	4	8	39	18
New Hires	43,178	235	N/A	91	8	20	79	33
Separations	50,142	244	N/A	114	6	25	66	30
Turnover	7.7%	7.0%	6.0%	5.2%	14.0%	11.7%	13.4%	8.6%
Avg Monthly Earnings	$3,521	$2,329	$2,749	$2,253	$2,016	$2,228	$2,719	$2,387
Avg New Hire Earnings	$2,241	$1,862	$1,241	$1,930	$1,599	$1,497	$1,945	$1,728

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	362,449	2,372	14	1,836	20	104	222	175
Net Job Flows	4,411	-73	-1	-56	-2	-2	-11	N/A
Job Creation	18,395	135	N/A	71	4	13	40	22
New Hires	58,867	341	5	150	9	33	104	38
Separations	63,206	548	8	277	14	47	148	52
Turnover	9.5%	6.7%	13.1%	5.5%	17.4%	11.1%	13.0%	10.2%
Avg Monthly Earnings	$3,171	$1,971	$2,425	$1,870	$2,073	$2,179	$2,868	$2,021
Avg New Hire Earnings	$2,052	$1,528	N/A	$1,389	$1,624	$1,699	$2,026	$1,687

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	336,179	2,656	13	2,014	12	159	233	222
Net Job Flows	2,721	4	N/A	7	N/A	-2	1	-1
Job Creation	16,257	164	N/A	119	2	22	30	23
New Hires	52,531	508	5	286	5	70	82	58
Separations	56,769	580	5	324	6	85	91	67
Turnover	8.9%	8.1%	13.9%	6.8%	13.2%	13.3%	12.8%	11.7%
Avg Monthly Earnings	$2,685	$1,928	$2,112	$1,848	$2,041	$2,124	$2,582	$1,917
Avg New Hire Earnings	$1,632	$1,552	$1,637	$1,478	$707	$1,709	$2,050	$1,310

**Data does not include state and federal government employment.*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.html

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Gender Honolulu County

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	349,800	1,668	1,016	652
Net Job Flows	492	26	16	9
Job Creation	15,024	104	72	38
New Hires	43,178	235	170	65
Separations	50,142	244	179	65
Turnover	7.7%	7.0%	8.0%	5.5%
Avg Monthly Earnings	$3,521	$2,329	$2,507	$2,061
Avg New Hire Earnings	$2,241	$1,862	$1,922	$1,739

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	362,449	2,372	1,462	909
Net Job Flows	4,411	-73	-64	-9
Job Creation	18,395	135	94	49
New Hires	58,867	341	241	100
Separations	63,206	548	407	140
Turnover	9.5%	6.7%	8.1%	4.7%
Avg Monthly Earnings	$3,171	$1,971	$2,152	$1,702
Avg New Hire Earnings	$2,052	$1,528	$1,662	$1,272

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	336,179	2,656	1,730	925
Net Job Flows	2,721	4	-8	11
Job Creation	16,257	164	129	47
New Hires	52,531	508	415	92
Separations	56,769	580	489	91
Turnover	8.9%	8.1%	9.5%	5.7%
Avg Monthly Earnings	$2,685	$1,928	$2,085	$1,665
Avg New Hire Earnings	$1,632	$1,552	$1,692	$1,173

**Data does not include state and federal government employment.*
Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.html
Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Age, Honolulu County

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	349,800	1,668	16	48	61	220	271	395	377	278
Net Job Flows	492	26	2	2	N/A	13	5	2	1	-3
Job Creation	15,024	104	5	11	11	28	23	23	18	7
New Hires	43,178	235	8	22	20	50	48	46	25	13
Separations	50,142	244	6	22	21	43	47	50	30	20
Turnover	7.7%	7.0%	18.5%	18.1%	18.2%	9.8%	8.9%	5.9%	4.9%	3.5%
Avg Monthly Earnings	$3,521	$2,329	$1,533	$1,581	$2,088	$2,360	$2,542	$2,595	$2,352	$1,888
Avg New Hire Earnings	$2,241	$1,862	$1,449	$1,436	$1,957	$1,953	$1,819	$1,947	$2,092	$1,437

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	362,449	2,372	21	51	79	262	453	594	609	301
Net Job Flows	4,411	-73	N/A	N/A	-3	-18	-24	-9	-4	-13
Job Creation	18,395	135	9	13	13	30	41	26	24	14
New Hires	58,867	341	31	26	28	69	77	50	35	22
Separations	63,206	548	33	31	37	115	144	81	55	48
Turnover	9.5%	6.7%	31.7%	19.8%	14.3%	12.0%	9.2%	4.2%	4.0%	6.1%
Avg Monthly Earnings	$3,171	$1,971	$865	$1,199	$1,445	$2,061	$2,120	$2,158	$1,996	$1,507
Avg New Hire Earnings	$2,052	$1,528	$489	$1,124	$1,129	$1,594	$1,781	$1,907	$1,311	$1,156

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	336,179	2,656	35	78	87	405	588	630	596	233
Net Job Flows	2,721	4	5	N/A	N/A	1	-3	4	N/A	-5
Job Creation	16,257	164	17	15	15	57	51	34	27	11
New Hires	52,531	508	35	40	38	153	129	59	40	12
Separations	56,769	580	34	43	42	173	154	63	46	23
Turnover	8.9%	8.1%	25.5%	21.8%	14.8%	13.7%	9.0%	5.4%	4.8%	6.1%
Avg Monthly Earnings	$2,685	$1,928	$685	$1,226	$1,340	$1,843	$2,128	$2,139	$1,943	$1,436
Avg New Hire Earnings	$1,632	$1,552	$844	$1,084	$1,254	$1,567	$1,898	$1,664	$1,545	$916

**Data does not include state and federal government employment.*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.html

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Education, Honolulu County

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	304,204	1,542	440	369	375	357
Net Job Flows	-1,388	19	2	6	4	6
Job Creation	11,180	87	23	25	23	22
New Hires	29,231	183	46	50	45	40
Separations	36,553	193	51	52	49	40
Turnover	6.6%	6.2%	5.4%	6.4%	7.0%	6.4%
Avg Monthly Earnings	$3,799	$2,362	$1,944	$2,262	$2,487	$2,856
Avg New Hire Earnings	$2,674	$1,901	$1,797	$1,938	$1,934	$1,913

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	307,417	2,219	689	540	516	473
Net Job Flows	1,296	-69	-22	-20	-15	-11
Job Creation	13,205	112	32	30	31	27
New Hires	36,685	255	69	63	66	57
Separations	42,268	445	125	115	110	94
Turnover	7.8%	6.1%	5.7%	6.5%	6.4%	6.1%
Avg Monthly Earnings	$3,446	$2,006	$1,696	$1,915	$2,199	$2,355
Avg New Hire Earnings	$2,475	$1,631	$1,340	$1,710	$1,806	$1,744

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	288,801	2,455	771	607	578	498
Net Job Flows	188	-1	-3	1	N/A	2
Job Creation	11,740	142	48	42	35	33
New Hires	33,602	393	121	100	95	76
Separations	38,885	461	146	116	111	87
Turnover	7.4%	7.4%	7.2%	7.5%	7.5%	7.3%
Avg Monthly Earnings	$2,907	$1,975	$1,663	$1,881	$2,137	$2,385
Avg New Hire Earnings	$1,954	$1,643	$1,535	$1,500	$1,755	$1,855

**Data does not include state and federal government employment.*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.html

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Race, State of Hawaii

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	482,558	6,278	42	3,515	73	341	1,569	734
Net Job Flows	1,587	32	N/A	-27	5	-2	52	2
Job Creation	21,917	385	6	151	15	33	180	56
New Hires	59,747	729	7	219	23	61	320	97
Separations	68,757	859	8	327	20	71	321	112
Turnover	7.8%	7.7%	9.3%	5.4%	14.1%	10.0%	12.1%	8.2%
Avg Monthly Earnings	$3,405	$2,833	$2,690	$2,554	$2,744	$2,543	$3,694	$2,612
Avg New Hire Earnings	$2,214	$1,989	$2,415	$1,874	$1,778	$1,712	$2,168	$1,849

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	500,369	7,394	37	4,837	51	417	1,253	796
Net Job Flows	6,661	-36	-1	-57	-2	-1	22	4
Job Creation	27,100	411	5	212	8	45	148	75
New Hires	83,756	930	10	378	16	82	304	137
Separations	90,282	1,240	13	582	23	106	348	166
Turnover	9.8%	7.2%	10.9%	5.7%	14.2%	10.3%	10.5%	9.1%
Avg Monthly Earnings	$3,082	$2,501	$2,343	$2,262	$2,600	$2,427	$3,619	$2,365
Avg New Hire Earnings	$2,029	$1,774	$1,816	$1,440	$1,865	$1,604	$2,440	$1,666

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting						
Indicator	All Races	All Races	American Indian or Alaska Native Alone	Asian Alone	Black or African American Alone	Native Hawaiian or Other Pacific Islander Alone	White Alone	More than One Race
Total Employment	456,926	8,255	36	5,405	41	543	1,325	904
Net Job Flows	4,460	-1	1	-8	1	-3	10	-2
Job Creation	23,259	595	6	361	8	63	141	98
New Hires	73,973	1,269	12	641	13	133	285	183
Separations	79,257	1,487	12	761	13	163	321	214
Turnover	9.1%	9.1%	12.5%	8.0%	15.4%	11.4%	12.0%	10.8%
Avg Monthly Earnings	$2,589	$2,096	$1,992	$1,927	$1,982	$1,977	$2,981	$1,965
Avg New Hire Earnings	$1,603	$1,530	$1,521	$1,441	$1,336	$1,420	$1,872	$1,422

**Data does not include state and federal government employment*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.htm

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Gender, State of Hawaii

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	482,558	6,278	3,969	2,309
Net Job Flows	1,587	32	28	4
Job Creation	21,917	385	270	143
New Hires	59,747	729	497	232
Separations	68,757	859	575	284
Turnover	7.8%	7.7%	8.0%	7.2%
Avg Monthly Earnings	$3,405	$2,833	$3,147	$2,302
Avg New Hire Earnings	$2,214	$1,989	$2,101	$1,780

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	500,369	7,394	4,651	2,743
Net Job Flows	6,661	-36	-38	2
Job Creation	27,100	411	290	161
New Hires	83,756	930	621	309
Separations	90,282	1,240	852	388
Turnover	9.8%	7.2%	7.7%	6.3%
Avg Monthly Earnings	$3,082	$2,501	$2,873	$1,892
Avg New Hire Earnings	$2,029	$1,774	$1,953	$1,449

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting		
Indicator	All Genders	All Genders	Male	Female
Total Employment	456,926	8,255	5,521	2,734
Net Job Flows	4,460	-1	-36	35
Job Creation	23,259	595	414	219
New Hires	73,973	1,269	928	341
Separations	79,257	1,487	1,119	367
Turnover	9.1%	9.1%	9.5%	8.7%
Avg Monthly Earnings	$2,589	$2,096	$2,352	$1,602
Avg New Hire Earnings	$1,603	$1,530	$1,664	$1,266

**Data does not include state and federal government employment*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.htm

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Age, State of Hawaii

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	482,558	6,278	88	214	261	1,034	1,045	1,489	1,351	793
Net Job Flows	1,587	32	11	1	4	21	14	6	-3	-21
Job Creation	21,917	385	28	39	38	102	86	84	65	32
New Hires	59,747	729	41	69	61	176	136	128	76	39
Separations	68,757	859	35	81	66	183	148	150	112	83
Turnover	7.8%	7.7%	17.8%	19.5%	14.5%	10.9%	8.7%	5.5%	4.9%	5.8%
Avg Monthly Earnings	$3,405	$2,833	$1,370	$1,552	$2,284	$2,984	$2,895	$3,082	$3,084	$2,233
Avg New Hire Earnings	$2,214	$1,989	$1,290	$1,273	$1,934	$2,182	$2,047	$2,288	$2,011	$1,475

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	500,369	7,394	102	202	268	918	1,414	1,948	1,687	851
Net Job Flows	6,661	-36	15	7	6	N/A	-20	-10	-5	-29
Job Creation	27,100	411	46	49	54	101	112	88	68	45
New Hires	83,756	930	92	84	88	200	181	137	90	56
Separations	90,282	1,240	92	93	99	246	270	189	133	117
Turnover	9.8%	7.2%	31.6%	20.4%	18.0%	11.4%	7.8%	4.5%	4.4%	6.9%
Avg Monthly Earnings	$3,082	$2,501	$1,006	$1,474	$1,693	$2,415	$2,551	$3,091	$2,523	$1,592
Avg New Hire Earnings	$2,029	$1,774	$942	$1,353	$1,550	$1,861	$1,988	$2,166	$1,811	$1,198

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting								
Indicator	All Ages	All Ages	14-18	19-21	22-24	25-34	35-44	45-54	55-64	65+
Total Employment	456,926	8,255	151	266	293	1,246	1,922	2,068	1,665	641
Net Job Flows	4,460	-1	24	4	-7	19	-8	-10	-13	-8
Job Creation	23,259	595	75	59	45	155	148	124	106	53
New Hires	73,973	1,269	123	114	92	309	268	176	128	55
Separations	79,257	1,487	121	127	110	332	322	214	171	88
Turnover	9.1%	9.1%	27.7%	23.1%	17.3%	12.5%	8.4%	6.6%	7.0%	9.2%
Avg Monthly Earnings	$2,589	$2,096	$719	$1,179	$1,424	$1,883	$2,284	$2,415	$2,192	$1,378
Avg New Hire Earnings	$1,603	$1,530	$899	$1,120	$1,410	$1,489	$1,762	$1,818	$1,478	$1,159

**Data does not include state and federal government employment*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.htm

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Quarterly Workforce Indicators* for Agriculture Industry by Education, State of Hawaii

Time Period: 2010	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	420,218	5,713	1,431	1,494	1,499	1,289
Net Job Flows	-1,119	16	-6	11	6	4
Job Creation	16,403	315	90	90	84	70
New Hires	40,813	557	135	156	147	117
Separations	50,319	678	184	177	174	142
Turnover	6.7%	6.9%	7.0%	6.9%	7.1%	6.7%
Avg Monthly Earnings	$3,662	$2,913	$2,239	$2,674	$3,029	$3,802
Avg New Hire Earnings	$2,615	$2,093	$1,843	$2,076	$2,134	$2,311

Time Period: 2005	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	423,938	6,820	1,888	1,785	1,714	1,432
Net Job Flows	2,258	-64	-24	-17	-15	-8
Job Creation	19,791	329	101	93	91	76
New Hires	52,347	665	172	175	175	142
Separations	60,458	956	262	252	244	196
Turnover	8.1%	6.3%	6.4%	6.4%	6.3%	6.0%
Avg Monthly Earnings	$3,340	$2,567	$1,874	$2,261	$2,731	$3,660
Avg New Hire Earnings	$2,420	$1,900	$1,481	$1,783	$2,062	$2,373

Time Period: 2000	All Industries	NAICS 11 - Agriculture, Forestry, Fishing and Hunting				
Indicator	All Education (for ages 25+)	All Education (for ages 25+)	Less than High School	High School or equivalent	Some college or Associate degree	Bachelor degree or above
Total Employment	391,314	7,544	2,144	2,017	1,882	1,500
Net Job Flows	796	-22	-3	-6	-9	-2
Job Creation	16,824	494	175	140	116	98
New Hires	47,183	938	277	249	231	180
Separations	53,840	1,127	339	300	275	212
Turnover	7.6%	8.2%	9.1%	8.3%	7.7%	7.8%
Avg Monthly Earnings	$2,797	$2,162	$1,668	$1,976	$2,411	$2,797
Avg New Hire Earnings	$1,900	$1,612	$1,410	$1,483	$1,737	$1,946

**Data does not include state and federal government employment*

Data Source: Census LED QWI Online - http://lehd.did.census.gov/led/datatools/qwiapp.htm

Prepared by State Dept. of Labor & Industrial Relations, Research & Statistics Office, 12/8/11.

Long-Term Projections 2008 - 2018
DLIR Research & Statistics Office

Long-term Occupational Projections, 2008-2018

Farming, fishing, and forestry occupations constitute less than one percent of the workforce in the State of Hawaii as well as in Honolulu MSA. Statewide growth within this occupational group will be minimal, while growth within Honolulu MSA will be well above the countywide average for all occupations.

State of Hawaii

SOC Code	Occupation Title	Employment 2008	Employment 2018	Growth Net	Growth Percent	Avg. Ann Growth	Average Annual Openings Growth	Average Annual Openings Replacement	Average Annual Openings Total	Training	Mean Annual Wage*
00-0000	Total, All Occupations	685,920	733,180	47,260	6.9%	0.7%	5,230	16,030	21,260		$43,740
45-0000	Farming, Fishing, & Forestry Occupations	5,080	5,090	10	0.2%	0.0%	10	140	140		$33,180
45-1000	Supervisors, Farming, Fishing, & Forestry Workers	360	400	40	11.1%	1.1%	**	10	10		
45-2000	Agricultural Workers	4,330	4,290	-40	-0.9%	-0.1%	**	120	120		
45-2011	Agricultural Inspectors	120	120	0	0.0%	0.0%	**	**	**	Work Experience in a related occupation	n/a
45-2091	Agricultural Equipment Operators	130	130	0	0.0%	0.0%	**	**	**	Short-term on-the-job training	$33,140
45-2092	Farmworkers & Laborers, Crop, Nursery, & Greenhouse	3,440	3,410	-30	-0.9%	-0.1%	0	90	90	Short-term on-the-job training	$26,980
45-2093	Farmworkers, Farm & Ranch Animals	540	520	-20	-3.7%	-0.4%	0	10	10	Short-term on-the-job training	$25,580

Honolulu MSA

SOC Code	Occupation Title	Employment 2008	Employment 2018	Growth Net	Growth Percent	Avg. Ann Growth	Average Annual Openings Growth	Average Annual Openings Replacement	Average Annual Openings Total	Training	Mean Annual Wage*
00-0000	Total, All Occupations	494,920	523,990	29,070	5.9%	0.6%	3,360	11,470	14,830		$45,100
45-0000	Farming, Fishing, & Forestry Occupations	1,550	1,700	150	9.7%	1.0%	20	40	60		$38,600
45-1000	Supervisors, Farming, Fishing, & Forestry Workers	80	100	20	25.0%	2.5%	**	**	**		
45-2000	Agricultural Workers	1,180	1,310	130	11.0%	1.1%	10	30	40		
45-2011	Agricultural Inspectors	80	80	0	0.0%	0.0%	**	**	**	Work Experience in a related occupation	n/a
45-2092	Farmworkers & Laborers, Crop, Nursery, & Greenhouse	880	980	100	11.4%	1.1%	10	20	30	Short-term on-the-job training	$31,000
45-2093	Farmworkers, Farm & Ranch Animals	150	170	20	13.3%	1.3%	**	**	10	Short-term on-the-job training	n/a

*Wages as of May 2010 Occupational Employment and Wage Estimates.

**The number of openings are greater than zero but less than ten.

Source: Hawaii State Department of Labor and Industrial Relations, Research and Statistics Office

Characteristics of the Insured Unemployed
Total Unemployment Rate
DLIR Research & Statistics Office

CHARACTERISTICS OF THE INSURED UNEMPLOYED in Hawaii -- 2010 (ALL CLAIMANTS)

Characteristics of claimants who filed for unemployment insurance benefits in Hawaii for the week containing the 12th of each month

	STATE		OAHU		MAUI/LANAI		HAWAII		KAUAI		MOLOKAI	
	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL
TOTAL	16,550	100.0	9,104	100.0	2,609	100.0	3,387	100.0	1,296	100.0	153	100.0
SEX												
Male	10,719	64.8	6,120	67.2	1,649	63.2	2,060	60.8	803	62.0	87	56.9
Female	5,831	35.2	2,984	32.8	961	36.8	1,327	39.2	494	38.1	66	43.1
INDUSTRY												
State	694	4.2	402	4.4	63	2.4	170	5.0	42	3.2	17	11.1
County	73	0.4	55	0.6	1	0.0	16	0.5	1	0.1	0	0.0
Agriculture/Forestry/Fishing	476	2.9	82	0.9	117	4.5	160	4.7	76	5.9	41	26.8
Mining	4	0.0	2	0.0	1	0.0	1	0.0	1	0.1	0	0.0
Utilities	10	0.1	4	0.0	2	0.1	4	0.1	0	0.0	0	0.0
Construction	4,626	28.0	2,867	31.5	636	24.4	813	24.0	286	22.1	23	15.0
Manufacturing	468	2.8	364	4.0	28	1.1	57	1.7	16	1.2	1	0.7
Wholesale Trade	337	2.0	219	2.4	34	1.3	64	1.9	18	1.4	2	1.3
Retail Trade	1,055	6.4	566	6.2	173	6.6	234	6.9	79	6.1	3	2.0
Transportation/Warehousing	605	3.7	318	3.5	108	4.1	120	3.5	52	4.0	7	4.6
Information	305	1.8	242	2.7	19	0.7	25	0.7	18	1.4	0	0.0
Finance/Insurance	235	1.4	170	1.9	19	0.7	33	1.0	12	0.9	0	0.0
Real Estate/Rental/Leasing	296	1.8	142	1.6	47	1.8	66	1.9	38	2.9	2	1.3
Professional/Technical Services	539	3.3	389	4.3	60	2.3	63	1.9	27	2.1	0	0.0
Management of Companies	30	0.2	21	0.2	6	0.2	3	0.1	1	0.1	0	0.0
Administrative/Waste Services	2,093	12.6	1,022	11.2	371	14.2	506	14.9	181	14.0	13	8.5
Educational Services	164	1.0	103	1.1	21	0.8	35	1.0	4	0.3	1	0.7
Health Care/Social Assistance	815	4.9	439	4.8	99	3.8	223	6.6	42	3.2	12	7.8
Arts/Entertainment/Recreation	238	1.4	93	1.0	73	2.8	42	1.2	30	2.3	0	0.0
Accommodation/Food Services	1,714	10.4	615	6.8	451	17.3	359	10.6	277	21.4	12	7.8
Other Services	466	2.8	258	2.8	88	3.4	80	2.4	36	2.8	5	3.3
Public Administration	6	0.0	2	0.0	1	0.0	0	0.0	3	0.2	0	0.0
Information not available	1,301	7.9	727	8.0	191	7.3	313	9.2	57	4.4	12	7.8
AGE												
Under 22	280	1.7	142	1.6	39	1.5	66	1.9	29	2.2	4	2.6
22 to 24	780	4.7	423	4.6	117	4.5	163	4.8	67	5.2	10	6.5
25 to 34	4,100	24.8	2,274	25.0	630	24.1	851	25.1	312	24.1	34	22.2
35 to 44	3,804	23.0	2,183	24.0	601	23.0	729	21.5	257	19.8	35	22.9
45 to 54	3,978	24.0	2,195	24.1	662	25.4	786	23.2	301	23.2	35	22.9
55 to 64	2,820	17.0	1,487	16.3	450	17.2	616	18.2	241	18.6	26	17.0
65 and over	787	4.8	401	4.4	111	4.3	176	5.2	90	6.9	10	6.5

Note: Averages and percentages may not add due to rounding.

Source: Research Statistics Office, DLIR

CHARACTERISTICS OF THE INSURED UNEMPLOYED in Hawaii -- 2010 (ALL CLAIMANTS)

	STATE		OAHU		MAUI/LANAI		HAWAII		KAUAI		MOLOKAI	
	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL	ANNUAL AVERAGE	% OF TOTAL
DURATION												
1-4 weeks	5,670	34.3	3,247	35.7	856	32.8	1,056	31.2	456	35.2	56	36.6
5-14 weeks	5,984	36.2	3,304	36.3	920	35.3	1,233	36.4	472	36.4	55	35.9
15 and over	4,896	29.6	2,553	28.0	834	32.0	1,098	32.4	369	28.5	42	27.5
OCCUPATION												
Management	1,025	6.2	635	7.0	167	6.4	156	4.6	62	4.8	5	3.3
Business/Financial Operations	306	1.8	215	2.4	38	1.5	35	1.0	17	1.3	1	0.7
Computer/Mathematical	127	0.8	99	1.1	10	0.4	14	0.4	3	0.2	1	0.7
Architecture/Engineering	113	0.7	78	0.9	13	0.5	16	0.5	7	0.5	0	0.0
Life/Physical/Social Science	96	0.6	50	0.5	11	0.4	26	0.8	9	0.7	1	0.7
Community/Social Services	244	1.5	122	1.3	28	1.1	79	2.3	10	0.8	5	3.3
Legal	40	0.2	31	0.3	3	0.1	5	0.1	1	0.1	0	0.0
Education/Training/Library	399	2.4	206	2.3	51	2.0	109	3.2	23	1.8	11	7.2
Arts/Entertainment/Sports	348	2.1	268	2.9	30	1.1	34	1.0	15	1.2	1	0.7
Healthcare Practitioner/Technical	151	0.9	86	0.9	17	0.7	33	1.0	14	1.1	1	0.7
Healthcare Support	214	1.3	115	1.3	23	0.9	52	1.5	21	1.6	3	2.0
Protective Service	286	1.7	149	1.6	40	1.5	75	2.2	20	1.5	1	0.7
Food Preparation/Serving	1,225	7.4	503	5.5	284	10.9	267	7.9	159	12.3	13	8.5
Building/Grounds Maintenance	602	3.6	227	2.5	124	4.8	176	5.2	68	5.2	6	3.9
Personal Care/Service	365	2.2	131	1.4	73	2.8	80	2.4	78	6.0	2	1.3
Sales Related	1,047	6.3	524	5.8	181	6.9	233	6.9	101	7.8	8	5.2
Office/Administrative Support	2,007	12.1	1,104	12.1	379	14.5	415	12.3	101	7.8	9	5.9
Farming/Fishing/Forestry	397	2.4	98	1.1	66	2.5	130	3.8	69	5.3	34	22.2
Construction/Extraction	5,324	32.2	3,163	34.7	761	29.2	1,025	30.3	344	26.5	31	20.3
Installation/Maintenance/Repair	437	2.6	252	2.8	68	2.6	80	2.4	35	2.7	2	1.3
Production	420	2.5	263	2.9	48	1.8	75	2.2	32	2.5	2	1.3
Transportation/Material Moving	829	5.0	420	4.6	139	5.3	183	5.4	77	5.9	11	7.2
Information not available	548	3.3	366	4.0	57	2.2	90	2.7	30	2.3	5	3.3
RACE												
American Indian	82	0.5	34	0.4	16	0.6	26	0.8	5	0.4	1	0.7
Chinese	613	3.7	500	5.5	42	1.6	49	1.4	21	1.6	0	0.0
Filipino	3,138	19.0	1,849	20.3	482	18.5	476	14.1	315	24.3	18	11.8
Japanese	1,515	9.2	1,075	11.8	152	5.8	212	6.3	73	5.6	2	1.3
Other Asians	356	2.2	289	3.2	26	1.0	35	1.0	7	0.5	0	0.0
Black	277	1.7	202	2.2	33	1.3	32	0.9	10	0.8	0	0.0
Hawaiian	3,374	20.4	1,768	19.4	442	16.9	861	25.4	217	16.7	86	56.2
Other Pacific Islander	878	5.3	563	6.2	117	4.5	164	4.8	31	2.4	3	2.0
White & Latino	4,325	26.1	1,780	19.6	961	36.8	1,103	32.6	468	36.1	14	9.2
Others	1,985	12.0	1,040	11.4	337	12.9	430	12.7	149	11.5	29	19.0
Information not available	8	0.0	5	0.1	1	0.0	1	0.0	1	0.1	0	0.0

Source: Research Statistics Office, DLIR

Note: Averages and percentages may not add due to rounding.

DEFINITIONS

DURATION is the number of uninterrupted weeks each claimant has during his/her current spell of unemployment.

RACE refers to the racial or cultural group an individual may most closely identify with within a community as designated by the claimant. (Previously called Ethnicity.)

INDUSTRY refers to the classification of the claimant's last employer or the employer for whom the claimant earned the greatest wage during the base period.

INSURED UNEMPLOYED represents the weekly number of covered workers, totally or partially unemployed, who have filed unemployment insurance claims.

INTERSTATE refers to those claimants filing for benefits in Hawaii (agent state) against wage credits earned in another state, Canada, Puerto Rico, or the Virgin Islands (liable state).

INTRASTATE refers to those claimants filing for benefits in Hawaii against wage credits earned in Hawaii or from Hawaii based employers.

OCCUPATIONS refers to the type of work the claimant is seeking or the occupation he/she was last employed in.

TECHNICAL NOTES

This report sketches the characteristics of the insured unemployed -- those covered by the Unemployment Insurance Law. Although this report can be used as a general indicator of the economic situation, some caution should be exercised as the data represent only a portion of the total "unemployed." Approximately 90 percent of Hawaii's workers are covered under the law. Exceptions are the self-employed, family employees, certain employees of nonprofit organizations, some domestic workers, newspaper carriers under l8, student nurses and interns, casual laborers, regularly enrolled students performing services for the school, college or university, ordained members of the church, insurance agents and real estate salespersons remunerated solely by commissions and agricultural workers on small farms. New graduates, re-entrants to the work force, newly arrived immigrants, persons who quit their jobs or have refused suitable work or were fired for misconduct are some examples of job seekers whose numbers are absent from this report.

The data shows characteristics of claims for benefit payments made for the week containing the 12th of each month. It includes jobless persons filing claims for unemployment insurance under the Hawaii Employment Security Law and persons filing claims in the State of Hawaii against another state. The data excludes those claimants filing under the Extended Benefit program, and federal programs covering ex-federal workers and ex-military personnel.

Beginning with the 2001-2002 Characteristics of the Insured Unemployed publication, there is a new format for the Industry and Occupation categories. The Standard Occupational Classification (SOC) system replaced the Dictionary of Occupational Titles (DOT) coding system for occupations. The North American Industry Classification System (NAICS) is being used to designate the different industries instead of the Standard Industrial Classification (SIC) system. For trend analysis purposes, the data may not be comparable.

UNEMPLOYMENT RATES- *NOT SEASONALLY ADJUSTED*

	OCT 2011	SEP 2011	OCT* 2010
STATE	**6.5**	**6.6**	**6.4**
HONOLULU	**5.6**	**5.7**	**5.5**
HAWAI`I COUNTY	**9.3**	**9.6**	**9.2**
KAUA`I	**8.5**	**8.8**	**8.4**
MAUI COUNTY	**7.6**	**7.9**	**7.8**
Maui Island	**7.3**	**7.6**	**7.7**
Moloka`i	**17.5**	**16.8**	**13.4**
Lana`i	**4.4**	**5.3**	**6.3**
U. S.	**8.5**	**8.8**	**9.0**

* benchmarked data

UNEMPLOYMENT RATES- *SEASONALLY ADJUSTED*

	OCT 2011	SEP 2011	OCT* 2010
STATE	**6.5**	**6.4**	**6.5**
U. S.	**9.0**	**9.1**	**9.7**

* benchmarked data

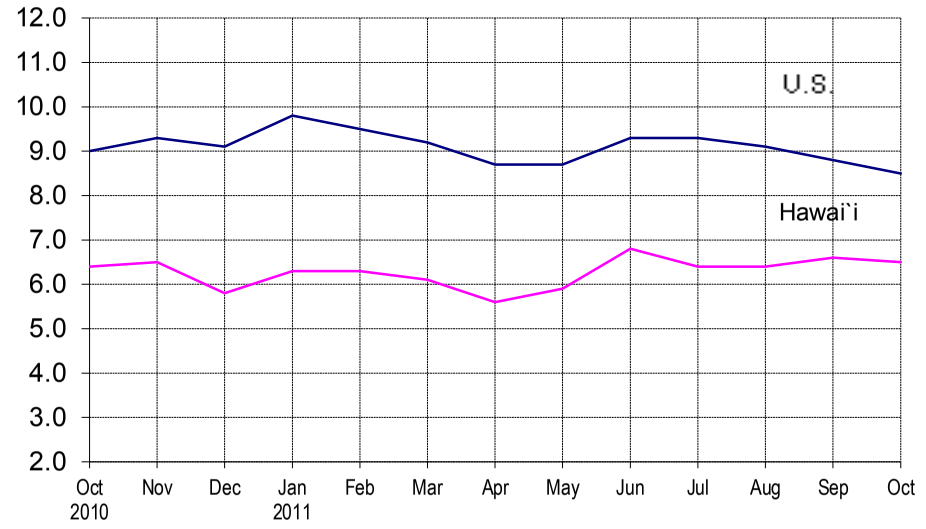
State of Hawai`i Seasonally Adjusted Labor Force Data**

	Oct 2011	Sep 2011	Oct 2010*
Labor Force	633,900	632,000	629,450
Employment	592,600	591,750	588,700
Unemployment	41,250	40,250	40,750

* benchmarked data

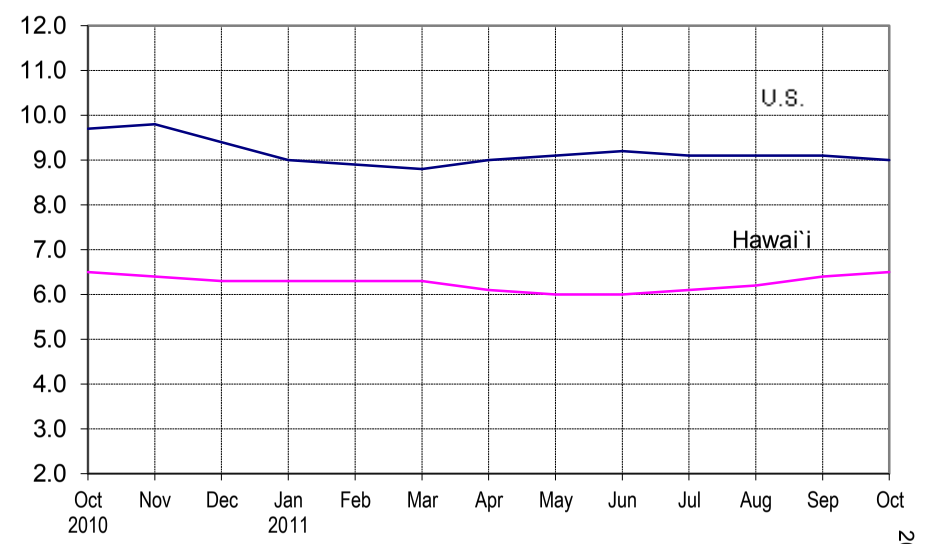
**totals may not add due to rounding

	Oct 2010	Nov	Dec	Jan 2011	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
U. S.	9.0	9.3	9.1	9.8	9.5	9.2	8.7	8.7	9.3	9.3	9.1	8.8	8.5
Hawai`i	6.4	6.5	5.8	6.3	6.3	6.1	5.6	5.9	6.8	6.4	6.4	6.6	6.5



Source: Hawaii Department of Labor & Industrial Relations, Research & Statistics Office, OMI

	Oct 2010	Nov	Dec	Jan 2011	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
U. S.	9.7	9.8	9.4	9.0	8.9	8.8	9.0	9.1	9.2	9.1	9.1	9.1	9.0
Hawai`i	6.5	6.4	6.3	6.3	6.3	6.3	6.1	6.0	6.0	6.1	6.2	6.4	6.5



Agriculture, Food, and Natural Resources Occupations

Career Kōkua, the Hawai‘i Career Information Delivery System

DLIR Research and Statistics Office

Occupations in the Agriculture, Food, and Natural Resources cluster raise plants and animals as sources for food and shelter. They also include occupations that sell and make products from plants and animals. These products include food, lumber, and fabrics. Other occupations in this cluster provide advice and services that farmers and ranchers need to improve products. Another option in this cluster is to work to conserve natural resources and protect the environment.

Occupations in this cluster:	Level of Education
Agricultural Inspectors	Work experience in a related occupation Bachelor's degree
Agricultural Products Graders and Sorters	Work experience in a related occupation
Agricultural Scientists	Bachelor's degree
Agricultural Worker Supervisors	Work experience in a related occupation
Animal Caretakers	Short-term on-the-job training (less than 1 month) Moderate-term on-the-job training (1 to 12 months)
Animal Scientists	Bachelor's degree
Animal Trainers	Moderate-term on-the-job training (1 to 12 months)
Aquaculture Workers	Short-term on-the-job training (less than 1 month) Moderate-term on-the-job training (1 to 12 months) Postsecondary vocational training Bachelor's degree
Bakers	Long-term on-the-job training (over 1 year)
Commercial Fishers	Moderate-term on-the-job training (1 to 12 months)
Conservation Scientists	Bachelor's degree
Farm and Ranch Workers	Short-term on-the-job training (less than 1 month) Moderate-term on-the-job training (1 to 12 months)
Farmers and Farm Managers	Long-term on-the-job training (over 1 year) Work experience plus a bachelor's or higher degree
Food Processing Workers	Short-term on-the-job training (less than 1 month)
Food Scientists	Bachelor's degree
Foresters	Bachelor's degree
Forestry Technicians	Associate degree
Meat Cutters	Short-term on-the-job training (less than 1 month) Moderate-term on-the-job training (1 to 12 months) Long-term on-the-job training (over 1 year)
Nursery Workers	Short-term on-the-job training (less than 1 month)
Park Naturalists	Bachelor's degree
Precision Agriculture Technicians	Postsecondary vocational training Associate degree
Recycling and Reclamation Workers	Moderate-term on-the-job training (1 to 12 months)
Trash Collectors	Short-term on-the-job training (less than 1 month)
Veterinarians	Professional degree
Veterinary Assistants	Short-term on-the-job training (less than 1 month)
Water Treatment Plant Operators	Long-term on-the-job training (over 1 year)
Zoologists	Bachelor's degree

The training or education required varies for careers in agriculture, food, or natural resources, Some occupations require less than one month of on-the-job training. However, some scientists need a doctoral degree to do research. The amount of training or education required depends on the type of work one would be doing.

The table above presents the level of education or training required to work in the occupations. Note that some occupations may have more than one required level of education because the type of work performed may vary in specific jobs.

Check the related programs of study to explore the educational programs that would prepare you to work in this cluster.

AGRICULTURAL INSPECTORS determine if farmers and food processors are using safe methods to care for livestock and to process food.

Preparation
Depending on specialty, a bachelor's degree with coursework in biological, agricultural or physical science may be required. Major areas of study may include entomology, plant pathology, biology, animal science, and agricultural science. For some specialties, persons may qualify with a high school diploma or equivalent and several years of related experience. Persons may begin as trainees.

Wages
Wages vary by area of the country and the inspector's area of specialization.

Agricultural inspectors who work full time generally receive benefits. Common benefits include paid vacation, sick leave, health insurance, and a retirement plan.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$15.25	$20.03	$24.24
	Yearly	$31,730	$41,670	$50,430

(1) Wage estimate is not available.

Outlook
Little change is expected in the number of jobs for agricultural inspectors in Hawaii through the year 2018. Outlook in Hawaii depends on budgetary constraints, industry growth or decline, economic conditions, the number of qualified applicants, government regulations, technological advances, availability of training, and replacement needs.

Nationally, the number of jobs for agricultural inspectors is expected to increase about as fast as average through the year 2018.

About three-quarters of all inspectors work for a government agency.

Major employers:
- Federal, state, and local government agencies
- Meat processing companies

Most inspectors work for the government. These government agencies are not expected to hire many new workers. Instead they expect businesses to do the routine inspections. Some new jobs will occur in the meat processing industry as consumers call for better inspection of their food.

Many agricultural inspectors are expected to retire in the next decade. Thus, job prospects should be good for recent graduates in this field.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	16,600	18,700	2,100	12.8
State	120	120	0	0

AGRICULTURAL PRODUCTS GRADERS AND SORTERS examine products such as fruits, vegetables, and textiles. They assign items to quality levels before they are sold to the public.

Preparation
To work as an agricultural products grader or sorter, you need:
- good eye-hand coordination;
- little or no previous work experience;
- to complete on-the-job training; and
- the ability to work independently (although a supervisor is usually present).

On-the-job training
Sorters and graders usually receive informal training on the job from experienced workers. On the job, you learn to grade and sort produce as well as test samples. Training may last one to four weeks. After training, you may be closely supervised by another worker for a short time.

Wages
Wages vary by employer, area of the country, and the grader's level of skill.

Graders and sorters who work full time may receive benefits. Common benefits include paid vacation, sick leave, and health insurance.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$8.57	$9.22	$10.98
	Yearly	$17,830	$19,180	$22,850

(1) Wage estimate is not available.

Outlook
Outlook information for agricultural products graders and sorters in Hawaii is not available. Outlook for agricultural products graders and sorters in Hawaii is affected by industry growth, the number of qualified applicants, economic conditions, wages, and technological advances.

Nationally, little change is expected in the number of jobs for agricultural products graders and sorters through the year 2018.

Major employers:
- Grocery stores
- Wholesale grocery sales companies
- Agricultural and food products companies
- Produce processing and packaging plants

Some grading and sorting jobs can be done by machines. In addition, an increasing amount of agricultural products are imported from other countries. These items are graded and sorted before they are shipped here. Both of these factors are likely to limit the number of new jobs in this occupation.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	33,400	33,500	100	0.2

AGRICULTURAL SCIENTISTS study plants and soils. They use science to protect, develop, and manage these resources.

Preparation
To work as an agricultural scientist, you must:
- have a high school diploma or GED;
- complete at least a bachelor's degree in agriculture science;
- have excellent written and oral communication skills; and
- be self-motivated.

Education after high school
A bachelor's degree in agricultural science is required for jobs in research. In agricultural science, you study communications, economics, and business. You also take courses in physical and life sciences, plant pathology, and soil chemistry. In addition, you study plant physiology and biochemistry.

A doctoral degree (Ph.D.) is required to lead research projects or teach at a college or university. To earn an advanced degree you complete more courses, do fieldwork, and do laboratory research. More jobs will require advanced degrees in the future.

All states have land-grant colleges that offer agricultural science degrees. However, not all colleges offer every specialty area.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	0
High school diploma or equivalent	4
Some college, no degree	9
Associate degree	7
Bachelor's degree	41
Master's degree	23
Doctoral (Ph.D.) or professional degree	14

* National data for agricultural and food scientists (SOC 19-1010).

Wages
Agricultural scientists who have a Ph.D. earn more than those with a master's or bachelor's degree. Agricultural scientists who work for the federal government are paid on a stair step pay scale. The more education and experience they have, the more they are paid. Federal employees need to apply and take a test to move up the scale.

Agricultural scientists who work full time usually receive benefits. Common benefits include paid vacation, health and dental insurance, and a retirement plan.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$26.17	$30.98	$38.65
	Yearly	$54,430	$64,430	$80,400
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$21.34	$27.57	$35.88
	Yearly	$44,390	$57,340	$74,630

(1) Wage estimate is not available.

Outlook
In Hawaii, average employment growth is expected for agriculture scientists through the year 2018. Job openings should arise from replacement needs. Factors affecting the outlook include federal and state funding for agricultural research and industry, economic conditions, growth of the agricultural industry, government regulations, technological and scientific advances, the number of qualified applicants, earnings, and replacement needs. Growth in the agricultural industry may be spurred by interest in local food self-sufficiency and demand for improved diversified agriculture products grown in Hawaii. In addition, Hawaii's geographic location is ideal for tropical agricultural research aimed at agricultural development in tropical regions. However, the high cost of land and other resources affects the profitability of growing crops locally. Having broad exposure to plant and environmental science may be helpful. Knowledge of basic sciences and good communication skills are important.

Nationally, the number of jobs for soil and plant scientists is expected to grow faster than average through the year 2018.

About 12 percent of agricultural scientists are self-employed.

Agricultural scientists work in varied settings. Those who work for the federal government are mainly with the Department of Agriculture. Others work for state governments and help farmers and others who need information. Some agricultural scientists work for seed or food product companies.

Major employers:
- Federal, state, and local government agencies
- Research and testing services

Past agriculture research has created higher-yielding crops. More research will be necessary as insects adapt to pesticides, and as soil and water quality decrease. Agricultural scientists will be needed to protect and preserve the soil, water, and ecosystems. In addition, demand for biofuels is expected to increase. Scientists will be needed to find new ways for turning plant material into usable energy sources.

Employment of agricultural scientists doesn't vary much with the state of the economy. Layoffs are less likely among these workers than some other occupations. This is because food is a staple item. Its demand changes very little with economic activity.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	13,900	16,100	2,200	15.5
State	190	200	10	5.3

AGRICULTURAL WORKER SUPERVISORS hire and supervise workers who tend and harvest crops, animals, ornamental plants, and trees.

Preparation
To work as an agricultural worker supervisor, you must:
- have a high school diploma or GED;
- have experience working as an agricultural worker;
- complete on-the-job training;

- have good interpersonal and communication skills; and
- enjoy working outdoors in all conditions.

Education after high school
No formal education is required beyond high school.

Work experience
Most people become supervisors after working for many years as an agricultural worker. Growing up on a farm provides good work experience. It is also helpful if you join clubs such as 4-H or Future Farmers of America while in high school.

On-the-job training
Agricultural worker supervisors usually receive informal training on the job from experienced workers. During training, you learn:

- human resources policies such as how to hire, train, or fire workers;
- methods used for agricultural production;
- how to use and maintain equipment; and
- company policies.

Training may last up to a month.

In certain specialized agricultural fields, higher levels of education and training may be required.

Wages
Some supervisors are paid by seasonal contracts. For example, supervisors contract with a farmer to harvest a crop. Supervisors supply the crew, pay the crew, and keep the remaining money as their income. Wages vary by area of the country, crop, and employer.

Few jobs on farms and ranches provide benefits such as retirement and health care. In addition, because many agricultural worker supervisors travel the country following the crops, they have several employers during the year. Thus, agricultural worker supervisors must provide their own insurance and other benefits.

First-Line Supervisors of Farming, Fishing, and Forestry Workers

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$20.54	$24.27	$31.20
	Yearly	$42,730	$50,480	$64,890
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$14.94	$20.10	$26.99
	Yearly	$31,070	$41,800	$56,140

(1) Wage estimate is not available.

Outlook
Outlook information for agriculture worker supervisors in Hawaii and nationally is not available.

About 25 percent of agricultural worker supervisors are self-employed.

Major employers:

- Farms and ranches

The number of small farms is decreasing. They are being sold to large farming companies. One result of this change is that more farm work is being done by hired workers rather than family members. Additional supervisors will be needed to oversee these hired workers. Because many small farms have already been sold, the need for additional supervisors will grow slowly.

ANIMAL SCIENTISTS conduct research. They try to develop better animal products and healthier animals.

Preparation
To work as an animal scientist, you must:
- have a high school diploma or GED;
- complete at least a bachelor's degree in agriculture or animal science;
- have a good eye for detail; and
- be self-motivated.

Education after high school
You need a bachelor's degree in animal or agriculture science if you want to work in research. In animal science programs, you study economics, business, and physical and life sciences. You also study animal breeding, reproductive physiology, and nutrition.

A doctoral degree (Ph.D.) is required to lead research projects or teach at a college or university. To complete an advanced degree, you take more courses, do fieldwork, and conduct laboratory research.

All states have land-grant colleges that offer animal science degrees. Most schools offer bachelor's, master's, and doctoral degrees in this field. All degree levels offer students opportunities to specialize in areas such as genetics, nutrition, poultry, or livestock.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	0
High school diploma or equivalent	4
Some college, no degree	9
Associate degree	7
Bachelor's degree	41
Master's degree	23
Doctoral (Ph.D.) or professional degree	14

* National data for agricultural and food scientists (SOC 19-1010).

Work experience
Work experience as an animal caretaker is helpful. Similarly, volunteering at an animal hospital or clinic is also valuable.

On-the-job training
Because most jobs in this field are research-based, on-the-job training is limited. New employees may be oriented to the lab and the company's policies. Orientation may last up to a month.

Wages
Wages vary by employer and area of the country. The scientist's level of education and experience also affect wages. In general, animal scientists who have a doctoral degree (Ph.D.) and postgraduate training earn higher wages.

Animal scientists who work full time usually receive benefits. Typical benefits include sick leave, paid vacation, and health insurance. Some employers also provide a retirement plan. Self-employed animal scientists must provide their own insurance.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$20.63	$28.00	$41.60
	Yearly	$42,910	$58.250	$86,530

(1) Wage estimate is not available.

Outlook
Specific information about the outlook for animal scientists in Hawaii is not available. Factors affecting the outlook include the number of qualified applicants, economic conditions, industry decline, and replacement needs.

Nationally, the number of jobs for animal scientists is expected to grow as fast as average through the year 2018.

About 12 percent of animal scientists are self-employed.

Major employers:
- State government agencies
- Research and testing services

Farmers and food production companies spend a lot of money on breeding, raising, and feeding animals. They are interested in faster, cheaper methods of raising animals. Thus, they will hire animal scientists at research firms to study new methods.

Job openings will occur as current animal scientists retire or leave this occupation. Opportunities will be best for those who have an advanced degree.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	3,700	4,200	500	13.2

AQUACULTURE WORKERS are responsible for the breeding and raising of aquatic life.

Preparation
A high school education or equivalent is generally preferred or required. Some post high school training including a biology course may be preferred. Depending on specialty, some employers may prefer persons with a bachelor's degree.

Employers often look for persons with related experience which provided practical knowledge, skills, and abilities. Background in biological sciences is usually necessary. Some jobs may require only on-the-job training while others may require knowledge of basic laboratory procedures including sampling and measuring techniques. For some positions, "hands on" farming experience plus college course work in such areas as marine biology, agriculture, aquaculture, fisheries biology, zoology, oceanography, and chemistry are suggested. In addition, trade skills such as carpentry and plumbing may be preferred. A business background may also be helpful in commercial farming. Volunteer or part time work or an internship is recommended. Experience working with aquariums as a hobbyist is also helpful. Related programs of study and courses are available in Hawaii. Employers may provide on the job training which may be from a few weeks to a year in length.

Wages
Earnings may vary with the type of work and type of aquatic life grown.

Outlook
Outlook information for aquaculture workers in Hawaii is not available. The outlook in Hawaii depends on economic conditions, construction and expansion of aquaculture operations, consumer demand for aquaculture products, the number of qualified applicants, wages, government regulations, technological advances, fewer grants available, and

replacement needs. Factors such as high start up and operating costs, site availability, water quality, environmental regulations, weather, and disease may affect the outlook for local farms. Opportunities may be best on the Big Island. Opportunities vary with specialty. The success of new open ocean fish farms may increase opportunities.

BAKERS mix and bake ingredients to produce breads, pastries, and other baked goods.

Preparation
To work as a baker, you must:
- have a high school diploma or GED;
- complete formal training;
- complete on-the-job training; and
- have a good sense of smell and taste.

Education after high school
No formal education is required beyond high school for bakers. However, some bakers enroll in formal training programs. Professional-technical schools, two-year colleges, and special culinary schools offer courses.

Culinary training includes courses in menu planning, food preparation, and the selection and storage of food. Some programs teach you how to bake specialty items such as pastries and gourmet breads. Training includes hands-on experience. Many programs include courses in business management.

On-the-job training
Most bakers learn their skills on the job from an experienced worker. You begin as a baker trainee. Training includes:
- selecting and preparing ingredients;
- baking;
- decorating cakes;
- baking processes; and
- handling food.

Training can last for several years. Some employers train apprentices. After training, an experienced baker supervises your work. As you gain experience you receive more difficult tasks and more independence.

Military training
The military trains people to be food service specialists. This occupation includes bakers. Training takes nine to 14 weeks, depending on the specialty. Further training occurs on the job.

Wages
Wages vary greatly depending on the area of the country and the employer. In general, bakers who work for manufacturing companies tend to earn higher wages than those who work for small bakeries.

Benefits also vary by employer. Full-time bakers often receive typical benefits, but part-time bakers usually do not. Typical benefits include paid vacation, sick leave, and health insurance. Some employers provide uniforms. Bakers who work for restaurants may receive free meals.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$10.73	$14.44	$19.85
	Yearly	$22,310	$30,030	$41,280
Honolulu	Hourly	$10.31	$13.51	$18.92
	Yearly	$21,440	$28,100	$39,350
United States	Hourly	$9.18	$11.27	$14.38
	Yearly	$19,090	$23,450	$29,910

Outlook
Locally, slower than average employment growth is expected for bakers through the year 2018. Job openings should arise from replacement needs. Outlook depends on replacement needs, economic conditions, wages, the number of qualified applicants, and demand for baked food products. Persons with formal training or related experience should fare best.

Nationally, little change in the number of jobs for bakers is expected through the year 2018.

Major employers:
- Grocery stores
- Bakeries and pastry stores
- Bakery products manufacturers
- Restaurants

Growth will be due to increases in population, household income, and leisure time. These factors will allow people to dine out more often. However, employment for bakers can be sensitive to the state of the economy. When money is tight, people are less likely to dine out.

The popularity of fresh baked breads and pastries should spur the growth in jobs for bakers. The popularity of specialty bakeries will also provide more jobs. Growth will be slower for bakers who work in manufacturing. This is because production equipment is efficient and bakers can produce a lot of bread quickly.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	151,600	151,900	300	0.2
State	1,550	1,580	30	1.9

COMMERCIAL FISHERS catch ocean fish and other marine life using nets, hooks, and traps.

Preparation
There are no formal education requirements. Many fishers learn fishing methods and operations through on-the-job training or experience. The length of on-the-job training depends on the individual's ability and the type of fishing. Persons must learn specific techniques for each type of fishing done. Helpful high school courses include marine science, biology, mechanics, and electronics. Related programs in seamanship are offered in Hawaii. Persons interested in owning or managing a fishing operation should have good business skills.

Wages
Nationally, most commercial fishers earn between $300 and $700 per week.

Pay varies with the worker's duties and experience as well as the type of operation. Pay also varies with the size of the boat and the amount and value of the catch. Wages also vary by season. In general, wages are lowest in the winter, when the weather is bad and fishers go out less often. Some fishers have other jobs during the winter.

The cost of operating the ship, repairing and maintaining the equipment, and feeding the crew is subtracted from the sale of the catch. The remaining money is divided as shares among the crew members. Generally, the ship's owner (usually its captain) receives half of the net proceeds. This amount covers any profit, as well as ship maintenance and repair. Crew shares are generally between five and 12 percent.

Commercial fishers who are self-employed must provide their own health insurance and retirement plan.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$9.56	$12.30	$15.98
	Yearly	$19,880	$25,590	$33,250

(1) Wage estimate is not available.

Outlook
Outlook information for commercial fishers in Hawaii is not available. Outlook depends on fishing conditions, weather conditions, government regulations, market conditions, industry growth, economic conditions, the number of qualified applicants, wages, and replacement needs.

Nationally, slow to moderate decline in the number of jobs for commercial fishers is expected through 2018.

About 56 percent of all commercial fishers are self-employed. Most of the rest work for commercial fishing companies. Some commercial fishers are involved in sport fishing activities.

The fishing industry depends on the ability of fish stock to replenish itself through growth and reproduction. Many types of fish are below the level at which they can replenish themselves easily. Thus, fishing for these types of fish has been reduced or prohibited. Because fishers are limited in the type of fish they can catch, fewer commercial fishers will be needed.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	35,600	32,900	-2,700	-7.7

Employment growth for commercial fishers will continue to be limited by three factors. First, the number of large fishing vessels is growing. Second, the use of electronic equipment for navigation, communication, and location of fish is increasing. Third, fishing gear is improving. All of these factors have increased the efficiency of fishing operations. As a result, boats can have fewer crew members. Similarly, the use of boats on which the catch is processed aboard the vessel may limit employment opportunities.

Despite the predicted decline in jobs, openings will occur. Some fishers will leave the occupation because of the strenuous, hazardous nature of the job. Others will leave because of the lack of steady, year-round income. Most job openings will arise from the need to replace workers who retire or leave the occupation. Sport fishing boats will continue to provide some job opportunities.

CONSERVATION SCIENTISTS manage, develop, and help protect soil and rangelands.

To work as a conservation scientist, you must:
- have a high school diploma or GED;
- complete at least a bachelor's degree in an agricultural science;
- have excellent written and oral communication skills;
- be self-motivated; and
- enjoy working outdoors.

Education after high school
Most conservation scientists have a bachelor's degree. Relatively few colleges and universities offer a degree in soil conservation. About 40 schools offer a degree in range management. Thus, many conservation scientists have a degree in a related field and take courses in their area of interest. Suggested areas of study include environmental studies, agronomy, general agriculture, or hydrology. You can also study crop or soil science, wildlife biology, forestry, or range management.

A doctoral degree (Ph.D.) is required to lead research projects or teach at a college or university. In order to complete an advanced degree, you take more classes, do fieldwork, and conduct laboratory research.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	1
High school diploma or equivalent	1
Some college, no degree	7
Associate degree	7
Bachelor's degree	63
Master's degree	18
Doctoral (Ph.D.) or professional degree	4

* National data for conservation scientists and foresters (SOC 19-1030).

On-the-job training

Many conservation scientists undergo more training once on the job. The training may be conducted through classroom work, strictly on the job, or a combination of both. Training usually lasts a few months, and will depend on the employer.

Wages

Wages vary by area of specialization and employer. Those who work for the federal government often receive higher wages than those who work for state or local government agencies.

Conservation scientists usually receive benefits. Typical benefits include health insurance, sick leave, paid vacation, and a retirement plan. Benefit packages tend to be better in government agencies than in small, private firms.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$22.58	$29.94	$37.62
	Yearly	$49,960	$62,280	$78,250
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$21.71	$28.51	$35.86
	Yearly	$45,150	$59,310	$74,590

(1) Wage estimate is not available.

Outlook

In Hawaii, average employment growth is expected for conservation scientists through the year 2018.

Nationally, the number of jobs for conservation scientists is expected to grow as fast as the average through the year 2018.

Major employers:

- Federal, state, and local government agencies
- Forestry companies

Public concern over water and soil pollution from farms and industrial plants is increasing. This is likely to lead to more government regulations. If this happens, more conservation scientists will be needed. Farms and industrial plants will hire

conservation scientists to help them comply with these regulations. In addition, research firms will hire conservation scientists to help them prepare environmental impact statements.

Fire prevention and suppression will become more important for those employed with the Federal Government. The Federal Government is the main employer of conservation scientists, and growth will be limited by budget concerns.

The number of jobs created through growth will be small. However, positions will occur with all government agencies as current workers retire or switch jobs.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	18,300	20,500	2,200	11.9
State	130	140	10	7.7

FARM AND RANCH WORKERS help raise crops and livestock for market.

Preparation
Many learn skills on the job. A high school diploma or equivalent is often preferred. Applicants should enjoy working outdoors, be dependable, and have good communication skills. Farming/ranching experience is helpful. A driver's license may be required. Related programs of study are offered in Hawaii at community colleges. Auto or diesel mechanics and welding courses may be helpful. Obtaining a commercial driver's license (CDL) is helpful for persons interested in driving trucks. Supervisory skills are helpful for advancement.

Wages
Wages for farm and ranch workers varies by the type of work they do. Wage information for several types of farm and ranch workers are given below:

Some farm and ranch workers may receive less pay in exchange for housing, utilities, and farm products.

Pay varies with the area of the country and the crop worked. In general, workers in the southern and mountain states receive lower wages. Wages may be higher in areas where workers are in short supply.

Wages also vary by time of the year. During planting and harvest times, farm and ranch workers have many opportunities to work overtime and earn higher wages. However, they may not work at all during some of the winter months.

Farm and ranch workers who work full time on large farms are likely to receive benefits. These benefits may include health insurance, paid vacation, and sick leave. Those who work on small farms often must provide their own insurance. Similarly, those who travel around the country following the crops must provide their own insurance.

Agricultural Equipment Operators

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$10.69	$16.11	$18.96
	Yearly	$22,240	$33,510	$39,440
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$9.22	$11.71	$14.77
	Yearly	$19,180	$24,360	$30,720

(1) Wage estimate is not available.

Farmworkers and Laborers, Crop, Nursery, and Greenhouse

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$10.11	$12.11	$15.95
	Yearly	$21,020	$25,180	$33,170
Honolulu	Hourly	$11.90	$15.39	$17.91
	Yearly	$24,750	$32,000	$37,250
United States	Hourly	$8.46	$8.98	$9.80
	Yearly	$17,600	$18,690	$20,390

Farmworkers, Farm, Ranch, and Aquacultural Animals

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$9.79	$11.30	$15.95
	Yearly	$20,370	$23,500	$33,180
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$8.77	$10.56	$13.39
	Yearly	$18,240	$21,970	$27,840

(1) Wage estimate is not available.

Outlook

Faster than average employment growth is expected for crop, nursery, and greenhouse farmworkers and laborers through the year 2018. Little change in employment is expected for agricultural equipment operators during this same period. However, employment of farm and ranch animal farmworkers is expected to decline through 2018. Outlook depends on economic conditions, production costs, availability of land and water, foreign competition, land costs, plant diseases, alien pests, replacement needs, the number of qualified applicants, wages, demand for products, and weather conditions. In Hawaii, most of the hired work force has continued to be in the diversified agricultural sector. Further mechanization of farm work may result in fewer workers employed. Because most of Hawaii's produce is imported, agriculture in Hawaii may increasingly focus on crops that will make Hawaii self-sustaining for some of its food.

Many farm and ranch workers work only part of the year. Workers are in demand from spring to fall, but not in winter. About half as many farm and ranch workers are employed during the winter. Farm and ranch worker jobs are available in all areas of the country.

Major employers:
- Commercial farms
- Agriculture worker supply services

Technological advances in farm machinery have produced machines that plant and harvest more quickly. Farms that have these machines need fewer workers to operate them. As more small farms are sold to large farming companies, machines will be used on more land. In addition, larger farms may coordinate the work of farm and ranch workers better than smaller farms. Thus, fewer workers can get more work done.

Some employment for farm and ranch workers is seasonal. There tend to be a lot of job openings in seasonal work because people move on to other jobs. In part, this is due to the low pay and the high level of physical labor in this occupation.

Despite the decline, many job openings will become available as current workers leave this occupation for various reasons.

Agricultural Equipment Operators

	Employment		Employment Change	
	2008	2018	Number	Percent
State	130	130	0	0

Farmworkers and Laborers, Crop, Nursery, and Greenhouse

	Employment		Employment Change	
	2008	2018	Number	Percent
State	3,430	3,770	340	9.9

Farmworkers, Farm, Ranch, and Aquacultural Animals

	Employment		Employment Change	
	2008	2018	Number	Percent
State	540	530	-10	-1.9

FARMERS AND FARM MANAGERS raise crops and livestock for market.

Preparation
A high school diploma or equivalent may be preferred. Post-high school education may also be preferred. Employers may train assistants on the job. Practical experience and knowledge of farming/ranching practices are important. Time spent on a farm/ranch and in youth programs, such as FFA or 4-H, is helpful. High school agriculture courses are suggested. Because farming/ranching increasingly requires more complex decisions, college-level training is suggested and may be required. College courses can provide a strong background in science, agriculture, and business management. Such skills are important for both self-employed and hired managers. Programs in agriculture and specific fields of study are available at universities and community colleges throughout Hawaii. Experience working on several farms may be helpful. Those who wish to become farmers/ranchers should be prepared to make a large initial investment for land, machinery, buildings, livestock, seed, feed, fertilizers, herbicides, and/or supplies. It may take several years or longer to receive a return on investment. Having good math and analytical skills may be very helpful.

Wages
Farm income varies greatly depending upon the type and size of farm. For example, vegetable and cotton farms generally produce the highest income. Beef and hog farms generate some of the lowest income. Large farms generally produce more income than smaller farms. However, some small farms that produce specialty crops have high incomes.

Farmers' incomes vary greatly from year to year. The prices of farm products change depending upon weather and other factors. These factors influence the quantity of farm products produced and the demand for those products. Farms that show a large profit in one year may show a loss in the following year.

Many farmers receive payments from the government that supplement their incomes. Some of these price supports are being phased out and may result in lower incomes for these farmers. Thus, many farmers have business activities away from the farm to supplement their income.

Farmers and self-employed farm managers must supply their own benefits. As members of farm organizations, they may receive group discounts on health and life insurance. Farm managers who are not self-employed may receive housing as a benefit. They may also receive paid vacations and health insurance.

Farmers, Ranchers, and Other Agricultural Managers

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$19.54	$29.21	$39.30
	Yearly	$40,640	$60,750	$81,750

(1) Wage estimate is not available.

Outlook
Varies with geographic area and specialty. Outlook depends mainly on the availability of land and water, economic conditions, demand for such agricultural products as fruits and flowers, production and transportation costs, developments in equipment and methods, government regulations, earnings, interest in farming/ranching, the number of qualified applicants, and replacement needs. Weather conditions, plant diseases, alien pests, and seasonal productions on some farms may also affect the outlook. A large capital investment is necessary to purchase or lease land, equipment, buildings, stock, and supplies. In some markets, it may be difficult for local farmers/ranchers to compete with large suppliers from elsewhere. Many small farmers have found it helpful to have working partnerships with restaurants. In addition, many farms have ag-tourism activities which provide education and activities for visitors to farms and generate additional income. Opportunities may be favorable in diversified crops and in crops that make Hawaii less dependent on other places for some of its food. There may also be potential markets overseas for Hawaii's products. Farmers and ranchers may be faced with a need to relocate as residential and other developments occur. Outlook information for farm managers in Hawaii is not available. However, employment of farmers and ranchers is expected to grow slower than average through the year 2018.

Nationally, a slow to moderate decline in the number of jobs for farmers is expected through the year 2018. However, the number of jobs for farm managers is expected to grow slower than average during the same period.

Nearly all farmers are self-employed.

Farm managers tend to work for large commercial farms. Others may work for companies that supply agricultural goods to farms. Some may work for agricultural worker supply services. These service companies contract with farms to help with the harvest or other services.

Outlook
As the population continues to grow, the demand for food will grow as well. However, new technology is allowing farmers to produce larger crops than in the past. In addition, large farming companies are buying smaller farms. Some farms are sold because the farmer's children do not want to farm the land. Others are sold because the farm has too much debt. The end result is that there are fewer farms and farmers. Most job openings will result from the need to replace farmers who retire or leave the occupation for other reasons.

There are an increasing number of small-scale farmers who are finding success by meeting the demands of specific markets. For example, many small farmers grow foods without pesticides or chemicals because there is a demand for organic food. Other farmers are starting to raise trees or plants for nurseries.

Aquaculture is another area that is offering new job opportunities for farmers. This type of farming involves raising fish for sale. Fish are raised in the ocean, lakes, or in very large tanks. Because of over-fishing of many types of fish, this type of farming is likely to grow.

FOOD PROCESSING WORKERS prepare raw food items and combine ingredients to make food products.

Preparation
To work as a food processing worker, you need:
- on-the-job training; and
- little or no previous work experience.

Education after high school
No formal education is required for this job. However, many employers prefer that you have a high school diploma or its equivalent.

On-the-job training
Food processing workers usually receive informal training on the job from experienced workers. You begin by doing simple tasks, such as loading and unloading materials. As you get experience, you learn to do more complex tasks, such as operating machinery.

Training may last up to one month. After training, another worker supervises your work for a short time.

Wages
Wages for food processing workers vary by the type of work they do. The wages for several types of workers are given below.

Wages vary with the type of food processed, the employer, and the area of the country. Workers who are members of unions generally earn more than non-union workers.

Food processing workers who work full time usually receive benefits. Typical benefits include sick leave, paid vacation, and health insurance.

Food and tobacco roasting, baking, and drying machine operators and tenders

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$13.30	$14.35	$15.33
	Yearly	$27,660	$29,860	$31,890
Honolulu	Hourly	$13.23	$14.21	$15.17
	Yearly	$27,510	$29,560	$31,550
United States	Hourly	$10.15	$13.05	$17.20
	Yearly	$21,110	$27,140	$35,780

Food batchmakers

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$8.67	$9.92	$11.44
	Yearly	$18,030	$20,630	$23,800
Honolulu	Hourly	$8.34	$9.19	$10.78
	Yearly	$17,340	$19,120	$22,420
United States	Hourly	$9.36	$11.85	$15.46
	Yearly	$19,470	$24,640	$32,160

Food cooking machine operators and tenders

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$8.93	$10.40	$14.88
	Yearly	$18,580	$21,640	$30,950
Honolulu	Hourly	$8.66	$9.67	$11.73
	Yearly	$18,010	$20,120	$24,410
United States	Hourly	$9.22	$11.24	$14.45
	Yearly	$19,180	$23,380	$30,060

Outlook
In Hawaii, employment of food batchmakers is expected to grow faster than the average through the year 2018. During this same period, little change in employment is expected for food cooking machine operators and tenders. Outlook depends on replacement needs, economic conditions, wages, demand for products processed locally, the number of qualified applicants, and technological changes. Increased automation may limit the demand for additional workers.

Nationally, the number of jobs for food batchmakers is expected to grow as fast as average through the year 2018. During this same period, the number of jobs for food cooking machine operators and tenders is expected to grow slower than average. Little change in the number of jobs is expected for food and tobacco roasting, baking, and drying machine operators and tenders through 2018.

Many food processing workers work only during the summer and fall harvest.

Major employers:
- Bakeries and tortilla manufacturers
- Fruit and vegetable processing companies
- Meat processing companies
- Dairy product manufacturers
- Sugar processing companies

Population growth will increase the demand for processed foods. However, automation will allow fewer workers to do the same amount of work.

Despite the slow growth, openings will become available as current workers leave this occupation.

Food and tobacco roasting, baking, and drying machine operators and tenders

	Employment		Employment Change	
	2008	2018	Number	Percent
National	18,100	18,200	100	0.3

Food batchmakers

	Employment		Employment Change	
	2008	2018	Number	Percent
National	100,500	109,200	8,700	8.7
State	690	770	80	11.6

Food cooking machine operators and tenders

	Employment		Employment Change	
	2008	2018	Number	Percent
National	39,300	40,800	1,500	3.8
State	70	70	0	0.0

FOOD SCIENTISTS conduct research to develop and improve food products that are healthy, safe, and appealing.

Preparation
To work as a food scientist, you must:
- have a high school diploma or GED;
- complete at least a bachelor's degree in agriculture or food science;
- have excellent written and oral communication skills;
- be self-motivated; and
- have a good eye for detail.

Education after high school
You need a bachelor's degree in agricultural or food science for a job in applied research. In a food science program, you study food chemistry, food analysis, and food processing. A degree in a related science, such as biology or chemistry, also prepares you for jobs in food science.

You need a doctoral degree (Ph.D.) to lead research projects or teach at a college or university. To complete a doctoral degree, you take more courses, do fieldwork, and do your own lab research. The general trend is for food scientists to have a Ph.D.

All states have land-grant colleges that offer agricultural and food science programs. Many other colleges and universities offer similar programs.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	0
High school diploma or equivalent	4
Some college, no degree	9
Associate degree	7
Bachelor's degree	41
Master's degree	23
Doctoral (Ph.D.) or professional degree	14

* National data for agricultural and food scientists (SOC 19-1010).

Military training
The military does not provide initial training in this field. However, the military may provide work experience to food scientists who have a master's degree or higher.

Wages
Wages vary by employer and area of the country. Wages also vary by the scientist's level of education and experience.

Benefits also vary by employer. Most full-time food scientists receive benefits. These include vacation, sick leave, and health insurance. Self-employed food scientists must provide their own insurance.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$30.33	$58.32	$65.50
	Yearly	$63,080	$121,301	$136,230
Honolulu	Hourly	$30.64	$58.65	$65.66
	Yearly	$63,730	$122,000	$136,570
United States	Hourly	$21.25	$28.93	$39.43
	Yearly	$44,200	$60,180	$82,020

Outlook
Outlook information for food scientists in Hawaii is not available. Factors that may affect the outlook include the number of qualified applicants, the number of manufacturing companies in Hawaii that need food scientists, availability of training, economic conditions, wages, and replacement needs.

Nationally, the number of jobs for food scientists and technologists is expected to grow faster than average through the year 2018.

About 13 percent of food scientists are self-employed.

Major employers:
- State government agencies
- Research and testing services

As the population grows, the demand for food scientists will increase. Many of the new jobs for food scientists will be at research and development services firms. Research scientists will address several areas of public concern. These areas include diet, health, and changes in food safety. It also includes biosecurity which is the study of ways to prevent animals from getting new diseases.

Competition may be strong for college teaching jobs, even for scientists with doctoral degrees. In general, food scientists who have advanced degrees will have the best chances.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	13,400	15,600	2,200	16.3

FORESTERS manage, use, and help protect forests and other natural resources.

Preparation
To work as a forester, you must:

- have a high school diploma or GED;
- complete a bachelor's degree in forestry or wildlife management;
- be self-motivated; and
- enjoy working outdoors.

Education after high school
Almost all foresters have a bachelor's degree. Most land-grant colleges and universities offer programs in forestry. These programs cover science, math, communication skills, and computer science. You also study forest economics and business management. Increasingly, you take courses on policy issues and the environmental rules that affect forest management.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	1
High school diploma or equivalent	1
Some college, no degree	7
Associate degree	7
Bachelor's degree	63
Master's degree	18
Doctoral (Ph.D.) or professional degree	4

* National data for conservation scientists and foresters (SOC 19-1030).

On-the-job training
Some employers offer varying levels of on-the-job training. This may be hands-on or classroom-based. In general, training lasts up to a year.

Many colleges require forestry students to complete an internship. You usually work in a research facility. It may be operated by the college, a government agency, or a private business.

Work experience
Some employers accept a combination of experience and appropriate coursework as a substitute for a bachelor's degree. However, competition for jobs makes this type of position difficult to find. Summer work experience in the forest is helpful for getting a job in this field.

Wages
Wages vary based on the forester's education level. Wages also vary by employer. Starting salaries in private industry are similar to those in the federal government. However, starting salaries in state and local government are usually lower.

Benefits also vary. Full-time foresters usually receive typical benefits. These include paid vacation, sick leave, and health insurance. Government employees usually receive a retirement plan.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$21.01	$26.22	$31.97
	Yearly	$43,700	$54,540	$66,510

(1) Wage estimate is not available.

Outlook
In Hawaii, little change in employment is expected through the year 2018. Outlook depends on replacement needs, economic conditions, the number of qualified applicants, interest in forestry, industry growth, growth of private forests and natural resource management, government regulations, availability of training, wages, and the need for improved forestry, logging, and range management practices. Concerns over environmental protection and the management of endangered species may affect local opportunities. Some positions may require a high level of expertise.

Nationally, the number of jobs for foresters is expected to grow as fast as the average through the year 2018.

Major employers:
- Federal government agencies (U.S. Department of Agriculture, Forest Service)
- State and local government agencies
- Sawmills and planing mills
- Logging companies

Growth should be strongest in state and local government agencies. Demand will be spurred by continuing emphasis on environmental protection, responsible land management, and fire prevention and suppression. Fewer opportunities for foresters are expected in the federal government, partly due to budget cuts. However, a large number of foresters are expected to retire or leave their government jobs. This should result in some job openings.

The recent reductions in timber harvests on public lands will also slow growth for private industry foresters. Most forested land is privately owned. The rising demand for timber on private lands will affect foresters. Those who work for private industry, such as paper companies and sawmills, will be needed to provide management plans to landowners.

In addition, some opportunities will be as consultants for companies that need professionals to prepare environmental impact statements.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	11,500	12,900	1,400	12.1
State	20	20	1	0.0

FORESTRY TECHNICIANS help develop and protect forests.

To work as a forestry technician, you need:
- a high school diploma or GED;
- at least a two-year degree in a forestry-related field or on-the-job training; and
- a love of the outdoors.

Education after high school
Professional-technical schools and two-year colleges offer programs in forest technology. Programs include courses in forestry and forest resource management. You also study forest technology and environmental studies. Programs also include hands-on experience working in the field or lab.

It is becoming more common for forest technicians to enter the field with a bachelor's degree in forestry or a related field.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	3
High school diploma or equivalent	17
Some college, no degree	24
Associate degree	13
Bachelor's degree	30
Master's degree	9
Doctoral (Ph.D.) or professional degree	4

* National data for other life, physical, and social science technicians (SOC 19-4090).

Work experience
Summer jobs in parks are very helpful if you would like to work as a forestry technician. Many students in forestry programs work for the state and national forests during the summer. Experience working as a wildfire fighter is also helpful.

On-the-job training
Once hired, most forestry technicians learn additional skills on the job from experienced forestry technicians. As a new technician you begin by working as a helper or forest conservation technician. As you get experience, you begin supervising other workers. Training may last up to a year.

Wages
Wages vary by employer. Starting salaries in private industry are similar to those in the federal government. However, starting salaries in state and local government are usually lower. Wages also vary based on the technician's experience and education.

Benefits also vary by employer. Full-time, year-round forestry technicians may earn typical benefits, especially in government agencies. Typical benefits include vacation, sick leave, and health insurance.

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$15.34	$18.50	$21.86
	Yearly	$31,920	$38,480	$45,460
Honolulu	Hourly	$15.06	$18.34	$23.32
	Yearly	$31.320	$38.150	$48.510
United States	Hourly	$13.45	$16.05	$21.14
	Yearly	$27,990	$33,390	$43,970

Outlook
In Hawaii, little change in employment is expected through the year 2018.

Nationally, the number of jobs for forestry technicians is expected to grow as fast as average through the year 2018.

Major employers:
- Federal, state, and local government agencies

Concern about the environment will spur some demand for forestry technicians. This is more likely at the state and local government level. However, tight budgets for many state governments are expected to limit job growth.

	Employment		Employment Change	
	2008	2018	Number	Percent
National	34.000	36,900	2,900	8.6
State	140	140	0	0.0

MEAT CUTTERS convert animal carcasses into pieces of meat for sale to consumers.

To work as a meat cutter, you must:
- have a high school diploma or GED; and
- complete on-the-job training or a formal training program.

Education after high school
Some meat cutters learn their skills through meat cutting training programs. Professional-technical schools and two-year colleges offer these programs. You can also take courses offered by organizations in the industry.

On-the-job training
Most meat cutters learn their skills on the job from experienced workers. The length of training varies by the type of work you do. Poultry cutters and trimmers receive up to one month of training. Those who slaughter cows receive up to one year of training. Butchers receive the most training, which generally is up to two years.

Wages
Wages for meat cutters vary by type of work they do. Wages for several types of meat cutters are given below.

Wages vary by employer and area of the country. In addition, those who are members of a union usually receive higher wages than non-union workers.

Benefits vary by employer and specialty. Meat cutters who work full time for grocery stores usually receive benefits. Typical benefits include sick leave, health insurance, and a retirement plan. Poultry workers, however, rarely earn major benefits.

Butchers and meat cutters

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$14.54	$19.21	$22.11
	Yearly	$30,240	$39,960	$45,990
Honolulu	Hourly	$16.61	$19.81	$22.36
	Yearly	$34,560	$41,210	$46,500
United States	Hourly	$10.50	$13.75	$17.97
	Yearly	$21,850	$28,600	$37,380

Meat, poultry, and fish cutters and trimmers

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$9.81	$13.27	$15.95
	Yearly	$20,400	$27,610	$33,180
Honolulu	Hourly	$9.49	$13.45	$16.00
	Yearly	$19,730	$27,970	$33,280
United States	Hourly	$9.37	$10.74	$12.49
	Yearly	$19,500	$22,330	$25,980

Slaughterers and meat packers

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$9.51	$11.24	$13.46
	Yearly	$19,790	$23,380	$27,990

(1) Wage estimate is not available.

Outlook

In Hawaii, average employment growth of employment of butchers and meat cutters is expected through the year 2018 while much faster than average employment growth is forecast for meat, poultry, and fish cutters and trimmers during the same period. Outlook depends on new processing methods, economic conditions, demand for meat, growth of retail food stores, the number of qualified applicants, and replacement needs.

Nationally, the number of jobs for meat, poultry, and fish cutters and trimmers and slaughterers and meat packers is expected to grow slower than average through the year 2018. During this same period, little change in the number of jobs is expected for butchers and meat cutters.

Major employers:

- Animal processing companies
- Grocery stores
- Butcher shops and fish markets
- Seafood processing companies

Most job growth will be for slaughterers and lower-skilled meat, poultry, and fish cutters. In contrast, the number of jobs for skilled butchers, who work primarily in grocery stores, is expected to grow more slowly.

The meat processing industry is changing. In the past, a lot of meat cutting was done at retail stores, such as butcher shops and grocery stores. However, it now costs less for meat to be processed at food processing plants, then sent to stores. Thus, there will be fewer jobs for butchers, but more jobs for other types of meat cutters.

Opportunities for meat, poultry, and fish cutters will be good because this occupation has a high rate of turnover.

Butchers and meat cutters

	Employment		Employment Change	
	2008	2018	Number	Percent
National	129,100	131,000	1,900	1.5
State	510	540	30	5.9

Meat, poultry, and fish cutters and trimmers

	Employment		Employment Change	
	2008	2018	Number	Percent
National	169,600	180,400	10,800	6.4
State	420	480	60	14.3

Slaughterers and meat packers

	Employment		Employment Change	
	2008	2018	Number	Percent
National	98,400	102,500	4,100	4.2

NURSERY WORKERS grow, transplant, and care for plants and trees for sale.

To work as a nursery worker, you must:
- have little or no previous work experience;
- be self-motivated;
- have good interpersonal skills; and
- enjoy working outdoors.

Education after high school
No formal education is required for this job. However, many employers prefer that you have a high school diploma or its equivalent.

You may need a certificate before you can apply pesticides to plants. Certification programs are available through nursery associations or your state agriculture department.

On-the-job training
Nursery workers usually receive informal training on the job from experienced workers. On the job, you learn to:
- use equipment and tools;
- plant and water; and
- provide customer service.

Training may last up to one month. However, it's important to remember that nursery workers continually learn new skills as new flowers and plants arrive or are cultivated.

Wages
Wage information is not available specifically for nursery workers. However, they are part of the larger group of "farmworkers and laborers."

Pay varies by employer, area of the country, and the worker's level of experience.

Nursery workers who work full time may receive benefits. Typical benefits include health insurance, sick leave, and paid vacation.

Farmworkers and Laborers, Crop, Nursery, and Greenhouse

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$10.00	$12.11	$15.95
	Yearly	$21,020	$25,180	$33,170
Honolulu	Hourly	$11.90	$15.39	$17.91
	Yearly	$24,750	$32,000	$37,250
United States	Hourly	$8.46	$8.98	$9.80
	Yearly	$17,600	$18,690	$20,390

Outlook
In Hawaii, employment of crop, nursery, and greenhouse farmworkers and laborers is expected to grow faster than the average through the year 2018. Job openings are expected mainly from replacement needs. Outlook is affected by local and worldwide demand for Hawaii's nursery products, economic conditions, the number of qualified applicants, developments in equipment and horticultural techniques, wages, and replacement needs. Hawaii's geographic location may be an advantage, since costs of growing flowers and plants in Hawaii's warm climate are relatively low. However, this advantage is offset by relatively high shipping and labor costs in comparison to some countries in the global market. Economic conditions in other countries, approval by foreign governments to import plants from Hawaii, and the ability to grow new and superior varieties of plants may also affect the outlook.

Major employers:
- Nurseries

Interest in gardening has grown in recent years and is expected to continue growing. In addition, the number of professional buildings, shopping malls, and homes needing new or updated landscaping should increase as well. As a

result of these factors, more people will buy plants. The growing demand for plants should increase the number of jobs for nursery workers who tend plants. However, the number of new workers hired will be slowed by the fact that nurseries make only a small profit off plants. Nurseries must be sure not to spend too much money on labor.

Regardless of the rate of growth, job openings will occur. This occupation has a high rate of turnover because many jobs are part time.

Farmworkers and Laborers, Crop, Nursery, and Greenhouse

	Employment		Employment Change	
	2008	2018	Number	Percent
State	3,430	3,770	340	9.9

PARK NATURALISTS create programs to teach park visitors about natural areas.

Preparation
To work as a park naturalist, you must:
- have a high school diploma or GED;
- complete a bachelor's degree in a life science;
- enjoy working outdoors; and
- have good interpersonal skills.

Education after high school
Most park naturalists have a bachelor's degree. Several fields of study provide a good background for this occupation. These include biology, forestry, and wildlife management. You can also choose history, environmental science, anthropology, or natural resource management. Some students major in education and minor in a life science program, or vice versa.

The table below lists the level of education attained by a subset of workers in this occupation. The workers surveyed were between ages 25 and 44.

Education level attained	Percentage of workers in this occupation*
Less than high school diploma	1
High school diploma or equivalent	1
Some college, no degree	7
Associate degree	7
Bachelor's degree	63
Master's degree	18
Doctoral (Ph.D.) or professional degree	4

* National data for conservation scientists and foresters (SOC 19-1030).

Work experience
Experience working in a park is very important in this field. You may need one to two years of work experience. While in college or high school, you might volunteer at a park, work for the forest service, or complete an internship.

On-the-job training
Park naturalists spend up to one month learning about their place of employment. This means you may spend time learning about specifics, such as administrative duties and park procedures.

Wages
Wage information is not available specifically for park naturalists. However they are part of the larger group of "conservation scientists."

Wages tend to be higher in some states than others. This depends on how much money the state or local government puts into their natural resources budget. Private agencies tend to pay higher wages than the government. However, some government agencies also offer housing and transportation as part of their pay.

Park naturalists usually receive benefits. Typical benefits include sick leave, paid vacation, health insurance, and a retirement plan.

Conservation scientists

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$22.58	$29.94	$37.62
	Yearly	$46,960	$62,280	$78,250
Honolulu	Hourly	(1)	(1)	(1)
	Yearly	(1)	(1)	(1)
United States	Hourly	$21.71	$28.51	$35.86
	Yearly	$45,150	$59,310	$74,590

(1) Wage estimate is not available.

Outlook
Specific information about the outlook for park naturalists in Hawaii is not available. However, this occupation is included in the larger group of “conservation scientists.” In Hawaii, average employment growth is expected for this group through the year 2018. Factors affecting the outlook include the number of qualified applicants, economic conditions, wages, government regulations, and replacement needs.

Major employers:
- Federal, state, and local government agencies

Nationally, there is an increased interest in preserving the nation's natural areas and parks. Many people are expected to donate money to private agencies that manage natural areas. This may increase the number of jobs. However, park naturalist is one of the first jobs to be cut when government agencies need to reduce their budgets. Thus, the number of job openings for park naturalists may be limited.

PRECISION AGRICULTURE TECHNICIANS use Geographic Information Systems (GIS) and Global Positioning System (GPS) to improve agricultural practices. They use data to make precise decisions about watering, planting, and pesticide application.

Preparation
To work as a precision agriculture technician, you must:
- have a high school diploma or GED;
- complete a certificate or two-year associate degree;
- have practical, hands-on skills;
- have good computer skills; and
- have good communication skills.

Education after high school
Most people prepare for this occupation by getting a certificate or associate degree in this field. Certificates typically take one year to complete while associate degrees usually take two. Many community colleges and vocational schools offer one-year programs in this field.

Because this degree combines two distinct fields, it is becoming more common for schools to offer bachelor’s degrees in precision agriculture.

Work experience
Working in jobs that give you practical experience in the areas you wish to work is good background for this occupation. The fields of civil engineering and geography are very helpful as they focus on use of the Geographic Information Software (GIS). Work on a farm or ranch setting is helpful, too.

On-the-job training
As a new technician, you perform routine tasks while closely supervised by an experienced technician or agricultural engineer. As you gain experience, you work on tasks that are more difficult. Training may last a month up to a year.

Wages
Wages vary by employer and area of the country. The individual's specialty and level of experience and responsibility also affect wages. Those who have supervisory duties usually earn higher wages.

Precision agriculture technicians who work full time usually receive benefits. Typical benefits include sick leave, paid vacation, and health insurance. Some employers also provide a retirement plan.

Life, physical, and social science technicians, all other

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$18.24	$22.67	$28.53
	Yearly	$37,950	$47,150	$59,340
Honolulu	Hourly	$19.28	$23.72	$29.43
	Yearly	$40,100	$49,330	$61,210
United States	Hourly	$15.97	$20.84	$26.98
	Yearly	$33,200	$43,350	$56,130

Outlook
In Hawaii, outlook information is not available specifically for precision agriculture technicians. However, they are part of a larger group of "life, physical, and social sciences technicians, all other." Little change in employment is expected for workers in this group through 2018. Nationally, employment of workers in this group is expected to grow as fast as the average through 2018.

Major employers:
- Consulting firms
- Federal, state, and local government agencies

The growing number of people in the world will increase demands for food and energy. Precision agriculture technicians will be needed to find better ways to produce food. They will also work to save natural resources such as soil, air, and water. Opportunities will be best for technicians with strong technical, computing, and communication skills.

The use of advanced technologies, such as GPS and GIS, will continue to increase both the accuracy and productivity of these workers. This will limit job growth to some extent. However, job openings will continue to arise from the need to replace workers who leave this occupation.

Life, physical, and social science technicians, all other

	Employment		Employment Change	
	2008	2018	Number	Percent
National	64,700	73,300	8,600	13.3
State	430	430	0	0.0

WATER TREATMENT PLANT OPERATORS treat water so that it is safe to drink. Wastewater treatment plant operators remove pollutants from wastewater so it is safe to return to the environment.

Preparation
For county government positions, a high school education or equivalent is generally required. High school courses in biology, physics, chemistry, and math are helpful. Employers often prefer applicants with post-high school training or related experience in such areas as water treatment or electricity and mechanical repair. Work experience in industrial or fuel plants may be helpful. Mechanical experience gained through the military and through such jobs as stationary equipment operator, mechanic, or boiler operator is helpful. Bachelor's degree programs in water quality, chemistry, or civil or mechanical engineering may be helpful in some cases. In some settings, skills may be gained through on-the-job

training. Related courses are offered in Hawaii. Courses on how to monitor, sample, and test water samples may be helpful.

Wages
Wages vary by area of the country. Operators who work at water treatment plants in big cities tend to earn more. The operator's level of experience and training also affect wages.

Operators usually receive benefits that include health and life insurance, paid vacation, and a retirement plan. Some employers also pay for job-related training courses.

Water and Wastewater Treatment Plant and System Operators

Location	Pay Period	25%	Median	75%
Hawaii	Hourly	$19.43	$22.71	$26.17
	Yearly	$40,410	$47,250	$54,440
Honolulu	Hourly	$19.86	$23.28	$26.76
	Yearly	$41,320	$48,420	$55,650
United States	Hourly	$15.14	$19.60	$24.99
	Yearly	$31,480	$40,770	$51,970

Outlook
In Hawaii, employment is expected to grow much faster than average through the year 2018. Job openings are expected to arise from both employment growth and replacement needs. Outlook depends on economic conditions, government regulations, industry growth, the number of qualified applicants, earnings, technological advances, and replacement needs.

Nationally, the number of jobs for water treatment plant operators is expected to grow much faster than average through the year 2018.

Major employers:
- Local government agencies (water treatment agencies)
- Water supply services

As the population increases, so will the demand for water. Many cities are responding to this demand by building more treatment plants. In addition, many manufacturers are beginning to treat wastewater before it leaves their plants. Both of these factors should increase the demand for operators.

Opportunities for water treatment plant operators should be good. While this occupation has a low turnover rate, it also has a low number of applicants for jobs. Thus, qualified applicants should have good job prospects. Water and wastewater treatment plant operators generally have steady employment. This is because their services are needed regardless of the state of the economy.

Water and Wastewater Treatment Plant and System Operators

	Employment		Employment Change	
	2008	2018	Number	Percent
National	113,400	135,900	22,500	19.8
State	350	430	80	22.9

Local Agriculture Programs of Study and Training

Career Kōkua, the Hawai‘i Career Information Delivery System

DLIR Research and Statistics Office

AGRICULTURAL BUSINESS AND PRODUCTION programs intend to provide the scientific knowledge and technical skills needed to produce agricultural products or to work in agricultural businesses and agencies. Programs vary in content and emphasis and range from certificate programs to associate, bachelor's, master's, and doctoral degree programs.

Coursework varies; however, students in 4-year programs usually take chemistry, math, physics, biology, and general lower division courses in their first two years and then meet specific degree requirements. Programs often include the following courses:

- Animal Science
- Bioengineering
- Crop Science and Production
- Management in Agribusiness
- Soil Science

Programs usually consist of lectures, laboratory work, and field experience. Consult college catalogs for more complete descriptions of curricula.

2 BIG ISLAND SCHOOLS

Hawaii Community College (12311) LOCATION: HILO

"AGRICULTURE": 1-year certificate of achievement and 2-year associate in applied science degree programs. Intend to prepare students for employment in government service, agribusiness, horticulture, livestock, sugar, flowers and foliage, macadamia nuts, papaya, and coffee industries.

University of Hawaii at Hilo (13327) LOCATION: HILO

"AGRICULTURE": Bachelor of science degree program. Curriculum consists of general agriculture courses and an agriculture specialty. Students may pursue specialties in agribusiness, agroecology and environmental quality, animal science/pre-vet, aquaculture, crop protection, general agriculture, and tropical horticulture.

“AGRIBUSINESS SPECIALTY": Bachelor of science degree program. Intends to prepare students for a variety of areas such as marketing of agricultural products, agricultural sales of equipment and supplies, employment in management, financial institutions, brokerage firms, and farm appraising. Program is flexible to meet student's individual interest. Students may gain experience through an internship program.

“GENERAL AGRICULTURE SPECIALTY": Bachelor of science degree program. Intends to prepare students with a general background in agriculture. Upon completing the various agriculture courses, students may transfer to another program within the College of Agriculture such as animal science, agribusiness, crop protection, and tropical horticulture. Students may also be prepared for graduate programs in agriculture at other institutions.

“AQUACULTURE SPECIALTY": Bachelor of science degree program. Intends to prepare persons as aquaculturists who are qualified for technician and biologist positions, as owners/operators of aquaculture farms, or for graduate school.

“AGROECOLOGY AND ENVIRONMENTAL QUALITY SPECIALTY": Bachelor of science degree program. Curriculum is designed for students interested in sustaining agrarian and surrounding ecosystems through more efficient management of wind, biota, and water. Intends to prepare students for career opportunities in environmental regulatory agencies, conservation, farm service agencies, and consulting. Also intends to prepare students for graduate studies.

1 MAUI SCHOOL

University of Hawaii Maui College (12211) LOCATIONS: KAHULUI, KAUNAKAKAI, AND LANAI CITY

“SUSTAINABLE TROPICAL CROP PRODUCTION": 15-credit certificate of completion program. Includes instruction in vegetable crop production, farm tractor and equipment operation, agricultural enterprise, soils technology, and irrigation principles and design.

“SUSTAINABLE TROPICAL CROP MANAGEMENT": 1-year (39-credit) certificate of achievement and 2-year (60-credit) associate in applied science degree programs which are part of the Agricultural Careers program. Include instruction in all certificate of completion courses plus weed science, horticulture, small engine repair, and other areas.

1 OAHU SCHOOL

Leeward Community College (12115) LOCATION: PEARL CITY

“COMMUNITY FOOD SECURITY”: 2-semester (26-credit) academic subject certificate program. This program intends to provide students with the skills and knowledge of the operation of a certified organic farm and the sale of products grown on the farm. The courses will also teach students skills to provide educational activities to elementary, middle, and high school students, knowledge of Hawaiian culture, and knowledge related to plants, nutrition, the environment, and agriculture. With this foundation, students may pursue degrees in a variety of areas including, environmental resources, education, nutrition, culinary arts, and business.

Programs in **ANIMAL SCIENCES** intend to teach the principles and skills that apply to the production and management of animals and animal products. Programs cover health, nutrition, physiology, breeding, genetics, and management of both companion and farm animals including swine, poultry, beef, dairy and aquaculture specialties. Depending on specific courses taken, the program may also prepare students for training in veterinary medicine.

Most 4-year programs include other science courses such as chemistry, biochemistry, genetics, and physics. Preveterinary students may also take additional courses in biology, microbiology, and zoology. Most programs also include courses in animal nutrition, physiology, genetics, biotechnology, and production. Consult college catalogs for more complete descriptions of curricula.

1 BIG ISLAND SCHOOL

University of Hawaii at Hilo (13327) LOCATION: HILO

"ANIMAL SCIENCE SPECIALTY": Bachelor of science degree program. Designed for persons interested in livestock production, animal-related industries, preveterinary medicine and pregraduate studies. Provides classroom education and "hands-on" laboratories at the university farm and privately owned ranches. Curriculum includes core courses such as introduction to animal science, livestock management techniques, animal nutrition, reproduction in farm animals, feeds and feeding, anatomy and physiology, and animal breeding and genetics. Animal science electives include range management, bovine reproductive techniques, livestock and meat evaluation, animal diseases and parasites, and production courses for most livestock species.

1 OAHU SCHOOL

University of Hawaii - Manoa Campus (13129)* LOCATION: HONOLULU

Programs offered by the College of Tropical Agriculture and Human Resources (CTAHR) intend to prepare students for effective service in business, industry, research, government, the community, and teaching. Contact the CTAHR Office of Academic Affairs or individual department offices for more information.

“ANIMAL SCIENCE": 4-year bachelor of science (BS) degree program. This program, with advising, also intends to prepare students for entrance into veterinary medicine.

“ANIMAL SCIENCES": 30-credit master of science (MS) degree program. Areas of concentration include biotechnology, meat science, genetics, nutrition, animal diseases, and reproductive physiology. Strong background in chemistry, biochemistry, biology, and/or mathematics is desirable depending upon specialization.

* Changes may be made during each academic year.

Programs in **BIOLOGICAL SCIENCES** intend to provide a better understanding of the living world through general or specialized study of microbial plant and animal life. Many 4-year colleges offer bachelor's degrees in biology and/or specialty areas such as marine biology, microbiology, botany, entomology, plant pathology, and zoology. Some also offer

master's and doctoral degrees. Most community colleges offer the first two years of additional degree requirements that can be transferred to a 4-year college for degree completion. Many majors take courses in education to be certified as teachers. Many 4-year biological sciences programs can be designed as preprofessional programs in medicine, dentistry, pharmacy, optometry, or veterinary medicine. Some programs allow students to spend their fourth year at an approved hospital clinical laboratory to get medical technology training.

Program requirements differ, but most include courses in:

- Anatomy
- Biochemistry
- Botany
- Chemistry
- Ecology and Evolution
- Genetics
- Marine Biology
- Mathematics
- Microbiology
- Molecular Cell Biology
- Physics
- Physiology
- Zoology

Instruction generally consists of lectures, laboratory work, and required scientific reading. Some degrees require students to obtain research experience. Consult school catalogs for more complete descriptions of curricula.

1 BIG ISLAND SCHOOL

University of Hawaii at Hilo (13327) LOCATION: HILO

"BIOLOGY": 4-year bachelor of arts degree program. Areas of emphasis include microbiology, molecular biology, marine biology, cell biology, botany, and zoology. Biomedical studies are offered in premedicine, predental, preveterinary, and pre-physical therapy areas. See UH-Hilo catalog for details. See PROGRAM 521 Physical Science, General for more information on programs in natural science.

"TROPICAL CONSERVATION BIOLOGY AND ENVIRONMENTAL SCIENCES": Master of science degree program. Intends to provide graduate training in conservation biology and environmental science and prepare students for technical positions and for entry into Ph.D programs in related fields. Students must have a bachelor's degree and be currently working in the field.

4 OAHU SCHOOLS

Brigham Young University - Hawaii (13113) LOCATION: LAIE

"BIOLOGICAL SCIENCES": 4-year bachelor of science degree program. Emphasis is on current developments in physiology, ecology, molecular biology, genetics, taxonomy, and anatomy of living organisms. Students may specialize in either general biology or pre-professional biology.

"BIOLOGY EDUCATION": Bachelor of science degree program. Designed to prepare teachers to teach biology in intermediate and high schools. This is a cooperative program administered by the School of Education. The biology content covers zoology, anatomy, genetics, physiology, and related chemistry and biology. See online catalog at www.byuh.edu.

"BIOCHEMISTRY": 4-year bachelor of science degree program. The biochemistry major is administered by the Chemistry Department with close coordination with the Biology Department. The degree provides a background for those interested in professional work in biochemistry and those planning to attend a professional or graduate school. A core of courses includes offerings in chemistry and biology which yield a solid background in biochemistry and strong foundations in organic chemistry, analytical chemistry, instrumental analysis, and spectroscopy. Based on his or her professional goals, the student selects a minimum of eight additional elective credits from a selection of courses in chemistry and biology.

Those planning to go to graduate schools and professional schools are strongly advised to obtain appropriate backgrounds in mathematics, physics and computers. All students are required to do an undergraduate research project.

Chaminade University of Honolulu (13117) LOCATION: KAIMUKI

"BIOLOGY": 4-year bachelor of arts degree programs. Designed for students planning to pursue a master's, doctorate, or a professional degree. This program allows for more electives within the major and liberal arts areas.

"BIOLOGY": 4-year bachelor of science degree program. Designed for students interested in graduate and professional programs.

Hawaii Pacific University (13121) LOCATION: HONOLULU/KANEOHE

“BIOLOGY": 124-credit bachelor of science degree program. Students may choose from one of two options. Option 1 is the general biology program of study which provides a broad, yet integrated curriculum. It provides the background and preparation for a variety of biological careers and further areas of studies including wildlife biology, conservation ecology, molecular biology, zoology, botany, and physiology. Option 2 is the human and health sciences program of study. This option prepares students for entry into medical, dental, and veterinary schools, pharmacy and health care training programs, and graduate studies in health related fields. It also provides the scientific background for careers in biotechnology, cell and molecular biology, and biomedicine.

“MARINE BIOLOGY”: 124-credit bachelor of science degree program. This is a rigorous program that includes a sequence of courses and laboratory and fieldwork. This program prepares students to enter the private or public sector and domestic or international careers in fields such as living marine resource management, marine environmental analysis and protection, and interpretation or teaching biology and marine science. Students also achieve the academic preparation to pursue a master’s or doctoral degree in their field.

University of Hawaii - Manoa Campus (13129)* LOCATION: HONOLULU

"MATHEMATICAL BIOLOGY": Certificate in mathematical biology program. The purpose of this certificate program is to induce students to pursue the interdisciplinary study of biology and mathematics together with research. Students must complete 15 credits of approved coursework with a "C" grade or higher and attain a GPA of 2.5 in the collection of courses used to satisfy the certificate requirements. Acceptance into this program requires completion of either Math 304 or 305 with a grade of "C" or better.

"BIOLOGY": 4-year bachelor of arts (BA) and bachelor of science (BS) degree programs. A minor is also offered. The BA degree program is specifically designed for premedical and other preprofessional students. The BS degree is designed to prepare students for graduate study in biotechnology, ecology/evolution, cell/molecular, organismic, or marine/aquatic biology as well as for secondary science education. Prospective majors should consult the Department of Biology early in their studies to design a curriculum that satisfies program requirements.

"MARINE BIOLOGY": 4-year bachelor of science (BS) degree program. The BS degree program has a very rigorous curriculum that will provide students with an excellent foundation in marine biology and related disciplines. It is built on a balanced understanding of the biology of the marine organisms, the marine environments, the organization of organisms into communities, and the relationship between these organisms and their environments. Students will be able to study a wide range of pelagic fishes, as well as sharks, marine mammals, seabirds, reef species, plants and micro-organisms. Extensive field experiences are integrated with traditional classroom and laboratory courses. It will prepare some students for employment in marine biology and others for admission to graduate schools. Prospective students should consult the Department of Biology early in their studies.

"MOLECULAR CELL BIOLOGY": 4-year bachelor of science (BS) degree program. The objective of the BS program is to prepare students for careers in fields that require advanced knowledge of molecular biology, in particular those that relate to human health and welfare. Examples of such fields include, but are not limited to medicine, pharmacology, pathology, genetic testing and counseling, biotechnology, nanotechnology, teaching, and basic research in the life sciences. This program focuses on the molecular biology of eukaryotic cells and organisms with emphasis on understanding of the molecular biology of human health, disease, and treatment. Contact an advisor in the Department of Microbiology for details.

“BOTANY": 4-year bachelor of arts (BA) and bachelor of science (BS) degree programs. The BA degree is a liberal arts degree with an emphasis on understanding modern concepts in plant sciences. The BS degree is a pre-professional degree intended for students who plan advanced study in botany, a career in secondary science education, or for positions requiring detailed knowledge of plants. Students should consult the Department of Botany early in their studies to design a curriculum which satisfies program requirements.

“BOTANY": Master of science (MS) and doctor of philosophy (PhD) degree programs. Six tracks are available: conservation, ecology, ethnobotany, general botany, systematics and evolution, and structure/function. An inter-departmental graduate program is available through Ecology, Evolution, and Conservation Biology (EECB)-Botany. Requires adequate preparation in anatomy, biochemistry, ecology, genetics, physiology, systematics, mathematics, organic chemistry and physics. Contact: Graduate Chair, Department of Botany for details.

“BIOMEDICAL SCIENCES": Master of science (MS) and doctor of philosophy (PhD) degree programs offered in the following areas of concentration: anatomy and reproductive biology, biochemistry, biophysics, genetics and molecular biology, pharmacology, physiology, and tropical medicine. A PhD degree program is offered in biostatistics-epidemiology. A Ph.D in biomedical sciences non-disciplinary program is also offered. Contact the College of Natural Sciences for details.

“ETHNOBOTANY”: 4-year bachelor of science degree program. This program integrates biological and social science theories. Graduates of this program will be prepared to work in areas related to the conservation of biological and cultural diversity and in natural health care businesses and practices. Students will also be prepared to enter graduate school programs in ethnobotany, botany, anthropology, and related fields or enter advance medical training programs. For more information, contact Ethnobotany Advisor, Department of Botany.

“NATURAL RESOURCES AND ENVIRONMENTAL MANAGEMENT": 4-year bachelor of science (BS) degree program. Interdisciplinary study in the management of natural and environmental resources. General core in the natural and social sciences, environmental issues and policy, quantitative and analytical methods, applied management techniques, and an internship. Students select between two upper-division tracks that emphasize either the biological/physical sciences or social science. The tracks provide greater depth in the respective area plus individual student specialization in a specific subfield. Contact the Department of Natural Resources and Environmental Management for details.

"MICROBIOLOGY": 4-year bachelor of arts (BA) and bachelor of science (BS) degree programs. The BA degree is a liberal arts degree designed for pre-health professionals, educators, and those with a wide-range of interests. Students may focus on areas such as infectious disease, immunology, environmental microbiology, molecular biology, virology and cell biology of microorganisms. The BS degree is designed for those seeking a career in microbiology, molecular biology, immunology, virology or infectious diseases. This degree intends to prepare students to enter the work force as professional microbiologists or to enter graduate programs in microbiology or other biological disciplines. Contact an advisor in Department of Microbiology for details.

“MICROBIOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs offer advanced training with specialization in microbial ecology, biochemistry, physiology, molecular genetics; metabolic regulation, regulation of gene expression; immunology, immunogenetics, immunochemistry; medical microbiology; animal and environmental virology, viral pathobiology; and cell biology. Undergraduate preparation in biological and physical sciences is desirable. Contact the Chairperson, Department of Microbiology for details.

“ZOOLOGY": 4-year bachelor of arts (BA) and bachelor of science (BS) degree programs. The BA degree is a liberal arts degree allowing specialization in broad areas of zoology such as marine biology, cell and molecular biology, ecology, evolution and conservation biology, and aquaculture. This degree is particularly suited for preprofessional careers in the health sciences (e.g., premedical and physician assistant, predental, preveterinary medical, preoptometry) and allied fields (e.g., cytotechnology, biotechnology, animal technicians) and as a basis for prelaw (e.g., environmental law). The BS degree provides good preparation for graduate study in zoology, for technical training in zoology (e.g., aquatic technicians, animal caretakers) and as preparation for secondary school teachers of zoology and biological science. Prospective majors should consult a departmental advisor as early as possible.

“ZOOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs. Areas of strength include marine biology, ecology, evolution, and conservation biology, comparative physiology, ichthyology, avian biology, and developmental biology. Contact Graduate Chair, Department of Zoology for details.

“ENTOMOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs offer instruction in insect biology, ecology, pest management, biological control, and a variety of other topics related to agricultural and environmental protection and the study of insects in natural, agricultural and urban situations. Contact the Department of Plant and Environmental Protection Sciences College of Tropical Agriculture and Human Resources for program details.

“PLANT AND ENVIRONMENTAL PROTECTION SCIENCES”: The bachelor of science (BS) degree program offers the opportunity to take courses in environmental issues, pest management, plant protection, entomology, plant pathology and application of biotechnology to applied biological issues. Graduates are prepared for careers in state and federal agricultural and environmental agencies, pest management in the private sector, field and laboratory research, or further graduate study in the biological, agricultural, and environmental sciences. Contact the Department of Plant and Environmental Protection Sciences, College of Tropical Agriculture and Human Resources for program details.

“TROPICAL PLANT PATHOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs. Contact the Department of Plant and Environmental Protection Sciences for details.

* Changes may be made during each academic year.

ENGINEERING TECHNOLOGIES programs intend to prepare individuals to support and assist engineers and other professionals. Programs stress specialized, practical knowledge related to the mathematical, scientific, and technical areas of engineering and related sciences. Related technologies include environmental and sanitation technologies. Persons may work as surveyors, drafters, quality control inspectors, engineering technicians, construction and building inspectors, compliance officers and inspectors, water and wastewater treatment plant operators, and in other occupations. Certificate and associate degree programs are offered. (Also see PROGRAM 631 Apprenticeship for information on apprenticeships in environmental and sanitation technologies.)

Programs vary extensively depending on technical specialty area. Programs may include general education degree requirements such as English composition, health, and communication skills. Instruction usually includes technical reading, report writing, and laboratory work. High school algebra, geometry, and physics provide a good background for these programs. Consult school catalogs for more complete descriptions of curricula and academic requirements.

1 MAUI SCHOOL

University of Hawaii Maui College (12211) LOCATIONS: KAHULUI, KAUNAKAKAI, AND LANAI CITY

"ENGINEERING TECHNOLOGY": Bachelor of applied science degree program. This program offers options to students seeking preparation in engineering technology, electronics, optics, and remote sensing. The curriculum emphasizes engineering technology and stresses the effective use of integrated electro-optic hardware and software systems. It also includes strong interdisciplinary general education with courses in the humanities, social sciences, communication, mathematics, and English.

1 OAHU SCHOOL

Honolulu Community College (12111) LOCATION: HONOLULU

"OCCUPATIONAL AND ENVIRONMENTAL SAFETY MANAGEMENT (OESM)": 46-credit certificate of achievement and 65-credit associate in science degree programs. The health and safety profession is one of the fastest growing professions. The OESM program offers theoretical and practical training on recognition, evaluation, and control techniques of workplace and environmental hazards. Graduates work in various government and business sectors to prevent work-related accidents, advise employees on hazardous material handling, develop and implement safety/environmental management programs, provide consultations on regulatory requirements related to occupational safety and environmental protection. Prerequisite courses include English 22-60 and Math 25 or placement in English 100 and Math 103/115.

Programs in **FOOD SERVICES/CULINARY ARTS** intend to provide persons with managerial, production, and/or service skills used in a variety of food establishments. Diploma, Certificate, and 2-year associate degree programs are offered.

Programs may include all or some of the following:

- Asian/Pacific Cuisine
- Baking
- Continental Cuisine
- Cookery
- Cost Control
- Dining Room Operations
- Food Preparation
- Internship
- Management
- Menu Merchandising
- Nutrition
- Sanitation/Safety

Programs usually emphasize practical experience. See school catalogs for complete descriptions of curricula.

1 BIG ISLAND SCHOOL

Hawaii Community College (12311) LOCATION: HILO

"FOOD SERVICE": 42-credit certificate of achievement and 63-credit associate in applied science degree programs. Intend to prepare students for entry-level positions in the food service industry. Degrees are also offered at West Hawaii.

1 KAUAI SCHOOL

Kauai Community College (12411) LOCATION: PUHI

"CULINARY ARTS": The culinary arts program is designed to meet the needs of persons who are already employed in the culinary arts area and to prepare persons for entry in that field:

- 9-credit certificate of competence in food service.
- 16-credit certificate of completion in food service.
- 30-credit certificate of achievement in culinary arts.
- 62-credit associate in applied science degree program in culinary arts.

2 MAUI SCHOOLS

Hawaii Job Corps Center (43111) LOCATION: MAKAWAO

"CULINARY ARTS": Estimated 12-month to 24-month certificate program. Provides on-center training in a variety of skills to include, but not limited to: counter, cashiering and customer service skills, food safety, ServSafe certification, cleaning and sanitization, nutrition, knife skills, culinary fundamentals, preparing and cooking meat, poultry, and fish/shellfish, preparation of stocks, soups, and sauces, and introduction to pantry, station saute and panfry cooking and baking. Program includes 12 weeks of work-based learning off-center.

University of Hawaii Maui College (12211) LOCATION: KAHULUI

"SANITATION": 2-credit certificate of competence program.

“PANTRY COOK": 2-credit certificate of competence program.

“WAITER/WAITRESS": 3-credit certificate of competence program.

“PREPARATION COOK": 4-credit certificate of competence program.

“SHORT ORDER COOK": 2-credit certificate of competence program.

“STOREROOM CLERK": 4-credit certificate of competence program.

“BAKER'S HELPER": 4-credit certificate of competence program.

“PASTRY COOK": 12-credit certificate of competence program.

“CULINARY ARTS": 31-credit certificate of achievement and 64-credit associate in applied science degree programs.

“BAKING”: 2-year (65-credit) associate in applied science degree program.

“RESTAURANT SUPERVISION”: 2-year (73-credit) associate in applied science degree program.

5 OAHU SCHOOLS

Hawaii Job Corps Center (43111) LOCATION: WAIMANALO

"CULINARY ARTS": Estimated 12-month to 24-month certificate program. Provides on-center training in a variety of skills to include, but not limited to: counter, cashiering and customer service skills, food safety, ServSafe certification, cleaning and sanitization, nutrition, knife skills, culinary fundamentals, preparing and cooking meat, poultry, and fish/shellfish, preparation of stocks, soups, and sauces, and introduction to pantry, station sauté and panfry cooking and baking. Program includes 12 weeks of work-based learning off-center.

Kapiolani Community College (12113) LOCATION: HONOLULU

“CULINARY (PATISSERIE)": 19-credit certificate of completion program. Intends to prepare students for employment as pastry cooks, baker's helpers and other skilled entry-level positions in bakeries, hotels, and patisseries.

“CULINARY (PATISSERIE)": 65-credit associate in science degree program. Intends to prepare students for entry into the patisserie industry and for advancement to such positions as professional bakers, pastry cooks, and assistant pastry chefs.

“CULINARY(DINING ROOM)": 16-credit certificate of completion program. Intends to prepare students for employment as waiters/waitresses, hosts/hostesses, or captains.

“CULINARY(CULINARY ARTS)": 14-credit certificate of completion program. Intends to prepare students for employment as prep cooks, cooks helpers, and pantry helpers in restaurants, hotels, and institutions.

"CULINARY(CULINARY ARTS)": 45-credit certificate of achievement program. Intends to prepare students for employment as garde manager helpers, short-order cooks, and assistant sous chefs in restaurants, hotels, clubs and institutions.

“CULINARY (CULINARY ARTS)": 70-to 72-credit associate in science degree program. Intends to prepare students for entry into the food service industry and for advancement to such positions as line cooks, sous chefs, food service supervisors, assistant managers, and managers.

“CULINARY (INSTITUTIONAL FOOD SERVICE MANAGEMENT)”: 63-credit associate in science degree program. This program intends to prepare students for entry into culinary arts field in institutional organizations such as hospitals and schools.

Leeward Community College (12115) LOCATION: PEARL CITY

"CULINARY ARTS": 10-credit to 16-credit certificate of completion program offered in prep cook, baking, and dining room supervision.

“CULINARY ARTS": 33-credit certificate of achievement program. Intends to prepare students with basic skills for entry-level food service positions.

“CULINARY ARTS": 67-credit associate in applied science degree program. Includes the certificate of achievement program courses plus general education and additional food service courses.

Travel Institute of the Pacific (15189) LOCATION: HONOLULU

“CULINARY ARTS": 11-month diploma program. Program is an in-depth course for the understanding, preparation, and production of worldwide cuisines. From history of foods to present day theories, terminology, systems, and trends, the program is designed to provide training for persons interested in becoming food service industry professionals. Program combines classroom lecture and hands-on kitchen preparation and production skills. Students will master the commercial kitchen while learning basic through advanced cooking techniques. Preparation of recipes, portioning, styling, and presentation with an emphasis on classic French cooking will equip students with a foundation for a career as a culinary professional.

University of Hawaii - West Oahu (13131) LOCATION: PEARL CITY

DISTANCE LEARNING: AVAILABLE

"CULINARY MANAGEMENT": Bachelor of applied science degree program with a concentration in culinary management. This program is designed to supplement Kapiolani Community College's culinary arts associate's program. It provides culinary students and those already working in the industry the strong business background needed to excel in the workforce. In addition to developing an understanding of the management, marketing, ethical, and legal aspects of running a food service operation, students will also learn valuable communication and leadership skills that are essential for higher level management positions.

HORTICULTURE AND HORTICULTURAL BUSINESS SERVICES programs generally prepare people to produce, research, and understand fruits, vegetables, flowers or ornamental plants. Programs also prepare persons to manage the business operations of nurseries, greenhouses and other similar operations. Depending on the scope and focus of the program, students may train for occupations in agribusiness, landscaping, production, extension services, education or research. Certificate and associate, bachelor's, and graduate degree programs are offered.

Programs vary, but usually include courses in chemistry and botany. Instruction generally consists of classroom, laboratory, and field work. Consult college catalogs for more complete descriptions of curricula.

1 BIG ISLAND SCHOOL

University of Hawaii at Hilo (13327) LOCATION: HILO

"TROPICAL HORTICULTURE SPECIALTY": Bachelor of science degree program. Intends to prepare students for employment in government service; nurseries; landscaping; tissue culture laboratories; flower, fruit, nut, and vegetable farms; or related industries. Also intends to prepare students for graduate school. Students are instructed with state-of-the-art equipment, new teaching classroom/laboratory facilities, and a fully-operational university farm laboratory.

1 KAUAI SCHOOL

Kauai Community College (12411) LOCATION: PUHI

"PLANT BIOSCIENCE TECHNOLOGY": 23-credit advanced academic subject certificate program. This program is designed to provide students with education and training in horticulture, propagation/micropropagation, agriculture, pest management, and crop improvement.

1 MAUI SCHOOL

University of Hawaii Maui College (12211) LOCATIONS: KAHULUI, KAUNAKAKAI, AND LANAI CITY

"AGRICULTURE SCIENCE": 7-credit certificate of competence program.

"NURSERY PRODUCTION": 9-credit certificate of competence program.

"PEST MANAGEMENT": 9-credit certificate of competence program.

"LANDSCAPE MAINTENANCE": 13-credit certificate of completion program.

"FLORICULTURE MANAGEMENT": 34-credit certificate of achievement program.

"NURSERY MANAGEMENT": 34-credit certificate of achievement program.

"HORTICULTURE AND LANDSCAPE MAINTENANCE": 1-year (40-credit) certificate of achievement and 2-year (60-credit) associate in applied science degree programs which are part of the Agricultural Careers program. Include instruction in soils technology, plant disease and pest control, irrigation principles and design, ornamental plant materials, and other areas.

"TURFGRASS SPECIALIST": 3-semester (23-credit) certificate of completion program designed to train persons to work in the specialized turfgrass industry, including golf courses, hotels, condominiums, parks, and sod farms.

3 OAHU SCHOOLS

Hawaii Job Corps Center (43111) LOCATION: WAIMANALO

"HORTICULTURE/LANDSCAPING": Estimated 12-month to 24-month certificate program. Provides on-center training and to include but not limited to: General safety, chemical spills, pesticide safety, plant physiology, woody ornamentals, soil preparation and maintenance, installing and maintaining trees, shrubs, groundcover and turf grass, fertilizers, irrigation systems and equipment operations and maintenance. Includes 12 weeks of work-based learning off center.

University of Hawaii - Manoa Campus (13129)* LOCATION: HONOLULU

Programs offered by the College of Tropical Agriculture and Human Resources (CTAHR) intend to prepare students for effective service in business, industry, research, government, and the community, and teaching. Contact the CTAHR Office of Academic and Student Affairs or individual department offices for more information.

“HORTICULTURE/TROPICAL HORTICULTURE": The program offers a BS degree in Tropical Plant and Soil Sciences with specializations in (1) Plant Sciences and Genetics, (2) Plant Production and Management, and (3) Environmental Soil Science. Students have an opportunity to take courses in tropical flower, fruit, vegetable and crop production, turf and landscape management, plant physiology, breeding and genetics, and soil science. They learn about the full spectrum of subjects and activities required to understand and responsibly manage land, water, crops, and their environments for the benefit of humankind. In addition, they learn about the adaptation and application of new technologies, such as molecular biotechnology, computer-based systems, and the Internet, to enhance plant production systems, assure a safe food supply, and protect the environment. For more information, call 956-8909 or 956-5900.

“HORTICULTURE/TROPICAL HORTICULTURE": The department offers graduate study leading to the MS (Plan A, Plan B and Plan C) and PhD degrees. The TPSS graduate program has three options: Plant Science, Horticulture, and Soil Science. All three options emphasize the development of problem-solving skills that integrate molecular, biochemical, physiological, chemical, genetic and ecological approaches to collaborative research in plant and soil sciences. The Plant Science option develops the adaptation and application of biotechnology to tropical crop plant production and requires understanding of fundamental biological processes, molecular and organism biology, genetics, plant physiology, and crop production systems. The Horticulture option explores the many facets of tropical food and ornamental crop production and requires the understanding of agricultural systems, plant production, soil fertility, and protection of the environment, as well as supporting disciplines such as crop ecology, plant physiology, and molecular biology. For more information, call 956-5698 or 956-5900.

* Changes may be made during each academic year

Windward Community College (12117) LOCATION: KANEOHE

"AGRICULTURAL TECHNOLOGY': 1-semester certificate of completion and 2-semester certificate of achievement programs. Designed for students desiring entry-level employment or to enhance their skills in the field of plant landscaping (landscape maintenance, turfgrass maintenance, nursery operations, and/or retail plant outlets).

Programs in **NATURAL RESOURCES AND CONSERVATION** intend to prepare people to manage and protect forest lands and natural resources. Specialty areas include forest hydrology, forest recreation, and forest management. Also included are programs in environmental science/studies that include the study of biological and physical aspects of the environment and environment-related issues. Undergraduate certificate and bachelor's and master's degree programs are offered at universities and colleges throughout the U.S. Many community colleges and 4-year colleges also offer first-year degree requirements that may be transferred to a 4-year program for degree completion.

Coursework varies with specialty. Many programs include courses in mathematics, chemistry, biology, botany, zoology, soils, ecology, geology, physics, communications, computer science, economics, business administration, environmental science, oceanography, and statistics. Many programs also include courses in water and soil quality, wildlife conservation, and environmental policy. Instruction generally consists of laboratory, classroom, and field work along with technical reading and senior thesis. In addition to forestry course work, longer programs usually include courses in the social sciences and humanities. Consult school catalogs for more complete descriptions of curricula.

1 BIG ISLAND SCHOOL

Hawaii Community College (12311) LOCATION: HILO

"TROPICAL FOREST ECOSYSYSTEM AND AGROFORESTRY MANAGEMENT": Certificate of achievement and associate in applied science degree programs. Prepares students to actively manage threatened native forests and manage the regeneration of Hawaii's native ecosystems. Students will learn how to grow native plants and establish agroforestry operations. Students will also be trained in the use of electronic data-loggers, Geographic Positioning Systems (GPS), and Geographic Information Systems (GIP). Classes and internships will involve rigorous fieldwork in forests and lava flows. Entry requirements include placement tests, completion of English 21 or placement in English 102, completion of Math 25x or 26 or placement in Math 100 and completion of English 22 or placement in English 100. Call 808-974-7537/974-7510 or go to http://www.hawcc.hawaii.edu/hawcc/forestteam for more information.

4 OAHU SCHOOLS

Chaminade University of Honolulu (13117) LOCATION: KAIMUKI

"ENVIRONMENTAL STUDIES": 4-year bachelor of science degree program. Intends to prepare students for careers in environmental service, science, business, communications, consulting, ethics, health, law, policy, as well as careers in government and non-profit environmental sectors. Students receive the broad-based knowledge required to fully comprehend and successfully problem-solve environmental challenges, work in the environmental industry, and run environmental businesses and organizations.

Hawaii Pacific University (13121) LOCATION: HONOLULU/KANEOHE

“ENVIRONMENTAL SCIENCE": 4-year bachelor of science degree program. Designed to prepare students for careers as environmental scientists.

“ENVIRONMENTAL STUDIES": 4-year bachelor of arts degree program. Designed to prepare students for careers with both private and public organizations that have significant environmental concerns or that deal with development and implementation of environmental policies.

University of Hawaii - Manoa Campus (13129)* LOCATION: HONOLULU

"GLOBAL ENVIRONMENTAL SCIENCE": Bachelor of science degree program. Refer to program 528 Oceanography for details.

*Changes may be made during each academic year. For more current information, please call the department chair of each unit.

University of Hawaii - West Oahu (13131) LOCATION: PEARL CITY

"CERTIFICATE IN INTERDISCIPLINARY ENVIRONMENTAL STUDIES": 18-credit upper division certificate program which provide students with an understanding of the underlying scientific and societal roles to finding solutions. Entry into this certificate program requires admission to UHWO and completion of a minimum of 54 transferable lower division credits.

Programs in **PLANT AND SOIL SCIENCES** teach scientific principles to maintain and improve the quality of soils and plants for food, feed, and soil conservation. Specific programs of study include agronomy, horticulture science, plant pathology, soil conservation, and soil management.

Coursework varies with specialty. Programs usually include most of the following:

- Botany
- Chemistry
- Crop Production
- Ecology
- Microbiology
- Pest Control
- Physics
- Plant and Soil Analysis
- Soil Fertility
- Soil Management

Instruction includes lectures, field experience, and laboratory work. Consult school catalogs for more complete descriptions of curricula.

1 BIG ISLAND SCHOOL

University of Hawaii at Hilo (13327) LOCATION: HILO

"CROP PROTECTION SPECIALTY": Bachelor of science degree program. Intends to prepare students for employment as agricultural inspectors, research technicians, teachers, and supervisors of agricultural enterprises. Also intends to prepare students for graduate school. Provides comprehensive training through organized lectures and practical laboratories. Offers a broad range of plant protection courses such as plant pathology, weed science and entomology. Additional courses in horticulture, soil science, animal science, and agricultural engineering round out the agricultural requirements.

2 OAHU SCHOOLS

Leeward Community College (12115) LOCATION: PEARL CITY

"PLANT BIOSCIENCE TECHNOLOGY": 27-credit academic subject certificate. This program is designed to provide plant science and laboratory knowledge and skills to facilitate employment to further education in agricultural business.

University of Hawaii - Manoa Campus (13129)* LOCATION: HONOLULU

Programs offered by the College of Tropical Agriculture and Human Resources (CTAHR) intend to prepare students for effective service in business, research, government, and the community, and teaching. Contact the CTAHR Office of Academic and Student Affairs, or individual department offices for more information.

“PLANT AND SOIL SCIENCES": The program offers a BS degree in Tropical Plant and Soil Sciences with specializations in (1) Plant Sciences and Genetics, (2) Plant Production and Management, and (3) Environmental Soil Science. Students have an opportunity to take courses in tropical flower, fruit, vegetable and crop production, turf and landscape management, plant physiology, breeding and genetics, and soil science. They learn about the full spectrum of subjects and activities required to understand and responsibly manage land, water, crops, and their environments for the benefit of humankind. In addition, they learn about the adaptation and application of new technologies, such as molecular biotechnology, computer-based systems, and the Internet, to enhance plant production systems, assure a safe food supply, and protect the environment. For more information, call 956-8909 or 956-5900.

The department offers graduate study leading to the MS (Plan A, Plan B, and Plan C) and PhD degrees. The TPSS graduate program has three options: Plant Science, Horticulture, and Soil Science. All three options emphasize the development of problem-solving skills that integrate molecular, biochemical, physiological, chemical, genetic and ecological approaches to collaborative research in plant and soil sciences. The Horticulture option explores the many facets of tropical food and ornamental crop production and requires the understanding of agricultural systems, plant production, soil fertility, and protection of the environment, as well as supporting disciplines such as crop ecology, plant physiology, and molecular biology. For more information, call 956-5698 or 956-5900.

The Plant Science option develops the adaptation and application of biotechnology to tropical crop plant production and requires understanding of fundamental biological processes, molecular and organism biology, genetics, plant physiology, and crop production systems.

“PLANT AND ENVIRONMENTAL PROTECTION SCIENCES": The bachelor of science (BS) degree program offers the opportunity to take courses in environmental issues, pest management, plant protection, entomology, plant pathology and application of biotechnology to applied biological issues. Graduates are prepared for careers in state and federal agricultural and environmental agencies, pest management in the private sector, field and laboratory research, or further graduate study in the biological, agricultural, and environmental sciences. Contact the Department of Plant and Environmental Protection Sciences, College of Tropical Agriculture and Human Resources for program details.

"ENTOMOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs. Instruction is offered in insect biology, ecology, pest management, biological control, and a variety of other topics related to agriculture and environmental protection and the study of insects in natural, agricultural, and urban situations. Contact the Department of Plant and Environmental Protection Sciences College of Tropical Agriculture and Human Resources for program details.

“TROPICAL PLANT PATHOLOGY": Master of science (MS) and doctor of philosophy (PhD) degree programs offer instruction in the biology, ecology, and management of plant pathogens, including nematodes, fungi, bacteria, and viruses. Contact the Department of Plant and Environmental Protection Sciences, College of Tropical Agriculture and Human Resources for program details.

* Changes may be made during each academic year.

