2012 AGRICULTURAL WORKFORCE

Agriculture economy
Employment and earnings
Agriculture labor market
H-2A and prevailing wages
Irrigation and agriculture

Employment Security Department
WASHINGTON STATE

Labor Market and Performance Analysis
December 2013

2012 Agricultural Workforce Report

Washington State Employment Security Department
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Published December 2013

This report was prepared in accordance with the Revised Code of Washington (RCW) 50.38.060.

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LM-13-0371

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Acknowledgments

The authors acknowledge the significant support and advice received in writing this report. Our thanks to all.

Robert Haglund and Donald Krug provided substantial contributions to the design, execution and interpretation of the report.

Any remaining errors are the responsibility of the authors.

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Executive summary

Agriculture is a key component of Washington state's economy. Agricultural production was valued at $9.2 billion in 2011, comprising 2.6 percent of the state's gross domestic product (GDP). Agriculture production value has increased significantly since the Great Recession, surpassing pre-recession levels for the first time in 2011. Agriculture produced an annual average of more than 88,000 jobs in 2012, almost half of which were seasonal. Farmworkers in Washington earned $2.1 billion in 2012 and almost 40,000 agriculture-related manufacturing workers earned an additional $1.7 billion.

The state is characterized by rich and varied soils and climate, plus extensive irrigation resources that yield over 300 diverse crops annually. Crops account for about 70 percent of production value, with the remainder consisting of specialty products and livestock and related products, such as milk. Washington is the leading producer of hops in the United States and has a reputation as a leader in the production of tree fruits – particularly apples, cherries and pears. While soil quality and climate are critical to production of these and other high-value crops in eastern Washington, irrigation was the catalyst that made these activities economically viable in that part of the state.

Washington state's leadership in the production of numerous crops is reflected in the strength of its exports. More than one-third of Washington's agricultural production by value is exported to other countries. Three commodities accounted for more than half of the $3.3 billion in agricultural exports in 2011: wheat, fresh fruits and processed fruits. While processed and fresh fruit exports increased by 17 and 21 percent, respectively, from 2010 to 2011, wheat exports increased by a hefty 70 percent. Most of the remainder of the state's agricultural production is consumed in other states.

The effect of the H-2A guest worker program on seasonal worker shortages in Washington

The H-2A guest worker program is intended to alleviate shortages of seasonal agricultural workers. Thirty-three Washington-based growers were certified to contract with 3,953 H-2A workers in 2012. These workers accounted for 4.3 percent of the 92,840 peak seasonal employment during July.

Washington state growers have been reporting generalized shortages of workers beginning in August 2011. Peak shortages occurred in September of each year, corresponding to an overlap of the apple- and pear-picking seasons. Growers reported shortages of over 5,000 workers during the picking seasons, so although the H-2A program has helped alleviate seasonal shortages, it has not been able to fully accommodate the reported worker shortages.

Unemployment insurance claims by agricultural workers reflect the seasonal nature of agricultural employment in Washington

Unemployment-insurance (UI) claims by agricultural workers increase significantly following the fruit-picking seasons, peak in January, then steadily decline through October (with a slight increase between fruit-picking seasons in late summer). For example, agriculture worker UI claims decreased from 6,099 in January 2012 to 1,267 in October, then rose to 5,785 in December. Nonfarm unemployment-insurance claims, on the other hand, show no discernible seasonal pattern.

Chapter 1: The state of the agricultural economy

This chapter describes the agricultural sector's role in the overall economy of Washington state. The estimates for the current and inflation-adjusted dollar production values – both agricultural commodities and the costs associated with their production – are for calendar year 2011. Employment and earnings data in subsequent chapters are for calendar year 2012.

Agricultural output in quantity terms can vary considerably from year to year based on such factors as new orchard acreage, planting density per acre, the weather, product prices and demand. These complex growing and market conditions affect the demand for labor.[1] For example, the national index of prices for fruits and nuts rose from 169 (December 2011) to 189 (December 2012), a change of 20 index points or an 11.8 percent increase year over year (*Figure 1-3*).

In many respects, especially with respect to the demand for seasonal labor, apple production dominates the infrastructure of the agricultural sector in Washington state. Washington apple growers increased production by 4 percent from 2009 through 2011, while prices received by growers increased by 24.3 percent per pound. This suggests an increase in apple demand greater than the increase in apple supply over the three-year period.

In contrast, sweet cherry production in Washington fell from 490 million pounds in 2009 to 400 million pounds in 2011. This 18.4 percent decrease coincided with a 154.7 percent increase in the average price per pound received by growers – $0.53 per pound in 2009 rising to $1.35 per pound in 2011. However, tart cherry production rose by 25.1 percent from 2009 to 2011, while prices received by growers dropped by 33.3 percent.[2]

The value of agricultural production

The 2011 market value of agricultural production in Washington state reached a record of $9.2 billion, an increase of 15.5 percent over 2010. (See *Figure 1-1.*) Washington's gross domestic product (GDP) increased 4.5 percent, to $355.1 billion over the same period.[3]

Figure 1-1 provides total value of agricultural production with and without the inclusion of government payments. Washington state's total value of agricultural production plus government payments reached $9.4 billion in 2011.[4] These government payments fall into two categories: commodity-related payments and conservation-related payments. Commodity-related payments target specific commodities and are designed to establish price and income support, stabilize production and provide a safety net for farmers. However, these payments do not represent increases in the value of agricultural production, since they are essentially transfer payments. Conservation-related payments also fall into two categories: land-retirement payments and working-land program payments. Land-retirement payments are made to remove environmentally sensitive acreage from production. Working-land program payments are made to address environmental problems, such as pesticide runoff, on acreage in active production. In summary, government payments do provide social benefits, both monetary and non-monetary.[5]

[1] Local geographic variations in this seasonal timing for the demand for labor can lead to spot shortages in any given locale and for any given grower, even when the overall supply of labor is adequate for the statewide growing and harvesting season.

[2] U.S. Department of Agriculture, Economic Research Service, "Fruit and Tree nuts Outlook," FTS-353, September 27, 2012, Table 3, page 6, Table 10, page 20 and Table 11, page 22.

[3] The source of the state gross domestic product (GDP) estimates is U.S. Department of Commerce, Bureau of Economic Analysis. "Widespread Economic Growth Across States in 2011,"News Release, BEA 12-22, June 5, 2012, Table 4. Contrasting estimates for 2010 compared to 2009 were 3.9 percent for state GDP and 11.5 percent for the value of agricultural production.

[4] As used in this report, the total value of agricultural production does not include related government payments.

[5] The payments are, in effect, for "services rendered." However, the economic value of those services is hard to measure and is not necessarily equal to the sum of government payments. The social economic value, the value to the public, of these services could be higher, lower or equal to the sum of government payments.

Figure 1-1. Total value of agricultural production and government payments, in 1,000s of current dollars
Washington state, 2007 through 2011
Source: U.S. Department of Agriculture, Economic Research Service

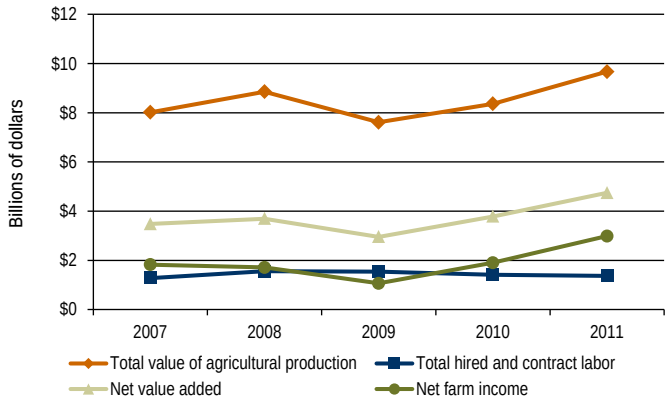
Year	Total value of production	Total value of production plus government payments
2007	$8,165,148	$8,350,252
2008	$7,736,891	$7,937,819
2009	$7,195,206	$7,384,548
2010	$7,938,139	$8,251,960
2011	$9,169,021	$9,400,203
Absolute difference: 2011 compared to 2010	$1,230,882	$1,148,243
Percent difference: 2011 compared to 2010	15.5%	13.9%

The year 2011 set a record in terms of the current dollar value of agricultural production.

Figure 1-2 tracks key components of the agricultural production process in current dollars over time. As *Figure 1-2* shows, total (gross) value of agricultural production (final output), net value added and net farm income generally move together. Expenditures for total hired and contract labor do not track the total value of agricultural production.

Comparison of the two different trend patterns highlights the fact that labor is hired in a resource market for labor, while agricultural production is bought and sold in a product market. Different factors determine the function of these two different markets. These components are discussed in more detail throughout this chapter.

Figure 1-2. Total (gross) value of agricultural production, net value added, total hired and contract labor and net farm income, in 1,000s of current dollars
Washington state, 2007 through 2011
Source: U.S. Department of Agriculture, Economic Research Service



Trend lines confirm that the total value of agricultural-sector production and total hired and contract labor are determined by different markets of supply and demand.

Volatility in agricultural prices

As discussed in previous years' reports, the value of agricultural production depends on demand for and supply of agricultural products in both the United States and world markets. This is particularly true for Washington state, since more than a third of state agricultural production is exported to overseas markets, with most of the remaining two-thirds being exported to the other 49 states.[6]

Figure 1-3 shows recent changes in the price indices for a wide range of agricultural products. All products except commercial vegetables, dairy products and potatoes and dry beans show a gain in prices from 2011 to 2012. This reflects an increase in product demand, which then also reflects an increase in demand for agricultural labor, especially during harvest season.

Year-over-year changes to the total value of agricultural production further highlight the changing situation of supply and demand for agricultural products as shown in *Figure 1-4*.

As in 2010, the crops and products that rose in value in 2011 included large value producers for agriculture, such as apples, milk, wheat, potatoes, hay and all cherry varieties. Apples rose by 18.8 percent, milk rose by 34.4 percent, wheat by 23 percent, potatoes by 17.8 percent, hay by 40.3 percent and all cherries by 45.3 percent. Only four crops and products of Washington's top 40 products fell in value by 15 percent or more in 2011. These four comprised only $239 million of production value.

Figure 1-3. Index of agricultural prices received by farmers, base year 1990 through 1992 = 100
Washington state, 2007 through 2012
Source: U.S. Department of Agriculture, Agricultural Prices, ISSN: 1937-4216, released July 31, 2013

Year	All farm products	All crops	Feed grains and hay	Fruits and nuts	Commercial vegetables	Potatoes and dry beans	Meat animals	Dairy products	Poultry and eggs
2007	136	142	152	158	158	126	118	146	140
2008	149	169	206	149	151	157	117	140	151
2009	131	151	162	140	161	150	106	98	139
2010	141	154	165	155	162	140	123	125	152
2011	178	204	253	169	169	171	151	154	152
2012	191	222	284	189	146	164	160	142	163

Since the base period 20 years ago, all agricultural commodities have risen in price, but all commodities show year-to-year volatility that adds to uncertainty in the production plans of agricultural producers.

[6] Input-output analysis of total state GDP indicates that Washington's foreign external trade has increased from an export level of 28.1 percent of total state GDP in 1963 to 38.2 percent in 2007. William B. Beyers and Ta-Win Lin, "The 2007 Washington Input-Output Study," (2007 WA I-O), Table 1-2, page 6, August 2012.

Figure 1-4. Agricultural products from among the top 40 agricultural commodities whose production value in current dollars rose or fell by 15 percent or more from 2010 to 2011
Washington state, 2010 to 2011
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, released October 31, 2012

Commodity	State rank in terms of value of production	Value of production in $1,000		Percent change from 2010 through 2011
Value rose by 15 percent or more	2011	2010	2011	Percent change
Apples	1	$1,541,420	$1,831,165	18.8%
Milk[1]	2	$950,061	$1,276,983	34.4%
Wheat	3	$925,265	$1,138,490	23%
Potatoes	4	$654,456	$771,040	17.8%
Hay	6	$452,410	$713,568	40.3%
Cherries, all	7	$367,208	$533,507	45.3%
Eggs	15	$120,732	$142,005	17.6%
Blueberries	20	$54,664	$122,000	123.2%
Corn for silage	17	$82,013	$101,861	24.2%
Dry edible beans	23	$38,528	$32,604	18.2%
Barley	26	$21,345	$41,274	93.4%
Green peas for processing	30	$19,061	$24,116	26.5%
Dry edible peas	32	$14,858	$21,206	42.7%
Strawberries	37	$7,640	$8,971	17.4%
Value fell by 15 percent or more				
Onions, all	11	$168,810	$121,686	-27.9%
Aquaculture (including trout eggs and fish)[2]	16	$114,689	$90,131	-21.4%
Alfalfa seed	29	$20,500	$14,200	-30.7%
Kentucky blue grass seed	24	$30,800	$13,260	-56.9%
Summary				
Total top 40 value of production		**$7,725,138**	**$9,148,992**	**18.4%**
Total value of production		**$7,938,139**	**$9,169,021**	**15.5%**

[1]Value at average returns per 100 pounds of milk in combined marketing of milk and cream plus value of milk used for home consumption and fed to calves.
[2]Includes trout eggs and fish. Excludes the value of distributed fish.

Fourteen of the top 40 agricultural products increased in value by over 15 percent in 2011 compared to 2010.

Figure 1-5. Percent change in value of production by commodity, 2011 compared to the average of the period 2004 through 2006, in current dollars Washington state, 2004 through 2006 and 2010 through 2011
Source: U.S. Department of Agriculture, National Agricultural Statistics Service

Agricultural commodity	2011 average percent share of total value of production	2004 through 2006 average percent share of total value of production	Difference: 2011 percent minus 2004 through 2006 average percent
Field crops	35.3%	31.2%	4.1%
Fruits and nuts	27.3%	27.2%	0.1%
Commercial vegetables	5.2%	6%	-0.8%
Berry crops	2.0%	1.2%	0.8%
Total crops	**69.8%**	**65.7%**	**4.1%**
Specialty products	4.1%	6.9%	-2.8%
Livestock and products	26%	27.4%	-1.4%

Commodity values in 2011 are similar to those in earlier periods.

Changes in the shares of agricultural commodities over time

Figure 1-5 provides detail on the changing share of production among agricultural commodities since the base period of 2004 through 2006. Crops comprised almost 70 percent of total agricultural production value in 2011, an increase of over four percentage points from the 2004 through 2006 period. Field crops accounted for most of this increased share, while fruits and nuts held steady at 27 percent. Livestock and products' share decreased, but still accounted for more than a quarter of the state's agricultural output by value.

The effect of changes in the total (gross) value of production on revenue shares

The value of Washington state's highly varied agricultural production is summarized as a yearly total value yield – total physical output multiplied by market price. The production components of this annual total value can be broken down as to both their source (e.g., wheat sales) and their recipients (e.g., hired labor or net farm income).

The year-to-year changes in the total value of production, as well as the changing mix in total value accruing each year to the state's agricultural production, affect the returns to net value added, net farm income and total hired and contract labor, which are discussed in detail in this section. *Figure 1-6* shows these relationships over the period 2007 through 2011. See *Appendix Figure A1-1* for a detailed breakdown of agriculture-sector production expenses in Washington state in 2011.

Net value added

Net value added is the increase in the value of agricultural production due to the application of the agricultural producer's resource inputs, such as the producer's labor time spent in management and direct agricultural production, the producer's capital and land and the labor that the producer hires.

Other factors of production purchased to facilitate agricultural production, such as gasoline, diesel fuel, electricity, fertilizer and seed, do not contribute to the net value added of agricultural production for that producer. Prior production processes of firms that supply needed inputs, such as fertilizer, capture the net value added of these purchased inputs and must be subtracted from the total (gross) value of agricultural production in order to measure the net contribution of Washington state agricultural producers due to the annual total value of production.

Figure 1-6. The relationship between measures of agricultural production value, net value added, net farm income, labor costs and total costs of production, current dollars
Washington state, 2007 through 2011
Source: U.S. Department of Agriculture, Economic Research Service

Production measures	2007	2008	2009	2010	2011
Total value of agricultural-sector production in $1,000s[1]	**$8,018,349**	**$8,857,011**	**$7,614,730**	**$8,362,851**	**$9,670,478**
Net value added as a percent of total value of agricultural-sector production[2]	43.3%	44.7%	38.8%	45.2%	49.1%
Net farm income as a percent of net value added	52.5%	46.3%	36.1%	50.3%	62.9%
Total hired and contract labor as a percent of net value added	36.7%	42.2%	52.2%	37.4%	28.7%
Total hired and contract labor as a percent of the total value of production	15.9%	17.6%	20.3%	16.9%	14.1%
Total cost of production as a percent of the total value of production[3]	56.7%	58.3%	61.2%	54.8%	50.9%
Total hired and contract labor as a percent of the total costs of production[3]	28.1%	30.1%	33.1%	30.9%	27.7%

[1]Production value is revised annually for prior years, so these figures may not match those in earlier reports.
[2]Net Farm Income includes direct government payments. Final agricultural-sector output does not, since such payments are transfer payments and are not net additions to economic production. Exclusion of direct government payments will reduce these percentages somewhat.
[3]Total cost of production equals total value of agricultural-sector production minus net value added. Payments to labor are a part of net value added.

There is an inverse relationship between net farm income and total hired and contract labor as a percent of net value added.

The percent of net value added generally corresponds with the changes in the total value of agricultural-sector production over the period 2007 through 2011. When the value of total production rises, net value added rises. When the value of total production falls, net value added falls.

For 2011, Washington's net value added of 49.1 percent of the total value of agricultural production was greater than the net value added nationwide of 39.9 percent.[7] Part of the reason was due to the relatively large amount of labor that Washington producers add to the production process. Much of the high-quality Washington agricultural output, such as apples, sweet cherries and pears is relatively labor intensive compared to, say, wheat production in Kansas. However, for 2011, in particular, it is notable that the share of total hired and contract labor as a percent of net value added dropped to 28.7 percent in 2011 compared to its 37.4 percent share in 2010. For 2011, the increase in both output and prices for Washington agricultural products was a major factor in explaining the increase in the share of net value added compared to earlier years (*Figure 1-6*).

Net farm income

Net farm income is a component of net value added. It is the revenue left over for owners/operators after all expenses, including the cost of hired and contract labor, have been paid out of the revenue earned from final agricultural-sector production.

Statewide, net farm income in 2011 was $3 billion. Nationwide, net farm income in 2011 was $117.9 billion.[8] Nationwide, net farm income as a percent of net value added equaled 70.7 percent. For Washington state, the comparable figure was 62.9 percent. This is another example of the effect of Washington's labor-intensive crops.

[7] U.S. Department of Agriculture, Economic Research Service, Farm Sector Income & Finances, Farm Income and Wealth Statistics, "Value-Added to the U.S. Economy by the Agricultural Sector via the Production of Goods and Services, 1950 through 2011."

[8] U.S. Department of Agriculture, Economic Research Service, Data Sets, Farm Income and Wealth Statistics.

Total hired and contract labor

Total hired and contract labor is a share of net value added.[9] Its percentage share of net value added rises as the total value of agricultural production falls, other things equal. Thus, in 2009, this share was a record high of 52.2 percent, but as the value of agricultural production rose in 2011 relative to 2009, the labor share fell to 28.7 percent. In contrast, for 2011, nationwide, the share of total hired and contract labor as a percent of net value added was only 16.2 percent. Similarly, the share of hired and contract labor as a percent of the total costs of production was 27.7 percent for Washington state in 2011, while the comparable nationwide estimate was 8.7 percent.

To summarize, these comparisons of the components of the total value of production reveal the relatively high proportion of labor used in Washington state's agricultural sector. However, this higher labor share also contributes to a higher value added. Yet, for 2011, the increase in agricultural product demand was the major determinant of net value added for Washington state agriculture.

Other expenses

Appendix Figure A1-1 provides detail on 33 diverse expense categories for 2011, in current dollars. These categories are not mutually exclusive; some represent sub-totals of other items. For 2011 current dollar total expenses incurred in agricultural-sector production, excluding operator dwellings was estimated to be $6,655.6 million.

Some of the proportionately large expense categories were:

- Hired and contract labor expenses – $1,363.1 million or 19.7 percent
- Farm origin expenses – $1,201.1 million or 17.4 percent
- Manufactured input expenses – $1,168.2 million or 17.6 percent
- Fertilizer and lime expenses, fuel and oil expenses and electricity expenses (expenses dependent, in whole or part, on the cost of hydrocarbon inputs) – $808.2 million or 11.7 percent
- Marketing, storage and transportation expenses – $804.9 million or 11.6 percent
- Capital consumption, including operator dwellings – $601.4 million or 8.7 percent
- Interest expenses, including operator dwellings – $260.4 million or 3.8 percent
- Property taxes, including operator dwellings – $210 million or 3.0 percent.[10]

Total labor expenses for Washington state equaled 19.7 percent of total expenses incurred in agricultural-sector production, excluding operator dwellings. The comparable percent for agricultural production nationwide was 12.4 percent in 2011.

An additional important fact is that, for Washington, contract labor was only 0.8 percent of total labor expenses in 2011. In contrast, for California, contract labor was 30.1 percent of total labor expenses and Oregon's was 11.4 percent. In short, Washington growers do not rely heavily on contract labor as a fundamental source of labor supply.

[9] We include contract labor as a share of value added since the agricultural producer is hiring some management skills, which are labor search costs and accounting costs in this case, plus the direct agricultural labor provided by this labor. Source: U.S. Department of Agriculture, Economic Research Service, Farm Sector Income & Finances, "Income Statement for the Farm Sector, 2009-2013F" (F= forecast).

[10] A discussion of the potential impact on farm businesses of recent tax reform discussions in Congress and the Obama Administration is available in: James M. Williamson, Ron Durst and Tracey Farrigan, The Potential Impact of Tax Reform on Farm Business and Rural Households," USDA, Economic Research Service, Economic Information Bulletin Number 107, February 2013.

International trade

Washington state exports most of its agricultural production either overseas or to its sister states. Over one-third of the last two years' agricultural-production value was exported to foreign markets (*Figure 1-11*). Therefore, international trade has a large influence on the economic fortunes of Washington growers and the workers they hire. Such trade affects product demand, which in turn affects the demand for agricultural labor.

Figure 1-7 shows the level of agricultural exports and imports at the national level for federal fiscal and calendar years 2008 through 2012. Both exports and imports show a long-run rising trend, though the effect of the Great Recession is notable for both the 2009 fiscal year and calendar year. For 2012, calendar-year exports surpassed those of the Great Recession, increasing from a low of $98.5 billion in calendar year 2009, the depth of the recession, to a 2012 total of $141.3 billion – an increase in four years of $42.9 billion or 43.5 percent. The export improvement on a fiscal year basis is $39.5 billion or 41 percent.[11]

Figure 1-7. Consumption value of U.S. agricultural trade, federal calendar and fiscal years, in billions of current dollars
United States, 2008 through 2012
Source: U.S. Department of Agriculture, Economic Research Service, Data Sets, Foreign Agricultural Trade of the United States

Calendar year	2008	2009	2010	2011	2012
Agricultural exports	$114.8	$98.5	$115.8	$136.3	$141.3
Agricultural imports	$80.5	$71.7	$81.9	$98.9	$102.9
Trade balance[2]	$34.3	$26.8	$33.9	$37.4	$38.4
Fiscal year[1]	**2008**	**2009**	**2010**	**2011**	**2012**
Agricultural exports	$114.9	$96.3	$108.6	$137.4	$135.8
Agricultural imports	$79.3	$73.4	$79.0	$94.5	$103.4
Trade balance[2]	$35.6	$22.9	$29.6	$42.9	$32.4

[1]October 1 of previous year through September 30 of current year.
[2]Exports minus imports.

Agricultural exports are a major contributor to an improved balance of trade for the United States.

Imports of foreign agricultural products also fell during the Great Recession as shown in *Figure 1-7*. In calendar year 2008, imports were $80.5 billion; they declined to $71.7 billion in calendar year 2009 but recovered to $102.9 billion in calendar year 2012. Relative to calendar year 2009, this is an increase of $31.2 billion or 43.5 percent.

American agricultural exports are very competitive in world markets, overall. This is reflected in the agricultural trade balance, which for fiscal year 2012 stood at $32.4 billion and for calendar year 2012, $38.4 billion, in favor of U.S. agricultural production.

Agricultural export prices

As *Figure 1-8* indicates, some of the increase in the value of total U.S. agricultural exports has been due to an increase in the prices paid for those exports. Since the base year of 2000, the price index for all agricultural commodities more than doubled by 2012 – reaching an index value of 221.7. The same is true for the index of prices for foods, feeds and beverages. This rise in prices at the same time that the value of total agricultural exports is increasing suggests that the demand for U.S. agricultural exports is rising faster than the supply of U.S. agricultural goods and services entering international trade.

Figure 1-8. Index of U.S. agricultural export prices, base year 2000 = 100
United States, 2008 through 2012
Source: U.S. Bureau of Labor Statistics, Economic News Release, U.S. Import and Export Price Indexes, Table 2 U.S. Export Price Indexes, by End Use

Exports	2008	2009	2010	2011	2012
All agricultural commodities	183.5	160	172.6	211	221.7
Foods, feeds and beverages	186.4	163.4	171.1	205.1	217.2

The index of agricultural export prices has risen sharply from 2009 to 2012.

[11] Fiscal year 2013 agricultural exports are predicted to be $142 billion – an increase of 4.6 percent over fiscal year 2012. See: U.S. Department of Agriculture, Economic Research Service, "Outlook for U.S. Agricultural Trade," AES-77, February 21, 2013. This report contains extensive detail on the composition of agricultural exports by commodity.

Figure 1-9. Top six U.S. agricultural export destinations, U.S. value, in billions of current dollars
United States, calendar year 2008 through 2012
Source: U.S. Department of Agriculture, Economic Research Service, Data Sets, Foreign Agricultural Trade of the United States

2008		2009		2010		2011		2012	
Foreign total	**$114.8**	**Foreign total**	**$98.5**	**Foreign total**	**$115.8**	**Foreign total**	**$136.4**	**Foreign total**	**$141.3**
Canada	$16.3	Canada	$15.7	China	$17.5	Canada	$19.0	China	$26.0
Mexico	$15.5	China	$13.1	Canada	$16.9	China	$18.9	Canada	$20.6
Japan	$13.2	Mexico	$12.9	Mexico	$14.6	Mexico	$18.3	Mexico	$18.9
China	$12.1	Japan	$11.1	Japan	$11.8	Japan	$14.1	Japan	$13.5
EU-27	$10.1	EU-27	$7.4	EU-27	$8.9	EU-27	$9.7	EU-27	$10.1
South Korea	$5.6	South Korea	$3.9	South Korea	$5.3	South Korea	$7.0	South Korea	$6.0

China's imports of U.S. agricultural commodities have increased by an average of 21.8 percent annually from 2008 through 2012.

Top U.S. agricultural export destinations and import sources

Figure 1-9 presents the top six U.S. agricultural commodity export destinations from 2008 through 2012. These countries accounted for well over half of total agricultural exports in 2012.

Canada and China imported almost the same dollar amount of U.S. agricultural commodities in 2011. However, China, with its massive consumer base and the continual appreciation in the value of the yuan relative to the U.S. dollar, has since emerged as the leading importer of U.S. agricultural commodities. The quantity demanded of U.S. agricultural exports to China surged by 37.6 percent in one year between 2011 and 2012. Exports to Canada rose by 8.4 percent; exports to Mexico by 3.3 percent. Exports to Japan fell from 2011 to 2012 by 4.3 percent, even with the modest appreciation of the yen over that same period. The European Union-27 countries have consistently ranked in fifth place for the past five years. South Korea has consistently ranked in sixth place over this five-year period, importing $6.0 billion of U.S. agricultural goods in calendar year 2012. It remains to be seen what impact the new trade bill with South Korea will have.

Figure 1-10 shows the top five agricultural import sources for the United States from 2008 through 2012. The most notable aspect of this figure is that while Canada, the EU-27 and Mexico's imports and exports of agricultural commodities are in approximate balance, China's exports of agricultural commodities to the U.S. are only 17.3 percent of the agricultural commodities it imports from the United States. This imbalance reflects, in part at least, the comparative advantage the U.S. has in certain agricultural commodities relative to China, even though wage rates in China are considerably lower than in the United States.[12]

[12] For an objective discussion of the differences in real wage rates for unskilled labor in America versus other nations, including China, see Orley Ashenfelter, "Comparing Real Wage Rates." American Economic Review, Vol. 102, No. 2, 2012.

Figure 1-10. Top five U.S. agricultural import origins, U.S. value, in billions of current dollars United States, calendar year 2008 through 2012
United States, calendar year 2008 through 2012
Source: U.S. Department of Agriculture, Economic Research Service, Data Sets, Foreign Agricultural Trade of the United States

2008		2009		2010		2011		2012	
Foreign total	**$80.5**	**Foreign total**	**$71.7**	**Foreign total**	**$81.9**	**Foreign total**	**$98.9**	**Foreign total**	**$102.9**
Canada	$18.0	Canada	$14.7	Canada	$16.2	Canada	$18.9	Canada	$20.2
EU-27	$15.8	EU-27	$13.6	EU-27	$14.2	Mexico	$15.8	EU-27	$16.6
Mexico	$10.9	Mexico	$11.4	Mexico	$13.6	EU-27	$15.7	Mexico	$16.4
China	$3.5	China	$2.9	China	$3.4	Indonesia	$4.2	India	$5.4
Indonesia	$2.8	Brazil	$2.4	Brazil	$2.9	Brazil	$4.0	China	$4.5

Canada and Mexico continue to be the top single-nation exporters of agricultural goods and services to the U.S. in 2012.

Detail on Washington agricultural commodity exports[13]

Figure 1-11 provides the dollar values for Washington exports from 2007 through 2011 for selected agricultural commodities. The export of fresh vegetables increased by 12.9 percent from 2010 to 2011. Processed vegetable exports increased by 17.7 percent. Fresh fruit exports increased by 17.2 percent year over year. Processed fruit exports increased by 20.5 percent. Other large year-over-year increases were wheat – 70.4 percent; corn – 42.2 percent; dairy – 38.1 percent; feeds and fodder – 27.8 percent; and beef and veal exports – 16.6 percent. Exports of oil cake and meal and vegetable oils remained unchanged year over year. The export of tree nuts declined by 11.1 percent, while the exports of plant seeds declined 23.9 percent. Other commodity exports declined by 9.3 percent.

Economy-wide effects of the agricultural sector – input-output analysis

The Washington state input-output model provides a detailed picture of the state's economic structure, including inter-industry linkages and the state economy's dependence on U.S. domestic and international markets. The Input-Output Table provides estimates of the interdependence of industrial sectors in the state economy. Updated periodically, the latest input-output model is based on 2007 data.

The Input-Output Table reports the distribution of sales and purchases of each sector in the state economy. It reports business sales to industrial sectors and to final demand categories (households, investors and governments) located in Washington state, as well as to markets outside Washington state (exports to other parts of the U.S., to foreign countries and to the federal government). The table also identifies purchases made by sectors from Washington industries, payments of labor income and other value added and purchases made out of state.

[13] For a discussion of how Washington state exports are estimated, see: Cassey, A.J., "The Collection and Description of Washington State Export Data," Washington State University Extension Fact Sheet, FS006E, no date.

Figure 1-11. Value of Washington agricultural exports by selected commodity groups, based on share of production, in millions of current dollars[1]
Washington state, 2007 through 2011
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Economic Research Service, Foreign Agricultural Service, released October 31, 2012

Variables and commodity groups	2007	2008	2009	2010	2011	Absolute change 2011 compared to 2010	Percent change 2011 compared to 2010
Value of agricultural-sector production	$8,165,148	$7,736,891	$7,195,206	$7,938,139	$9,169,021	$1,230,882	15.5%
Value of estimated foreign exports	$2,354,100	$2,775,300	$2,206,200	$2,658,600	$3,321,100	$662,500	24.9%
Exports as a percent of production value	28.8%	35.9%	30.7%	33.5%	36.2%	2.7%	8.1%
Commodity group exported							
Beef and veal exports	$38.1	$39.9	$42.2	$51.8	$60.4	$8.6	16.6%
Pork	$1.2	$1.4	$1.4	$1.8	$1.9	$0.1	5.6%
Hides and skins	$31.5	$25.8	$20.1	$29.0	$29.7	$0.7	2.4%
Dairy	$89	$108	$63	$112	$154	$42.5	38.1%
Vegetables, fresh	$108.1	$121.9	$119.7	$126.8	$143.2	$16.4	12.9%
Vegetables, processed	$148.4	$197.6	$192.8	$197.4	$232.3	$34.9	17.7%
Fruits, fresh	$497.7	$638.3	$502.3	$620.2	$726.9	$106.7	17.2%
Fruits, processed	$329.5	$418.2	$321.4	$384.7	$463.7	$79	20.5%
Tree nuts	$1.1	$1.4	$1.0	$0.9	$0.8	-$0.1	-11.1%
Wheat	$595.5	$539.6	$328.7	$497.6	$847.7	$350.1	70.4%
Corn	$17.4	$25.3	$15.2	$18.0	$25.6	$7.6	42.2%
Grain products, processed	$29.5	$28.5	$26.1	$27.6	$29.9	$2.3	8.3%
Feeds and fodder	$128.3	$171.1	$157.5	$218.5	$279.3	$60.8	27.8%
Oil cake and meal	$0.2	$0.4	$0.4	$0.4	$0.4	$0.0	0.0%
Vegetable oils	$0.3	$0.5	$0.4	$0.4	$0.4	$0.0	0.0%
Sugar	$1.6	$1.6	$0.0	$0.0	$0.1	$0.1	not defined
Plant seeds	$74.9	$99.4	$102.5	$87.2	$66.4	-$20.8	-23.9%
Other[2]	$261.8	$356.7	$311.8	$284.9	$258.3	-$26.6	-9.3%

[1]Estimates are based on cash receipts. On December 17, 2012, the calendar year (new series) state export data for several agricultural export categories were corrected. The values for feeds and fodders and for grain products were corrected for all states and all years.
[2]This group includes live animals, other meats, animal parts, eggs, wine, beer, other beverages, coffee, cocoa, hops, nursery crops, inedible materials and prepared foods.

Agricultural commodity exports increased in value by 24.9 percent from 2010 to 2011.

Figure 1-12. Selected input-output multipliers
Washington state, 2007
Source: Washington State Office of Financial Management, The 2007 Washington Input-Output Study (2007 WA I-O), August 2012

Industry sectors	Total jobs per $1 million direct output	Total employment per direct job	Total dollar direct output per dollar of final demand	Total labor income per dollar of final demand
Agriculture sectors[1]				
Crop production	17.79	1.56	$1.96	$0.63
Animal production	15.4	2.16	$2.28	$0.67
Food, beverage and tobacco manufacturing	6.67	3.47	$1.78	$0.32
Agriculture-supporting sectors				
Air transportation	5.91	2.84	$1.69	$0.33
Water transportation	8.73	3.29	$1.96	$0.50
Truck transportation	13.23	2.11	$2.10	$0.64
Support activities for storage, transportation and warehousing	13.6	2.63	$2.23	$0.72
Wholesale	9.6	2.18	$1.74	$0.55
Credit intermediation and related activities	8.5	4.22	$2.08	$0.49
Other finance and insurance	16.07	2.78	$2.52	$0.82

[1]See narrative preceding this figure for an explanation of how to interpret the coefficients in this figure. It is incorrect to compute a column average of any given set of estimates for any one of the four measures presented in this figure.

Crop production creates about 0.56 additional jobs for each direct job in crop production. The estimate for animal production is 1.16 additional jobs.

Figure 1-12 shows, for 2007, the economy-wide effect of the two components of the agricultural sector (crop and animal), plus the food, beverage and tobacco manufacturing sector and seven additional sectors related to the overall production of agriculture in the state. For crop production, we see that:

- Each $1 million of direct output in crop production results in 17.79 jobs.
- Each direct job in crop production results in 0.56 additional jobs created in the state (one direct-demand job plus 0.56 jobs due to indirect and induced demand).[14]
- Each dollar of direct output results in an additional $0.96 in final demand ($1.00 direct demand plus $0.96 indirect and induced demand).
- For each dollar of final demand, $0.63 of that dollar is labor income.

Although the values are different, the same components are provided for animal production and food, beverage and tobacco manufacturing in *Figure 1-12*.

[14] A recent estimate for the apple industry is 1.47. For potatoes, a recent estimate is 2.36. See: Globalwise Inc. and Belrose Inc., "The Washington Apple Industry: Contributions to the State Economy and the Important Role of Exports," Vancouver, Washington and Pullman, Washington, respectively, August 29, 2012, Table 3, page 13; and, David Holland and Nick Beleiciks, "The Economic Impact of Potatoes in Washington State," Washington State University, School of Economic Sciences, EB 1953E, 2006, Table 8, page 19.

Agriculture-sector contribution to the state gross domestic product

Policymakers often need to know the total dollar effect of an economic sector on state gross domestic product (GDP). For every dollar of crop production, a total of 1.96 dollars in total dollar output is generated, including the dollar from crop production. Although the currently available input-output coefficients are for 2007, the following calculation is instructive, since the total contribution of agricultural production to the state economy is thereby estimated. For 2011, crop production contributed $6.4 billion directly to state GDP. Applying the multiplier of 1.96, the final dollar amount would be $12.6 billion. For animal production, the estimate would be $2.4 billion multiplied by 2.28 or $5.5 billion. The sum of these two effects for all agriculture on state GDP is an estimated $18.1 billion.

Other agriculture-sector effects

Figure 1-12 includes input-output data on other economic sectors that support agriculture. Total employment for each direct job created in selected support sectors is generally higher than that in either crop or animal production. It takes much less labor to generate $1 million of direct output in the food, beverage and tobacco manufacturing sector, for instance, compared to crop production or animal production. Total dollar output per dollar of final demand is lower than either crop or animal production. Finally, only $0.32 of every dollar of final demand goes to labor income.

Total jobs per $1 million of direct output vary considerably for the selected supporting industry sectors, ranging from a low of 5.91 (1 direct plus 4.91 indirect and induced) jobs for air transportation to a high of 16.07 total jobs in other finance and insurance.

Summary

- The total value of agricultural production in Washington reached a record of $9.2 billion in 2011, excluding government transfer payments.
- The prices of agricultural products continue to be volatile year over year. The overall price picture is one of price volatility along a rising price trend.
- The gradual change in the composition of Washington state agricultural commodities continued through 2011.
- Net value added as a percent of the gross value of production is higher for Washington state than for American agriculture nationwide, due to the state's labor-intensive crops.
- Agricultural export prices have been rising as well as the total value of exports, suggesting a continuing increase in the demand for Washington state agricultural products.
- Canada, China and Mexico continue to be the largest importers of U.S. agricultural products for calendar year 2012. Each imported over $18 billion in U.S. agricultural products in 2012.
- Canada, the EU-27 and Mexico are the largest agricultural exporters to the United States.
- Washington state exports have increased for most commodity groups.
- Each one million dollars of agricultural output directly generates 17.79 jobs.
- Each agricultural job generates an additional 0.56 jobs.
- The sum of direct, indirect and induced demand due to the agricultural sector is estimated at $18 billion annually.

Chapter 2: Washington's agricultural employment and average earnings

Washington state's agricultural economy operates within the context of the economies of the Pacific region of the United States, the United States as a whole and elements of the international economy. Its labor market is a complex composite, involving annual sources of labor supply from within the state, from Oregon and California, the rest of the United States and internationally, mainly from Mexico. A natural consequence to this labor market structure is the fact that the United States imports agricultural commodities in various conditions of preparation for U.S. consumer use. Thus, Washington growers and agricultural workers compete directly with international agricultural commodity and labor markets.

There are different sources and definitions for information on employment and earnings in the national economy and the state's agricultural economy. Each measure provides a slightly different picture of the overall agricultural labor market in the state, the Pacific coast region and across the nation. Covered UI employment, often referred to as Quarterly Census of Employment and Wages data (QCEW), includes approximately 85 percent of all employers in the state and almost all agricultural employment in Washington. The data are based on business location and counts jobs, not employees. Local Area Unemployment Statistics (LAUS) data, on the other hand, are collected from households and include all employment reported at the place of residence.

We also publish total agricultural employment data that includes non-covered employment (*Appendix Figure A2-1*). These data provide a more complete picture of agricultural employment and includes hobby farms and any businesses that do agricultural production but are not classified by industry code (NAICS[15]) as agricultural employers. Due to these facts, 51 percent of their revenue does not come from agricultural activities. We provide these different sources to more fully describe the agricultural economy in the state, since any one measure and its source may be deficient in explaining a particular labor market phenomenon. We have found that these complementary sets of data tend to move in the same direction at a given point in time even though the variable definitions (e.g., what is considered a "farm" business?) and the sample timing, sampling frames and sampling methods differ.

The average monthly agricultural employment in Washington[16] rose from 81,573 workers in 2011 to 87,249 workers in 2012 – a 7 percent increase. Seasonal workers increased from a monthly average of 40,279 workers in 2011 to 43,881 in 2012 – an 8.9 percent increase in one year. Non-seasonal employment in the state increased from a monthly average of 41,294 workers in 2011 to 43,199 workers in 2012 – a 4.6 percent increase.

Regional and national agricultural employment[17]

The U.S. Department of Agriculture conducts a quarterly survey of farms to develop estimates of employment, hours worked and hourly wage rates.[18] These data are not limited to employment that is covered by the unemployment-insurance program. Results are reported by region and nationally. Washington and Oregon are combined to make up the Pacific region. Although results for Washington cannot be singled out, these data do provide an important comparison at the regional and national levels.

[15] See Glossary for a definition of NAICS.

[16] Employment Security Department/LMPA, Agricultural Employment and Wage survey.

[17] The data in this section are based on the quarterly nationwide Farm Labor Survey conducted by the U.S. Department of Agriculture. An important characteristic of this design is the designation of a "farm" – an agricultural entity that has at least $1,000 in sales in the given sample period. This definition of "farm" is different from the type of agricultural operation typically reported in this report, since much of the data in this report comes from farm operations that hire at least one worker who is covered by the unemployment-insurance program. Any agricultural producer who does not hire labor outside of the family is not represented, even if the producer has a significant quantity of output and sales.

[18] The estimated hourly "wage rate" is actually total earnings divided by total hours worked. Therefore, the "wage rate" estimate includes the base hourly wage rate plus any bonuses, tips, etc. that are paid to the worker. It also includes piece-rate earnings converted to hourly rates.

Figure 2-1 compares hired farm-labor employment[19] in Washington and Oregon with California and the nation for the period 2008 through 2012. Hired farm labor includes seasonal workers hired by the grower. The time span picks up the recovery period of the Great Recession.

Washington/Oregon, California and the United States all experience seasonality, with the lowest employment occurring in the first quarter of each calendar year and the highest generally in the third quarter. California is distinct in that the highest employment levels sometimes occur in the fourth quarter. Given the heavy concentration of labor employed in both the third and fourth quarters, *Figure 2-1* also includes the average of those two quarters for each year and region. Nationally, this average has been increasing over time, with the exception of 2010 when it was flat, and 2011 when it declined. The Pacific region (Washington and Oregon) experienced a similar pattern. California, on the other hand, experienced a large increase in 2010, followed by declines in 2011 and 2012.

Weekly hours worked

Figure 2-2 shows that average weekly hours worked in California are consistently higher every year for the past five years compared to both the Pacific region and the United States. There is no consistent trend in average weekly hours worked for the Pacific region or the United States. There may be a pattern for all three geographic regions in relation to the Great Recession, however, with slightly fewer hours worked in the third and fourth quarters of 2009 than in other years.

Average hourly earnings

Estimated average hourly earnings are total weekly earnings divided by total hours worked per week. Weekly earnings are a composite of the average hourly wage rate, piece rates and any bonuses, overtime, jury pay, etc. that a worker may receive. Average hourly earnings are often, but not always, lower in the first quarter of the year than they are in the remaining three quarters of the calendar year.

Figure 2-3 shows that livestock workers consistently earned more than field workers did across all geographic areas. Field workers in Washington/Oregon generally have higher average hourly earnings in the third and fourth quarters than do field workers in other areas.[20]

Comparing all agricultural workers in the fourth quarter of 2012 (October), those in Washington/Oregon earned 15.9 percent more than their counterparts in California and 15.6 percent more than their counterparts across the United States. These percentage differences can be due to labor supply factors, either labor demand factors or both.

[19] The Farm Labor Survey distinguishes between hired farmworkers and agricultural service workers. Both perform agricultural work, but hired farmworkers are employed by the farm while agricultural service workers perform services on a contract or fee basis. The survey only collects information on agricultural services workers for California and Florida, so those data are not included in this report. Hired farmworkers also include supervisors.

[20] It is important to note that higher average hourly earnings do not necessarily mean higher labor costs. Insofar as the wage rate measures the productivity of workers, higher average hourly earnings are an index of higher hourly productivity, other things equal.

Figure 2-1. Agricultural employment - number of workers hired
Pacific region, California and the United States, 2008 through 2012
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Economics, Statistics and Market Information System, Farm Labor

		Employment		
Year	Month	Pacific Region (Washington/Oregon)	California	United States (exccludes Alaska)
2008	January	42,000	132,000	594,000
	April	68,000	156,000	700,000
	July	110,000	160,000	828,000
	October	90,000	173,000	801,000
	Average last two quarters	100,000	166,500	814,500
2009	January	52,000	132,000	595,000
	April	61,000	138,000	680,000
	July	117,000	170,000	875,000
	October	99,000	157,000	807,000
	Average last two quarters	108,000	163,500	841,000
2010	January	52,000	139,000	612,000
	April	65,000	149,000	746,000
	July	120,000	200,000	855,000
	October	94,000	193,000	827,000
	Average last two quarters	107,000	197,000	841,000
2011	January	52,000	133,000	603,000
	April[1]	N/A	N/A	N/A
	July	111,000	177,000	834,000
	October	90,000	185,000	828,000
	Average last two quarters	101,000	181,000	831,000
2012	January	47,000	135,000	575,000
	April	66,000	156,000	748,000
	July	127,000	176,000	906,000
	October	103,000	162,000	872,000
	Average last two quarters	115,000	169,000	889,000

[1]Data are not available since surveys were not conducted for April 2011.

The seasonality of agricultural employment is displayed for the Pacific region (Washington and Oregon). The labor force more than doubles from January to July.

Figure 2-2. Average weekly hours worked in agricultural employment
Pacific region, California and the United States, 2008 through 2012
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Economics, Statistics and Market Information System, Farm Labor

		Average weekly hours worked		
Year	Month	Pacific Region (Washington/Oregon)	California	United States (excludes Alaska)
2008	January	36	41	38
	April	44	45	41
	July	41	46	41
	October	46	46	41
	Average last two quarters	43	46	41
2009	January	38	41	38
	April	38	44	40
	July	40	46	40
	October	38	42	39
	Average last two quarters	39	44	39
2010	January	37	41	37
	April	41	43	40
	July	43	43	41
	October	41	45	42
	Average last two quarters	42	44	41
2011	January	36	42	39
	April[1]	N/A	N/A	N/A
	July	43	45	41
	October	41	44	42
	Average last two quarters	42	45	42
2012	January	39	43	40
	April	42	40	39
	July	43	45	40
	October	44	47	42
	Average last two quarters	44	46	41

[1]Data are not available since surveys were not conducted for April 2011.

There is no clear-cut year-over-year trend in average hours worked per week for the Pacific region.

Figure 2-3. Average hourly earnings by type of agricultural labor,[21] current dollars
Pacific region (Washington/Oregon), California (CA) and the United States (U.S.), 2008 through 2012
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Economics, Statistics and Market Information System, Farm Labor

		Average hourly earnings											
		Field workers only			Livestock workers only			Field and livestock workers			All agricultural workers		
Year	Month	Pacific region	CA	U.S.[1]	Pacific region	CA	U.S. [1]	Pacific region	CA	U.S.[1]	Pacific region	CA	U.S.[1]
2008	January	$9.94	$10.20	$9.67	$11.68	$10.70	$10.18	$10.14	$10.32	$9.88	$11.25	$11.56	$10.81
	April	$9.14	$10.00	$9.65	$11.34	$11.00	$10.24	$9.41	$10.16	$9.84	$10.00	$11.05	$10.57
	July	$9.85	$9.85	$9.66	$10.22	$11.00	$9.98	$9.87	$10.00	$9.74	$10.35	$10.74	$10.34
	October	$10.94	$9.95	$10.05	$10.54	$11.90	$10.21	$10.90	$10.22	$10.09	$11.37	$10.93	$10.70
2009	January	$10.35	$9.80	$9.96	$9.48	$10.95	$10.27	$10.25	$10.09	$10.08	$11.40	$11.15	$10.93
	April	$10.67	$9.96	$9.99	$12.09	$10.93	$10.25	$10.80	$10.14	$10.07	$11.55	$11.07	$10.84
	July	$10.93	$10.10	$10.04	$11.77	$11.30	$10.05	$11.00	$10.30	$10.04	$11.43	$11.08	$10.66
	October	$11.07	$10.25	$10.25	$10.42	$11.05	$10.23	$11.00	$11.40	$10.24	$11.82	$11.25	$10.91
2010	January	$9.77	$10.32	$10.10	$10.55	$11.24	$10.31	$9.95	$10.56	$10.18	$11.05	$11.68	$11.08
	April	$10.02	$9.96	$10.03	$11.73	$10.93	$10.30	$10.25	$10.16	$10.12	$11.18	$11.07	$10.82
	July	$10.65	$10.10	$10.09	$11.89	$11.10	$10.15	$10.75	$10.23	$10.11	$11.27	$11.12	$10.79
	October	$10.95	$10.20	$10.49	$10.97	$11.25	$10.28	$10.95	$10.35	$10.43	$11.59	$11.20	$11.13
2011	January	$10.72	$9.98	$10.26	$11.53	$10.75	$10.52	$10.90	$10.14	$10.37	$11.80	$11.12	$11.30
	April[2]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	July	$10.82	$10.10	$10.27	$10.56	$10.90	$10.29	$10.80	$10.20	$10.28	$11.28	$10.90	$10.93
	October	$11.42	$10.15	$10.54	$11.78	$11.20	$10.67	$11.45	$10.30	$10.57	$12.04	$10.96	$11.15
2012	January	$10.73	$10.08	$10.39	$12.58	$11.75	$10.96	$11.00	$10.42	$10.58	$11.85	$11.38	$11.52
	April	$10.85	$10.55	$10.50	$12.62	$11.85	$10.95	$11.04	$10.83	$10.62	$11.67	$11.81	$11.41
	July	$11.66	$10.75	$10.71	$12.15	$11.55	$10.89	$11.70	$10.85	$10.75	$12.10	$11.61	$11.36
	October	$13.49	$10.70	$11.22	$11.41	$11.50	$10.83	$13.30	$10.80	$11.13	$13.59	$11.73	$11.76

[1]United States excludes Alaska.
[2]Data are not available since surveys were not conducted for April 2011.

Average hourly earnings in the Pacific region are generally higher than in California and the United States as a whole, particularly during the third and fourth quarter harvest season.

[21] Types of work identified in the survey include field, livestock, supervisors and other.

Agricultural employment in Washington state

Full- and part-time employment

The U.S. Department of Commerce's Bureau of Economic Analysis (BEA) uses a combination of administrative records and census data to develop estimates of agricultural employment.[22] The BEA calculates total employment estimates using proprietors' reported employment and wage and salary employment, the latter of which is based on the Quarterly Census of Employment and Wages (QCEW). The QCEW in turn is based on unemployment-insurance program data. As with the U.S. Department of Agriculture data discussed in the first part of this chapter, these estimates are not limited to employment that is covered by the unemployment-insurance program.

Figure 2-4 shows estimates of farm proprietor employment, wage and salary employment and total farm employment. The year-over-year changes for 2011 compared to 2010 show both percentage increases and decreases. Farm proprietor employment (jobs, not unique workers) increased only 0.4 percent while farm wage and salary employment decreased 4.6 percent and total farm employment decreased by 2.6 percent. Agriculture and forestry support jobs increased by 16 percent and total support activity employment increased by 12.1 percent. The increase in agriculture and forestry support jobs over the

Figure 2-4. Full- and part-time agricultural employment, including agriculture and forestry support activities
Washington state, 2002 through 2011
Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Accounts, Table SA-25N and SA-27N

	Farm employment (jobs)			Agriculture and forestry support (jobs) activities	
Year	Farm proprietors employment[1]	Wage and salary employment	Total farm employment[2]	Wage and salary employment	Total support activity employment
2002	34,547	44,116	78,663	15,809	20,063
2003	32,733	47,682	80,415	16,320	19,769
2004	31,561	42,139	73,700	16,969	20,550
2005	31,097	42,649	73,746	18,036	21,487
2006	30,089	43,496	73,585	18,775	22,102
2007	34,673	40,162	74,835	18,905	22,751
2008	34,699	47,163	81,862	18,531	22,495
2009	34,522	50,520	85,042	19,543	23,712
2010	34,526	48,899	83,425	18,931	23,044
2011	34,662	46,644	81,306	21,956	25,833
Percent change: 2011 compared to 2010	0.4%	-4.6%	-2.6%	16%	12.1%

[1]This variable measures the number of non-corporate farm operators, sole proprietors and partners who operate a farm that produces $1,000 or more of farm products per year.
[2] Estimates are based on the 2002 and 2007 North American Industry Classification (NAICS). This variable is the number of workers engaged in the production of agricultural commodities, either livestock or crops, whether as a sole proprietor, partner or hired labor.

Agriculture and forestry support jobs have shown a steady increase over the past decade.

[22] See: "State Personal Income and Employment Methodology," U.S. Department of Commerce, Bureau of Economic Analysis, September 2012 (http://www.bea.gov/regional/pdf/spi2011.pdf).

decade indicates an increase in the use of capital relative to labor and a possible substitution of this form of more capital-intensive labor service for regular farm employment, other things equal.

Appendix figures A2-2 through *A2-8* provide detailed information on monthly agricultural employment by activity for each agricultural reporting area for 2012.

Seasonal and non-seasonal employment

Given the seasonal nature of agricultural labor, the Washington State Employment Security Department conducts a monthly survey of agricultural employers to gather information on seasonal employment and wages.[23] *Figures 2-5* and *2-6* show seasonal, non-seasonal and total employment for 2011 and 2012, respectively, based on the monthly survey and the Quarterly Census of Employment and Wages (QCEW), which includes approximately 85 percent of all employment covered by unemployment insurance, including almost all agricultural employment.

On an annual basis, almost half of the state's agriculture employment is seasonal in nature. Whereas non-seasonal employment shows little month-to-month variation, seasonal employment varies considerably, reflecting the crops grown in Washington.

The monthly pattern of seasonal and total employment has been bi-modal for a number of years – there are two peaks in the distribution of employment by month. The exact timing of this historical pattern varies somewhat from year to year, based largely on weather patterns as these patterns affect the apple, cherry and pear harvests, to name the key crops that drive most of the seasonal employment in the state.

The July peak represents the height of the sweet cherry harvest; the September/October peak represents the height of the apple harvest. In some years, the cherry peak occurs earlier in June, and the apple peak can occur in September as well as October. Weather patterns have an important effect on the timing of the demand and supply of migrant and seasonal labor and can result in local spot shortages and even statewide shortages in labor supply for specific crops.[24]

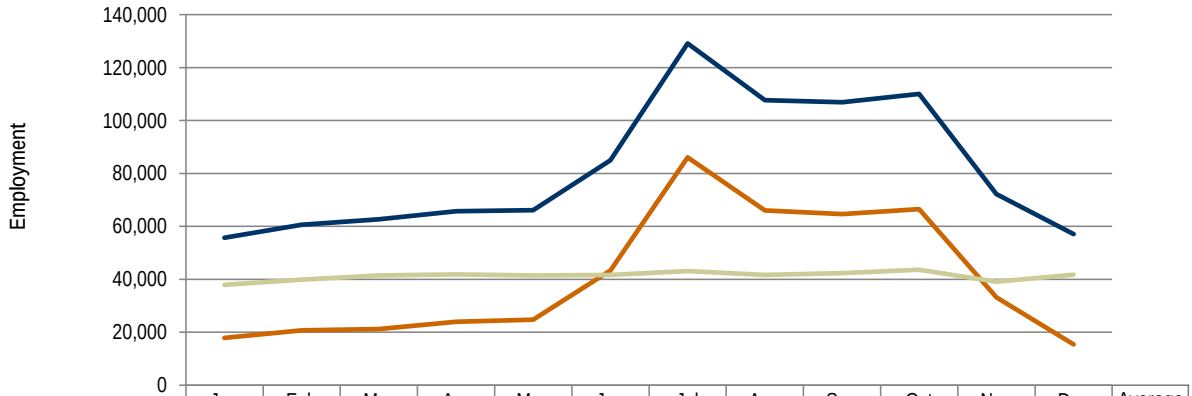
In 2011, a cool spring delayed the apple, cherry and pear harvests by as much as two weeks. In 2011, seasonal employment in June, the start of the sweet cherry harvest, was only 43,323 workers; in 2012 it was 65,940. In July 2011, peak seasonal employment was 86,020; in 2012 it was 94,976. The late harvest for cherries extended well into August in 2011, with 65,991 seasonal workers at that time.

Seasonal employment (jobs, not workers) during the fall pear and apple harvests peaked in October for the 2011 season and September for the 2012 season. In 2011, seasonal employment was 64,599, 66,516 and 33,133 for September, October and November, respectively. In contrast, over the same three months in 2012, employment was 67,717, 62,174 and 33,980, respectively.

[23] See: Monthly Agriculture Employment and Wage Report, Employment Security Department/LMPA (https://fortress.wa.gov/esd/employmentdata/reports-publications/industry-reports/agricultural-employment-and-wage-report).

[24] There is no theoretical economic definition of a shortage nor is there a nationally agreed-upon policy definition. When we refer to a "shortage" in this report, it means that growers have reported a shortage or it has been determined that wage rates have risen in an effort to bring forth more workers and eliminate the shortage.

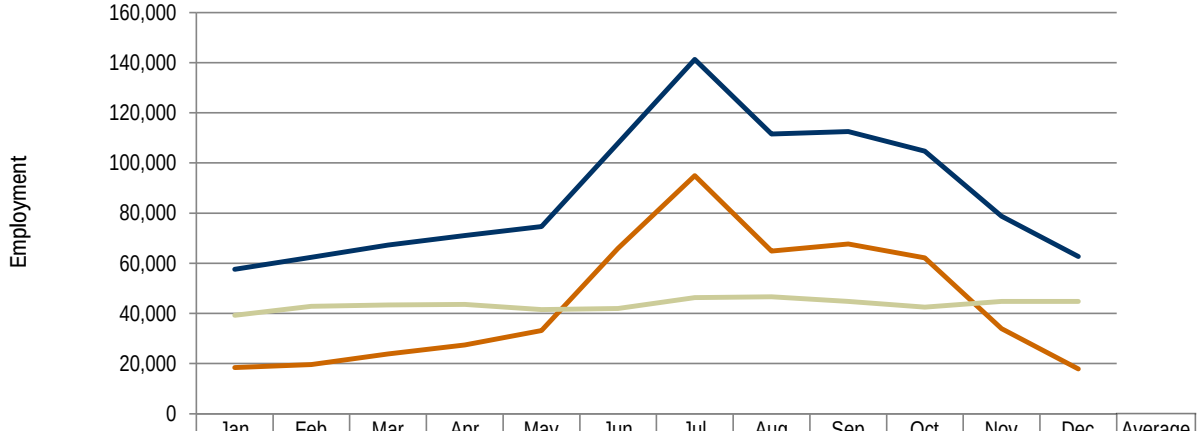
Figure 2-5. Total, seasonal and non-seasonal agricultural employment, by month
Washington state, 2011
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Seasonal	17,845	20,689	21,176	23,984	24,719	43,323	86,020	65,991	64,599	66,516	33,133	15,353	40,279
Nonseasonal	37,889	39,882	41,476	41,781	41,396	41,624	43,132	41,671	42,325	43,557	39,060	41,736	41,294
Total	55,734	60,571	62,652	65,765	66,115	84,947	129,152	107,662	106,924	110,073	72,193	57,089	81,573

The sweet cherry seasonal labor peak was in July; the seasonal labor peak for apples was in October.

Figure 2-6. Total, seasonal and non-seasonal agricultural employment, by month
Washington state, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Seasonal	18,393	19,608	23,858	27,443	33,197	65,940	94,976	64,914	67,717	62,174	33,980	17,903	44,175
Nonseasonal	39,249	42,809	43,412	43,587	41,486	41,920	46,297	46,651	44,791	42,523	44,757	44,831	43,526
Total	57,642	62,417	67,270	71,030	74,683	107,860	141,273	111,565	112,508	104,697	78,737	62,734	87,701

Seasonal labor demand for apples peaked in September of 2012, earlier than the slight October peak in 2011.

The regional distribution of agricultural employment

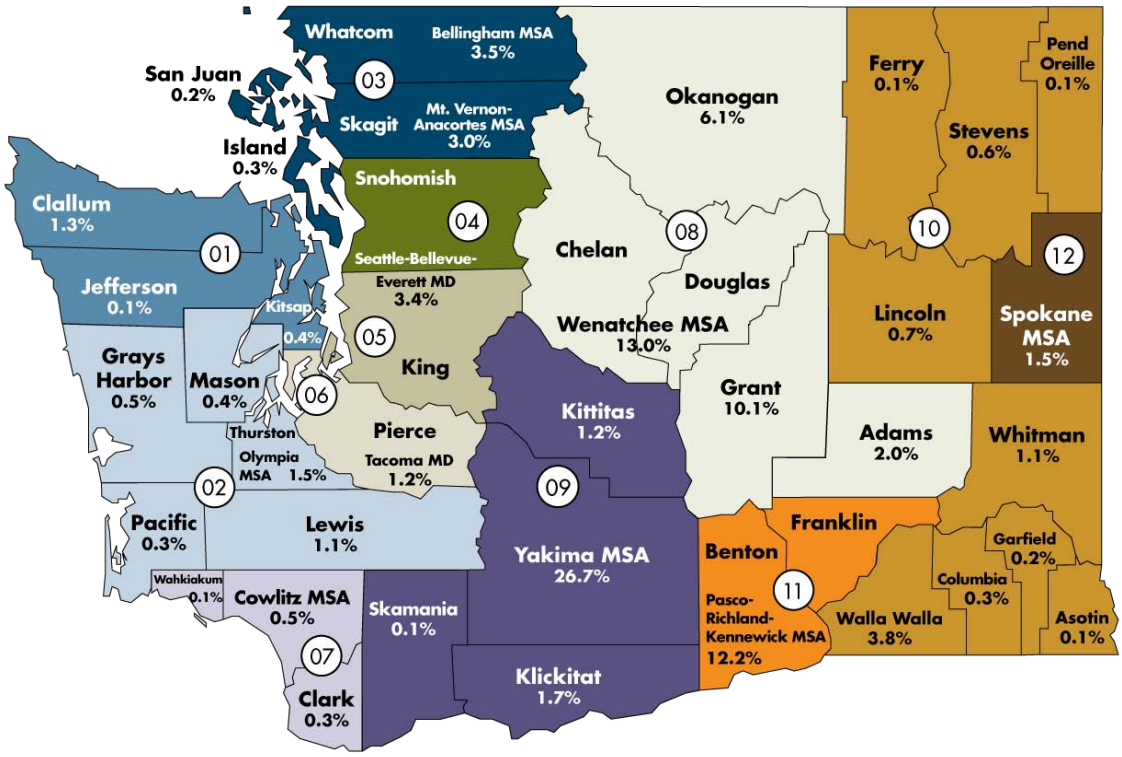
The Employment Security Department's monthly seasonal agriculture survey provides information on seasonal and non-seasonal agricultural employment by region.

The proportional geographic distribution of Washington state's agricultural employment is shown in *Figure 2-7*. Year over year, the percentage distribution of agricultural employment in the 12 workforce development areas (WDAs) has been relatively stable. This is also true of the nine metropolitan divisions (MDs) and metropolitan statistical areas (MSAs). Five of the MDs and MSAs did not change their share of agricultural employment from 2011 to 2012. Of the four that did change their share, changes were minimal – two differed year over year by 0.1 percentage point and the other two by 0.4 percentage points.

In 2012, four non-metropolitan counties employed 23 percent of the state's agricultural employment: Grant, 10.1 percent; Okanogan, 6.1 percent; Skagit, 3 percent; and Walla Walla, 3.8 percent. In 2011, these same four counties employed a total share of 23 percent. Two MSAs, Yakima and Wenatchee, accounted for 39.7 percent of the state's agricultural employment.

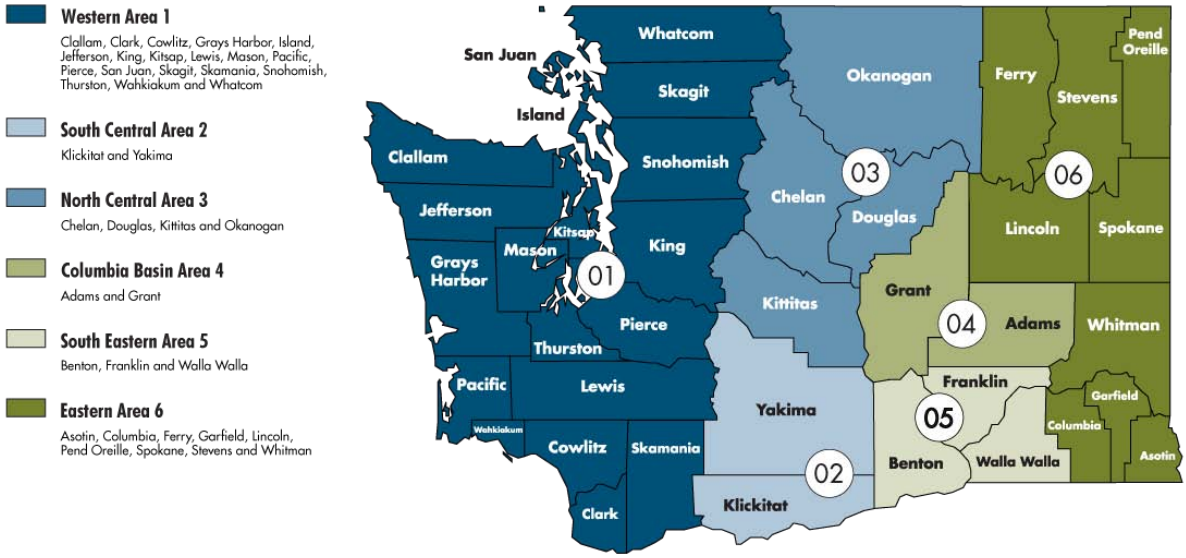
The state is divided into six agricultural growing regions for statistical reporting purposes, referred to as agricultural reporting areas. The regions are based on agricultural economic similarity. Some of these regions in eastern Washington

Figure 2-7. Total agricultural employment in percent by metropolitan division (MD), metropolitan statistical area (MSA) and county within the 12 workforce development areas (WDAs)
Washington state, 2012
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics



Workforce development areas 08, 09 and 11 contain the bulk of seasonal and non-seasonal agricultural employment.

Figure 2-8. Agricultural reporting areas 1 through 6
Washington state, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



Agricultural reporting areas are more reflective of agricultural activity then are workforce development areas.

are geographically similar to the state's workforce development areas. Because these agricultural reporting areas are more relevant to agricultural activity, we report sub-state data in the remainder of this chapter by these regions, which are displayed in *Figure 2-8*.

Appendix figures A2-2 through *A2-8* provide detailed information on monthly agricultural employment by activity statewide and for each agricultural reporting area for 2012.

Seasonal employment by region and crop

The Employment Security Department's monthly seasonal agriculture survey provides information on seasonal employment by crop and by region. Seasonal employment varies by crop and by region mainly due to weather in any given growing year. Over time, seasonal employment varies by crop composition due to changing demand and by technology, e.g., the number and variety of apple trees planted per acre and their method of planting.

Figure 2-9 shows seasonal agricultural employment by agricultural reporting area and crop for 2010, 2011 and 2012. Three reporting areas (South Central Area 2, North Central Area 3 and Columbia Basin Area 4) experienced growth in both 2011 and 2012, while the other three areas experienced a drop in seasonal employment in 2011 followed by growth in 2012. South Central Area 2 experienced the greatest absolute change in employment from 2010 to 2012 (2,861) as well as the greatest percentage change over the period (25.7 percent). Although the implementation of new technology could affect year-to-year changes, short-run variations are most likely due to weather effects.

Figure 2-9. Average annual seasonal agricultural employment by region and crop
Washington state, 2012 compared to 2010 and 2011
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Areas and crops	2010 average annual seasonal employment	2011 average annual seasonal employment	2012 average annual seasonal employment	2010 to 2012 change	2010 to 2012 percent change	2011 to 2012 change	2011 to 2012 percent change
State totals	39,375	40,282	44,176	4,801	12.2%	3,894	9.7%
Agricultural reporting area							
Western Area 1	3,865	3,724	3,914	49	1.3%	190	5.1%
South Central Area 2	11,142	12,764	14,003	2,861	25.7%	1,239	9.7%
North Central Area 3	9,513	10,220	10,519	1,006	10.6%	299	2.9%
Columbia Basin Area 4	5,920	6,419	7,222	1,302	22%	803	12.5%
South Eastern Area 5	8,392	6,765	8,079	-313	-3.7%	1,314	19.4%
Eastern Area 6	543	390	439	-104	-19.2%	49	12.6%
Crop totals[1]							
Apples	18,909	19,663	20,925	2,015	10.7%	1,261	6.4%
Cherries	6,213	6,685	7,973	1,760	28.3%	1,288	19.3%
Pears	1,705	1,560	1,207	-498	-29.2%	-351	-22.6%
Other tree fruit	503	382	349	-154	-30.6%	-33	-8.6%
Grapes	1,717	1,629	1,392	-325	-18.9%	-237	-14.5%
Blueberries	500	726	651	151	30.2%	-75	-10.3%
Raspberries	728	835	802	74	10.2%	-33	-4.0%
Strawberries	368	335	186	-182	-49.5%	-149	-44.5%
Hops	534	844	960	426	79.8%	116	13.7%
Nurseries	417	967	904	487	116.8%	-63	-6.5%
Wheat/grain	462	414	332	-130	-28.1%	-82	-19.8%
Asparagus	462	323	402	-60	-13%	79	24.5%
Onions	851	831	1,095	244	28.7%	264	31.8%
Potatoes	913	1,577	1,130	217	23.8%	-447	-28.3%
Misc. vegetables	1,205	678	1,291	86	7.1%	613	90.4%
Other seasonal crops	3,056	2,791	4,504	1,448	47.4%	1,713	61.4%

[1]Some crop data is suppressed for confidentiality reasons.

Seasonal employment increased from 2010 to 2012, with apples and sweet cherries accounting for most of the increase.

Figure 2-10. Total firms, average monthly jobs and total annual and average annual before-tax earnings by industry, in current dollars Washington state, 2011 compared to 2009 and 2010
Source: Employment Security Department/LMPA; U.S. Bureau of Labor Statistics, Quarterly Census of Employment and Wages

Industry	2011 number of firms	2011 total annual earnings (the wage bill)	2011 average monthly jobs	2011 average annual earnings per job	2010 average annual earnings per job	Percent change in 2011 earnings compared to 2010	Percent change in 2011 earnings compared to 2009
Production agriculture total	**5,153**	**$1,599,695,287**	**73,990**	**$21,620**	**$20,974**	**3.1%**	**0.9%**
Poultry and egg production	30	$17,592,649	600	$29,321	$27,990	4.8%	-7.3%
Cattle ranching and farming	595	$133,022,194	4,552	$29,223	$29,259	-0.1%	1.5%
Other crop farming	776	$170,652,932	6,354	$26,858	$26,895	-0.1%	2.1%
Support activities for crop production	60	$379,027,546	15,824	$23,953	$24,578	-2.5%	-1.4%
Greenhouse, nursery and floriculture	315	$74,247,888	4,342	$24,119	$23,987	0.5%	3.6%
Other animal production	91	$6,002,518	243	$24,702	$23,215	6.4%	4.2%
Vegetable and melon farming	226	$77,320,546	2,843	$27,197	$25,950	4.8%	-2.8%
Support activities for animal production	167	$12,677,239	480	$26,411	$25,133	5.1%	10.8%
Oilseed and grain farming	830	$40,663,370	1,588	$25,607	$24,314	5.3%	13.3%
Fruit and tree nut farming	2,010	$667,337,334	36,388	$18,339	$17,138	7%	6.5%
Other industries	53	$21,151,071	776	$27,257	$26,889	1.4%	-5.6%
Agriculture manufacturing total	**1,332**	**1,905,839,196**	**45,931**	**$41,493**	**$39,188**	**5.9%**	**0.2%**
Seafood product preparation and packaging	90	$388,130,389	7,058	$54,992	$51,201	7.4%	4.4%
Dairy product manufacturing[1]	*	*	*	*	*	*	*
Grain and oilseed milling[1]	*	*	*	*	*	*	*
Beverage manufacturing	332	$185,763,540	4,580	$40,560	$39,446	2.8%	1.5%
Animal food manufacturing	49	$30,928,765	710	$43,562	$40,058	8.7%	4.4%
Other food manufacturing	163	$157,379,841	4,061	$38,750	$37,895	2.3%	3.3%
Fruit and vegetable preserving and specialty	77	$423,971,193	10,898	$38,904	$38,596	0.8%	2.6%
Bakeries and tortilla manufacturing[1]	*	*	*	*	*	*	*
Animal slaughtering and processing	84	$164,657,281	4,822	$34,147	$35,311	-3.3%	1.5%
Sugar and confectionery product manufacturing[1]	*	*	*	*	*	*	*
Other industries	537	$555,008,187	13,802	$40,213	$33,563	19.8%	16.9%

[1]Not published due to confidentiality.
*Totals are folded into "Other industries."

In 2011, employment was 37.9 percent lower in agricultural manufacturing compared to production agriculture but average annual earnings were 47.9 percent higher.

Viewing crop production over time yields a different view of the changing demand for labor. Crops showing a consistent increase in employed workers in the past three years were apples, cherries and hops. Blueberries, raspberries, nurseries and potatoes increased employment from 2010 to 2011, dropping in 2012 relative to 2011, but maintaining a higher employment level in 2012 compared to 2010. Crops showing a consistent decrease in production in the past three years were other tree fruits (peaches, nectarines, prunes and plums), pears, grapes, wheat/grain and strawberries. Asparagus, onions, miscellaneous vegetables and other seasonal crops declined in employment from 2010 to 2011 and then rose in 2012 relative to 2011.

Employment and earnings by industry

The Quarterly Census of Employment and Wages provides data on agricultural employment and wages by industry sector. These data relate to employers who hire at least one worker who is covered by the unemployment-insurance program.

Based on this source, in 2011 there were 5,153 agricultural producers, a 5.1 percent decrease from 5,430 producers in 2010 (*Figure 2-10*). Monthly average employment increased by 4.1 percent, however, from 71,082 jobs in 2010 to 73,990 in 2011.[25] The total wage bill also increased, from $1,511,097,697 in 2010 to $1,599,695,287 in 2011, a 5.9 percent increase. Average annual earnings per-job also increased, from $20,974 in 2010 to $21,620 in 2011, a 3.1 percent increase.[26]

The output from the Washington agricultural-production sector and agricultural imports from outside of Washington supply the agricultural-manufacturing sector. In 2011, 1,332 agricultural manufacturing firms employed an average of 45,931 workers per month. In 2010, there were 1,249 such firms employing an average monthly labor force of 39,574 workers over the calendar year. Thus, in one year both the number of firms increased as well as the number of jobs.[27]

The total wage bill for the agricultural-manufacturing sector in 2011 was considerably greater than that of production agriculture – $1.9 billion compared to $1.6 billion, respectively. In addition, average annual earnings in agricultural manufacturing were almost double that of average annual earnings in production agriculture – $41,493 versus $21,620.

For production agriculture by industry, average annual earnings show a mixed pattern of increases and decreases for 2011 compared to 2010. Average annual earnings rose in poultry and egg production, greenhouse, nursery and floriculture, other animal production, vegetable and melon farming, support activities for animal production, oilseed and grain farming, fruit and tree nut farming and all other industry sectors. Average annual earnings fell slightly in cattle ranching and farming, other crop farming and support activities for crop production.[28]

The highest average annual earnings in production agriculture were for workers in poultry and egg production followed by cattle ranching and farming, at $29,321 and $29,223, respectively. The lowest average annual earnings were for workers in fruit and tree nut farming, at $18,339. This earnings pattern has persisted for a number of years.

Comparing 2011 average annual earnings in agricultural manufacturing with those of 2010, we see a general rise in such earnings for 2011, the one exception being a 3.3 percent drop in annual earnings for animal slaughtering and processing. For agricultural manufacturing, the highest average annual earnings were for workers in seafood production preparation and packaging. These workers earned 32.5 percent more per year compared to the average worker in agricultural manufacturing – $54,992 compared to $41,493.[29]

[25] See ESD/LMPA, 2011 Agricultural Workforce, Figure 2-11, page 22 for the 2010 data.

[26] See the 2011 Agricultural Workforce, Figure 2-11, page 22.

[27] See the 2011 Agricultural Workforce, Figure 2-11. Page 22..

[28] See the 2011 Agricultural Workforce, Figure 2-11. Page 22.

[29] See the 2011 Agricultural Workforce, Figure 2-11. Page 22.

Apples, cherries and pears

Unemployment-insurance program wage files provide data on agricultural employment and wages for specific crops. This is supplemented by the Employment Security Department's monthly survey of growers to provide earnings estimates. The production of apples, cherries and pears dominates the demand for seasonal and migrant labor in Washington during the state's long harvest season, as shown in *Figure 2-9*. Thus, the wage level and distribution in these three types of production are of particular concern to both the growers of these crops and the workers involved in their production.

Both current and inflation-adjusted measures are important to the grower. First, current wages measure how much – more, the same or less – the grower must pay to hire labor to produce a unit of output in the current growing and harvesting season. Given the crop quality and quantity, factors that interact with the weather over the growing and harvest season, will the grower need more or less cash to finance the labor needed? Second, inflation-adjusted dollars inform the grower as to whether the real cost of labor is rising, falling or staying constant over time.

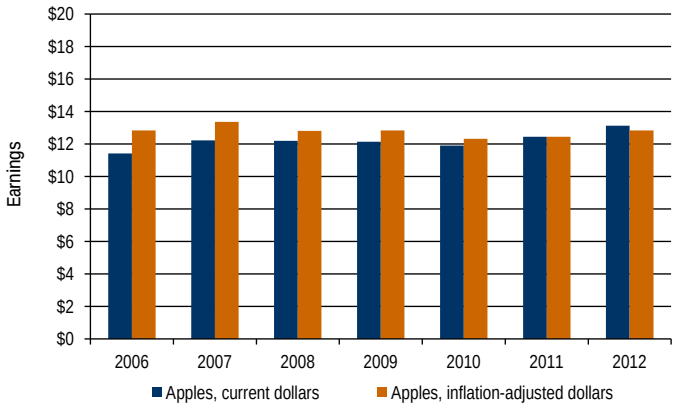
Figures 2-11, *2-12* and *2-13* show the patterns of average hourly wages from 2006 through 2012 for the apple, cherry and pear peak harvest periods. Note that average hourly wages for the three fruit varieties are well above the state's minimum wage, which was $9.04 in 2012.

Refer to *Appendix Figure A2-9* for average hourly wage data from 2002 through 2012.

Apples

Current dollar average hourly before-tax earnings increased significantly from 2006 to 2007, fell less steeply from 2007 through 2010, but then surged upward through 2012. Measured in inflation-adjusted dollars, earnings were about the same in 2012 as in 2006.

Figure 2-11. Average hourly before-tax earnings, apple harvest, current and inflation-adjusted dollars
Washington state, 2006 through 2012, fourth-quarter data
Source: Employment Security Department/LMPA, Unemployment Insurance Wage File

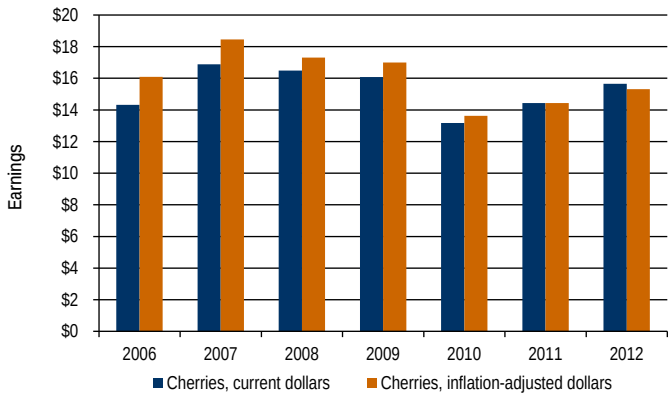


The changes in apple harvest wages reflect changes in the supply and demand for harvest labor.

Cherries

Average hourly before-tax earnings show more volatility for cherries than was the case with apples, as illustrated in *Figure 2-12*. Following a sharp increase from $14.32 in 2006 to $16.88 in 2007, earnings declined to $13.17 in 2010. Earnings then increased through 2012 to $15.65, but did not reach the per-hour rates experienced in 2007 through 2009. When measured in inflation-adjusted dollars, the pattern is more pronounced. Average hourly earnings in cherries always respond sharply to seasonal harvest demands in part because the harvest season is relatively short and the fresh storage period for consumer marketing is also relatively short compared to other fruits such as apples.

Figure 2-12. Average hourly before-tax earnings, cherry harvest, current and inflation-adjusted dollars
Washington state, 2006 through 2012, third-quarter data
Source: Employment Security Department/LMPA, Unemployment Insurance Wage File

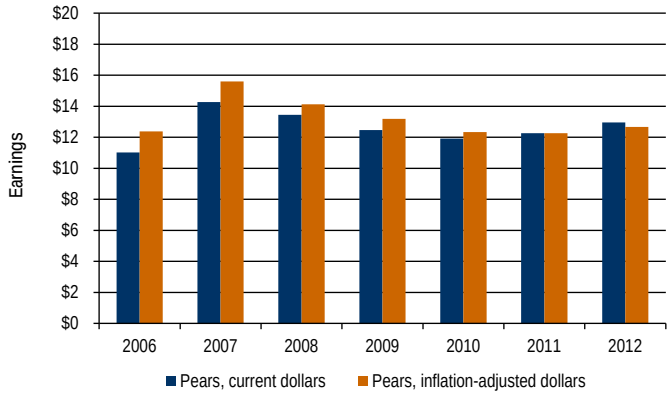


The changes in cherry harvest wages reflect changes in the supply and demand for harvest labor.

Pears

Figure 2-13 shows the pattern of year-over-year changes in average hourly before-tax earnings for pear harvest. The pattern was similar to cherries – a sharp increase in hourly earnings from 2006 to 2007 followed by decreases through 2010. Average hourly earnings then increased in both 2011 and 2012, but did not reach the per-hour rates experienced in 2007 and 2008. As with cherries, when measured in inflation-adjusted dollars, the pattern is more pronounced.

Figure 2-13. Average hourly before-tax earnings, pear harvest, current and inflation-adjusted dollars
Washington state, 2006 through 2012, third-quarter data
Source: Employment Security Department/LMPA, Unemployment Insurance Wage File



The changes in pear harvest wages reflect changes in the supply and demand for harvest labor.

Average and median hourly before-tax earnings for selected agricultural commodities

Figure 2-14 shows current dollar average and median hourly before-tax earnings for selected agricultural commodities. These data are based on the Unemployment Insurance Wage File.[30] Statistical significance tests revealed that average hourly earnings for each agricultural commodity included in the table were significantly different from the all-agriculture estimate.

Workers in all agricultural industries earned an average of $14.14 per hour before taxes. However, half of all agricultural workers earned $13.38 or less per hour, the median hourly before-tax earnings rate. The highest average hourly earnings are for wheat workers, at $16.17 per hour, followed by potato workers at $16.12 per hour.

Apple workers, the lowest paid workers, earned $12.65 per hour while non-apple tree fruit workers earned $13.17. Note that half of all non-apple tree fruit workers earned $13.86 or more per hour, in contrast to apple workers, half of whom earned $12.70 or more per hour.

Figure 2-14. Average and median hourly before-tax earnings[3] by selected agricultural commodities, current dollars
Washington state, 2012
Source:Employment Security Department/LMPA, Unemployment Insurance Wage File

NAICS	Agricultural commodities	Number of growers	Average before-tax hourly earnings	Median before-tax hourly earning
111331	Apples[1]	879	$12.65	$12.70
111339	Non-apple tree fruit[2]	998	$13.17	$13.86
111332	Grapes	239	$14.56	$11.00
111140	Wheat	779	$16.17	$15.02
111211	Potatoes	112	$16.12	$14.38
111219	Vegetables	221	$13.74	$11.62
111421, 111422	Nursery and floriculture	282	$13.81	$11.99
1119	Other crop farming	559	$13.28	$13.50
112	Animal production	760	$15.85	$13.88
1151	Support activities for crop production	296	$13.31	$14.16
1152	Support activities for animal production	153	$15.86	$13.98
111, 112, 1151, 1152	**All agriculture**	**5,726**	**$14.14**	**$13.38**

[1]Includes some employers that also grow non-apple tree fruit.
[2]Includes some employers that also grow apples.
[3]Based on full-time equivalent of 173.3 hours per month.

Average and median hourly before-tax earnings differed by industry.

[30] The average hourly earnings estimate includes the base hourly rate of pay plus any additional bonuses, tips or other money payments made to the worker during the pay period in question.

Annual hours and months worked for selected agricultural commodities

Figure 2-15 shows average and median annual hours and months worked for selected agricultural commodities in 2012. Statistical significance tests were conducted for each average hours estimate relative to average annual hours worked for agriculture overall. Note that the hourly estimate for workers in each of the commodities was statistically significantly different from the all agriculture average. In addition, median hours worked annually were always lower than average annual hours worked, except for other crop farming.

For all agricultural industries, workers averaged 997 hours in 2012, equivalent to 5.8 months. Non-apple tree fruit and apple workers put in the fewest hours per worker, equivalent to 4.9 months per year. On the other hand, workers in animal production put in an average of 1,837 hours annually – at an equivalent of 10.6 months, effectively full time.

Figure 2-15. Median and average annual hours and months per worker by selected agricultural commodities
Washington state, 2012
Source:Employment Security Department/LMPA, Unemployment Insurance Wage File

NAICS	Agricultural commodities	Number of growers	Average annual hours	Median annual hours	Average annual months worked[3]
111331	Apples[1]	879	854	495	4.9
111339	Non-apple tree fruit[2]	998	687	282	4.0
111332	Grapes	239	1,086	697	6.3
111140	Wheat	779	1,142	1,041	6.6
111211	Potatoes	112	1,423	1,349	8.2
111219	Vegetables	221	1,261	918	7.3
111421, 111422	Nursery and floriculture	282	1,382	992	8.0
1119	Other crop farming	559	1,170	1,301	6.7
112	Animal production	760	1,837	1,494	10.6
1151	Support activities for crop production	296	1,161	1,109	6.7
1152	Support activities for animal production	153	1,218	1,173	7.0
111, 112, 1151, 1152	**All agriculture**	**5,726**	**997**	**799**	**5.8**

[1]Includes some employers that also grow non-apple tree fruit.
[2]Includes some employers that also grow apples.
[3]Based on full-time equivalent of 173.3 hours per month.

Both average and median annual hours worked varied widely among different agricultural commodities.

Summary

- The average monthly agricultural employment in Washington increased from 81,573 workers in 2011 to 87,249 workers in 2012.
- Seasonal agricultural workers in Washington increased by 8.9 percent from 2011 to 2012.
- Overall, average hourly earnings in agriculture were higher for Washington/Oregon than for California and the United States overall.
- The seasonal pattern in employment has changed slightly from 2012 compared to 2011, largely reflecting seasonal weather patterns.
- The regional distribution of agricultural labor in Washington for 2012 continues to remain relatively stable, consistent with earlier years.
- Seasonal workers in apples, cherries and pears account for the majority of seasonal employment in Washington agriculture.
- Workers in agriculture manufacturing earn about twice as much annually as do workers in production agriculture.
- Average hourly before-tax earnings in the three principle fruit harvests (apple, cherry and pear) increased from 2010 through 2012.
- For 2012, workers in all agricultural industries earn an average of $14.14 per hour; one half of these workers earn $13.38 or less.
- Wheat and potato workers have the highest average hourly wage rate; apple workers have the lowest.
- Overall, agricultural workers averaged 997 hours per year or an estimated 5.8 months. Workers in animal production have the highest hours and months worked; workers in non-apple tree fruit have the lowest.

Chapter 3: Employment and unemployment in Washington's agricultural labor market

Every month, the federal Bureau of Labor Statistics (BLS), in conjunction with the Census Bureau, surveys households to learn whether residents are employed, unemployed and looking for work, or out of the labor force – not working and not looking for work. These survey data are used to create the Local Area Unemployment Statistics (LAUS) report, including monthly estimates of the labor force, employment and unemployment levels. Unemployment rates are calculated statewide, by county, metropolitan divisions (MDs) and metropolitan statistical areas (MSAs). The LAUS database includes individuals not covered by the unemployment-insurance program, such as the self-employed, non-paid family members and undocumented workers. LAUS is the source of the employment data included in *Figure 3-1*.

The data reported in *figures 3-2*, *3-3* and *3-4*, include unemployed individuals who are receiving unemployment benefits. The unemployment-insurance program covers almost all agricultural employment in Washington.

Seasonal shifts in the employed labor force

Figure 3-1 compares the level of January employment to employment during the peak employment month for metropolitan areas, including two with high levels of agricultural activity (Wenatchee MSA and Yakima MSA) and six non-metropolitan agricultural counties for 2010 through 2012. Comparing agricultural MSAs and counties to non-agricultural metropolitan areas reveals the effects of agricultural activity on employment patterns:

- Employment during peak employment months is much higher than January employment in agricultural MSAs and counties compared to non-agricultural areas.
- The peak month for employment was always between June and October in agricultural areas and counties, but never in the late spring or summer in non-agricultural areas.

Key agricultural counties

All six agricultural counties increased workers from January levels during each of these years. Depending upon the year, agricultural commodity and weather, the peak employment month ranged from June to October. Okanogan county had the largest percentage shift in employment for each of the three years, ranging from a three-year high of 56.2 percent in 2012 to a three-year low of 47.4 percent in 2011. Skagit County had the lowest percentage shift ranging from 5.3 percent in 2010 to 3.6 percent in 2011.

MDs and MSAs

From 2010 through 2012, the eight MDs and MSAs supplied over 2,400,000 employed workers to the state economy during their peak employment months. The six non-agricultural metropolitan areas had a much higher component of nonfarm employment than did the two agricultural MSAs and six agricultural counties. Seasonal hiring is less of a factor affecting employment for these areas.

Variation between January and the peak month was never more than three percent for the six non-agricultural MDs and MSAs. On the other hand, peak employment increased much more in agricultural MSAs, as much as 36.2 percent for the Wenatchee MSA and 23.3 percent for the Yakima MSA.

Figure 3-1. Total employment for January and peak labor-force participation month, selected counties, metropolitan divisions (MD) and metropolitan statistical areas (MSA), not seasonally adjusted
Washington state, 2010 through 2012
Source: Employment Security Department/LMPA; U.S Bureau of Labor Statistics, Local Area Unemployment Statistics

	January and peak month employment											
	2010				2011				2012			
Agricultural areas	January empl.	Peak month	Peak month empl.	Percent change 2010	January empl.	Peak month	Peak month empl.	Percent change 2011	January empl.	Peak month	Peak month empl.	Percent change 2012
Key agricultural counties												
Benton	84,100	6	94,030	11.8%	86,770	7	93,580	7.8%	84,320	6	91,410	8.4%
Franklin	31,920	6	35,690	11.8%	32,930	7	35,520	7.9%	33,130	6	35,920	8.4%
Grant	33,130	9	41,220	24.4%	33,670	9	41,790	24.1%	34,090	6	43,090	26.4%
Okanogan	16,180	7	25,160	55.5%	16,430	7	24,210	47.4%	15,900	7	24,840	56.2%
Skagit	50,660	7	53,350	5.3%	50,240	10	52,050	3.6%	49,710	10	52,310	5.2%
Walla Walla	27,480	6	30,650	11.5%	27,550	10	29,820	8.2%	27,430	7	29,570	7.8%
Total	243,470		280,100	15%	247,590		276,970	11.9%	244,580		277,140	13.3%
Agricultural MSA*												
Wenatchee MSA	52,520	7	69,400	32.1%	52,160	7	69,080	32.4%	52,090	7	70,930	36.2%
Yakima MSA	105,130	7	124,190	18.1%	104,950	7	125,180	19.3%	104,440	7	128,770	23.3%
Total	**157,650**		**193,590**	**22.8%**	**157,110**		**194,260**	**23.6%**	**156,530**		**199,700**	**27.6%**
Nonfarm MD/MSA*												
Bellingham MSA	95,770	4	97,890	2.2%	95,990	11	98,830	3%	96,240	4	99,090	3%
Bremerton MSA	114,710	12	115,310	0.5%	113,160	12	114,250	1%	112,290	1	112,290	0.0%
Olympia MSA	119,370	11	120,810	1.2%	118,400	11	121,190	2.4%	117,220	11	118,330	0.9%
Seattle MD	1,344,000	4	1,368,050	1.8%	1,344,060	12	1,383,080	2.9%	1,377,550	9	1,408,910	2.3%
Spokane MSA	211,340	11	216,560	2.5%	209,410	11	213,340	1.9%	208,640	11	214,660	2.9%
Tacoma MD	351,890	12	356,800	1.4%	349,550	12	357,620	2.3%	351,320	12	357,330	1.7%
Total	**2,237,080**		**2,275,420**	**1.7%**	**2,230,570**		**2,288,310**	**2.6%**	**2,263,260**		**2,310,610**	**2.1%**

*MD = Metropolitan Division; MSA = Metropolitan Statistical Area.

Seasonal peak employment varies sharply for agricultural regions and counties.

Unemployed workers covered by unemployment insurance

Unemployment compensation is only available to workers no longer employed who had a job covered by the unemployment-insurance system, which includes most agricultural workers. Examining the number of continued claims provides an idea of the number of workers looking for and available for work.

Claimants in these tables are the numbers of individuals receiving benefits. Claims are the number of claims that are filed. In addition, the former employer who paid the highest base-year wages is noted as the industry affiliation for the claimant, which may not be their most recent employer.

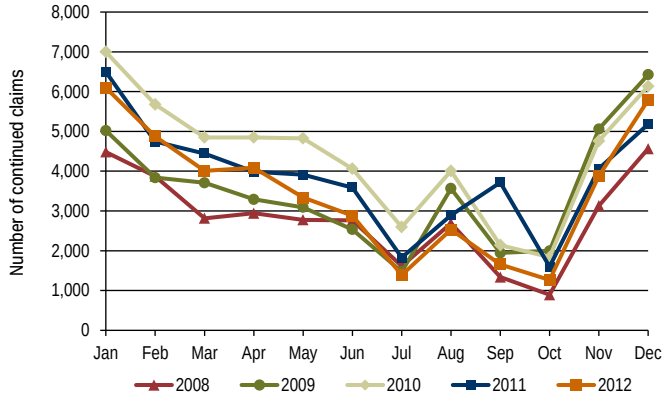
Agriculture continued claims[31]

The pattern of agricultural-worker continued claims reflects seasonal changes in agricultural labor supply and demand. In 2008, there was an average of 2,824 monthly-continued claims[32] (*Figure 3-2*). On an annual basis, continued claims in agriculture peaked at 4,395 monthly claims in 2010 and then dropped to 3,482 continued claims in 2012. This amounts to a 20.8 percent drop in continued claims from 2010 to 2012, showing a general tightening of the labor market, but this was still considerably higher than in 2008.

The seasonal patterns were consistent from year to year. Continued claims peaked in January. They dropped steadily to July; rose again in August, depending on weather patterns, then dropped again in September or October, only to rise again through November and December.

Seasonal labor demand significantly reduced the number of continued claims. Comparing January continued claims with July, the number dropped by 2,871 claims in 2008 and 4,709 in 2012. Comparing January with October, continued claims dropped by 3,591 in 2008, 5,161 in 2010 and 4,832 in 2012.

Figure 3-2. Agriculture continued claims[1] for unemployment benefits, by month
Washington state, 2007 through 2011
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse, Continued Claims Table



[1]Claims data for years 2008 through 2012 in this year's report use the North American Industry Classification System (NAICS). Previous years' reports for this data used the Standard Industrial Classification (SIC).

Unemployment-insurance continued claims for agriculture have historically dropped steadily through the year, increased between fruit harvesting seasons, then increased dramatically at the end of the year.

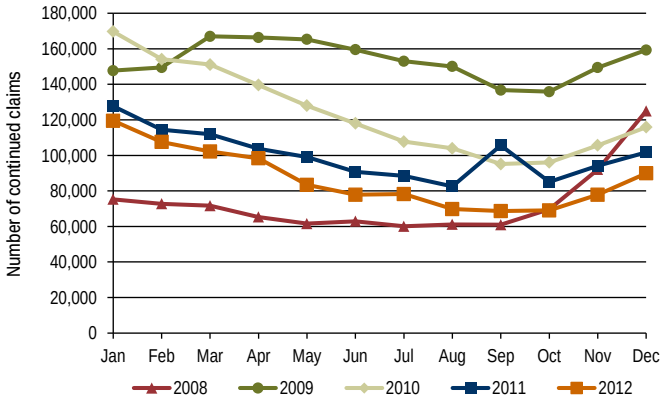
[31] Defined as individuals who are eligible for unemployment-insurance benefits and who are in a waiting period for unemployment-insurance credit or who are requesting payments of unemployment-insurance benefits for one or more weeks of unemployment.

[32] This total is a duplicated count. Some workers appear in more than one month's count.

Nonfarm continued claims

Figure 3-3 shows the seasonal pattern of continued claims for nonfarm workers. Unlike the pattern for agriculture, except for 2009, there was a general, but typically smooth drop in continued claims from January to September with an increase that occurred from October through December. Both the agricultural and the nonfarm continued claims showed a sharp jump for September 2011. This was apparently due to a change in administrative procedures in the unemployment-insurance program.

Figure 3-3. Nonfarm continued claims[1] for unemployment benefits, by month
Washington state, 2008 through 2012
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse, Continued Claims Table



[1]Claims data for years 2008 through 2012 in this year's report use the North American Industry Classification System (NAICS). Previous years' reports for this data used the Standard Industrial Classification (SIC).

The historical month-to-month pattern for nonfarm continued claims showed less seasonality than agriculture.

Distinct claims by agricultural industry

Figure 3-4 shows distinct claims in agriculture by industry for 2008 through 2012. Claimants could have filed one or more claims during the year but they are only counted once. Detail is provided for 32 agricultural industries plus an other category.

Unduplicated claims rose from 10,087 in 2008 to a high of 13,261 in 2010 and then dropped back to 12,550 in 2012. Thus, over 10,000 workers from agricultural industries filed claims at some point during these five years. Much of this labor is specialized. Workers in finfish farming and fish hatcheries or shellfish farming, for example, are not close substitutes for workers in grape vineyards or wheat farming.

Due to growers' recent reports of labor shortages for apple and other tree fruit harvests, the claims data for apple orchards and other non-citrus fruit farming were tabulated. The seasonal harvest surge for the fresh fruit harvest periods amounted to 40,000 to 60,000 workers each season. Annual hired claimants during this period totaled 3,325 workers in 2008, rose to 4,254 workers in 2010 and then dropped back to 3,983 workers in 2012 or about 8 percent of the peak season surge.

Figure 3-4. Annual unduplicated unemployment-insurance claims by selected agricultural industries[1]
Washington state, 2008 through 2012
Source: Employment Security Department/LMPA, Unemployment Insurance Data Warehouse, Continued Claims Table

Industry	Annual total continued claims 2008	Annual total continued claims 2009	Annual change 2008/2009	Annual total continued claims 2010	Annual change 2009/2010	Annual total continued claims 2011	Annual change 2010/2011	Annual total continued claims 2012	Annual change 2011/2012
Postharvest crop activities (except cotton ginning)	2,896	3,184	9.9%	4,078	28.1%	3,852	-5.5%	3,684	-4.4%
Apple orchards	1,867	2,239	19.9%	2,448	9.3%	2,357	-3.7%	2,374	0.7%
Other non-citrus fruit farming	1,458	1,567	7.5%	1,806	15.3%	1,648	-8.7%	1,609	-2.4%
All other miscellaneous crop farming	979	1,222	24.8%	1,232	0.8%	1,155	-6.3%	1,216	5.3%
Other vegetable (except potato) and melon farming	397	465	17.1%	508	9.2%	537	5.7%	562	4.7%
Grape vineyards	410	502	22.4%	526	4.8%	503	-4.4%	463	-8%
Nursery and tree production	334	487	45.8%	530	8.8%	495	-6.6%	505	2%
Potato farming	320	324	1.3%	331	2.2%	334	0.9%	346	3.6%
Floriculture production	229	283	23.6%	326	15.2%	300	-8%	300	0.0%
Hay farming	205	235	14.6%	251	6.8%	256	2%	261	2%
Berry (except strawberry) farming	127	168	32.3%	197	17.3%	223	13.2%	220	-1.3%
Wheat farming	131	180	37.4%	198	10%	212	7.1%	194	-8.5%
Farm labor contractors and crew leaders	86	121	40.7%	141	16.5%	121	-14.2%	154	27.3%
Dairy cattle and milk production	89	144	61.8%	121	-16%	108	-10.7%	112	3.7%
Soil preparation, planting and cultivating	74	78	5.4%	90	15.4%	98	8.9%	103	5.1%
Farm management services	70	82	17.1%	78	-4.9%	71	-9%	76	7%
Chicken egg production	128	61	-52.3%	35	-42.6%	29	-17.1%	38	31%
Shellfish farming	28	42	50%	46	9.5%	37	-19.6%	57	54.1%
Beef cattle ranching and farming	32	43	34.4%	42	-2.3%	37	-11.9%	46	24.3%
Fruit and tree nut combination farming	24	34	41.7%	35	2.9%	37	5.7%	48	29.7%
Cattle feedlots	32	33	3.1%	41	24.2%	30	-26.8%	21	-30%
Support activities for animal production	16	39	143.8%	51	30.8%	30	-41.2%	15	-50%
Corn farming	23	33	43.5%	24	-27.3%	20	-16.7%	19	-5%
Crop harvesting, primarily by machine	26	27	3.8%	23	-14.8%	19	-17.4%	18	-5.3%
All other grain farming	15	22	46.7%	20	-9.1%	23	15%	29	26.1%
Mushroom production	14	17	21.4%	14	-17.6%	9	-35.7%	12	33.3%

Industry	Annual total continued claims 2008	Annual total continued claims 2009	Annual change 2008/2009	Annual total continued claims 2010	Annual change 2009/2010	Annual total continued claims 2011	Annual change 2010/2011	Annual total continued claims 2012	Annual change 2011/2012
Finfish farming and fish hatcheries	12	9	-25%	8	-11.1%	16	100%	16	0.0%
Strawberry farming	13	8	-38.5%	10	25.0%	11	10%	8	-27.3%
Oilseed and grain combination farming	11	8	-27.3%	7	-12.5%	7	0.0%	7	0.0%
All other animal production	13	15	15.4%	4	-73.3%	8	100%	7	-12.5%
Horses and other equine production	10	11	10%	12	9.1%	8	-33.3%	4	-50%
Apiculture	5	6	20%	10	66.7%	10	0.0%	10	0.0%
Other	13	24	84.6%	18	-25%	17	-5.6%	16	-5.9%
Totals	**10,087**	**11,713**	**16.1%**	**13,261**	**13.2%**	**12,618**	**-4.8%**	**12,550**	**-0.5%**

[1]Claims data for years 2008 through 2012 in this year's report use the North American Industry Classification System (NAICS). Previous years' reports for this data used the Standard Industrial Classification (SIC).

Annual total continued claims for 2012 showed a decrease of 0.5 percent from 2011.

Summary

- The labor force is a dynamic economic institution; continuous changes occur in the numbers of employed, unemployed and those out of the labor force. This adds uncertainty to the labor force planning of growers.
- Seasonal employment is much more of a factor for the six key agricultural counties and two heavily agricultural MSAs in the state than for the state's six urban metropolitan divisions and metropolitan statistical areas. This high seasonality also lends uncertainty to the growers' labor force planning.
- Unemployment percentages and levels are an index of the labor supply for growers. In general, based on these data, agricultural labor markets have tightened up over the period 2010 through 2012.
- Continued claims in agriculture show a distinct seasonal pattern. The magnitude of these claims is small relative to the annual increase in demand for seasonal agricultural workers.

Chapter 4: H-2A employment and the issue of hired labor shortages

H-2A employment: Washington and the United States

The federal H-2A guest worker program allows U.S. employers to hire foreign workers on a temporary basis to perform agricultural work when there are not sufficient U.S. workers. The H-2A program was instituted to meet this need for seasonal and temporary labor, without adding permanent residents to the population.[33] Since workers under the program do not remain in the United States after the end of their contracted employment period, there is no annual limit to the number of H-2A workers who may enter the United States to work.

At the federal level, certified employer applications for H-2A workers have grown from 6,550 in 2006 to 7,836 in 2012, a 19.6 percent increase. The number of workers certified over that time has grown by an even greater amount, from 59,110 to 85,487, a 44.6 percent increase. The number of employer applications certified in Washington state increased from 11 in 2006 to 33 in 2012. The number of workers certified increased from 814 in 2006 to 3,953 in 2012. There were some decreases in applicants, workers certified, or both in 2009 and 2010 (*Figure 4-1*).

Figure 4-1. H-2A certifications
United States and Washington state, 2006 through 2012
Source: Employment Security Department/Workforce & Career Development Division; U.S. Department of Labor, Office of Foreign Labor Certification, Fiscal Year Performance Summaries

	H-2A certifications							
	United States[1]				Washington state[2]			
Year	Employer applications certified	Percent change year to year	Workers certified	Percent change year to year	Employer applications certified	Percent change year to year	Workers certified	Percent change year to year
2006	6,550	-0.8%	59,110	22.3%	11	57.1%	814	*
2007	7,491	14.4%	76,814	30%	26	136.4%	1,688	107.4%
2008	7,944	6.0%	82,099	6.9%	34	13.3%	2,513	40.1%
2009	7,665	-3.5%	86,014	4.8%	30	-11.8%	1,882	-25.1%
2010	6,988	-8.8%	79,011	-8.1%	25	-16.7%	2,981	58.4%
2011	7,000	0.2%	77,246	-2.2%	18	-28.0%	3,182	7%
2012	7,836	11.9%	85,487	10.7%	33	83.3%	3,953	24.2%

* No 2005 comparison data.
[1] National data are on a federal fiscal year basis.
[2] Washington data do not include applications submitted for sheepherder or beekeeper jobs.

With the exception of 2009, the depth of the recent recession, the number of H-2A workers has been steadily increasing in Washington state.

[33] U.S. Department of Homeland Security, "H-2A Temporary Agricultural Worker Program" (https://www.dhs.gov/h-2a-temporary-agricultural-worker-program).

The H-2A program and agricultural wages

Federal regulations require that growers pay the highest of the following:

- the federal Adverse Effect Wage Rate (AEWR);[34]
- the state prevailing wage; or
- the state or federal minimum wage.

In addition, all non-H-2A workers performing the same tasks or jobs employed by the H-2A employer must be paid the same wage rate or piece rate as is paid to the H-2A worker for that task or job.

The AEWR in Washington is equal to the annual weighted average hourly wage rate for field and livestock workers (combined) for the region (Washington and Oregon). It is calculated annually by the U.S. Department of Labor using the U.S. Department of Agriculture's annual wage rates from its regional Farm Labor Survey of nonfamily field and livestock workers.

Prevailing wage rates are revised every two years based on surveys of fruit growers conducted by the Washington State Employment Security Department's Labor Market and Performance Analysis branch (LMPA). LMPA surveys fruit growers on four activities: apple thinning, cherry harvest, pear harvest and apple harvest. The survey responses are analyzed based on the U.S. Department of Labor's (DOL) methodology. The results are used by DOL to establish wages under the federal H-2A guest worker program. Currently, prevailing wage rates are based on results of a survey conducted in 2011. Prevailing wage rates for 2014 and 2015 will be based on a survey conducted during the summer and fall of 2013. The current prevailing wage rates for Washington and other states are posted on the DOL website at http://www.foreignlaborcert.doleta.gov/aowl.cfm.

State prevailing wages vary among both products and production methods and are usually expressed in piece-rate terms such as by the bin or lug. *Appendix Figure A4-1* provides the full set of prevailing wage rates for H-2A workers for 2012 in Washington. The AEWR varies among states and is currently $12 an hour in Washington (shown in *Figure 4-2*). Since the federal and state minimum wage are both well below the AEWR, the minimum wage paid to farmworkers is either the state prevailing wage for a given product/production method combination or the AEWR. In cases where workers are paid piece rates, workers are guaranteed $12 an hour (the AEWR), but may earn more based on their productivity.

It is difficult to know for certain what effect the H-2A program is having on agricultural wages in Washington. As presented in *Figure 2-14*, median before-tax hourly earnings in 2012 ranged from $11.00 to $15.02. The AEWR may be acting as a floor for less productive workers who might have earned less than $12 in the absence of the AEWR. It is also difficult to know what bin or lug rates would have been in the absence of prevailing wages, particularly in light of seasonal worker shortages.

The remainder of this chapter analyzes the seasonal agricultural workforce and discusses the issue of worker shortages.

[34] The AEWR is determined by the U.S. Department of Labor and is not based on any ESD/LMPA survey or data source.

Figure 4-2. The Adverse Effect Wage Rate (AEWR), current and inflation-adjusted dollars, CPI-W 2011 = 100
Washington, Oregon and California, 2004 through 2013
Source: U.S. Department of Labor, Employment and Training Administration, Office of Foreign Labor Certification, Adverse Effect Wage Rate (AEWR)

	Current dollars			Inflation-adjusted dollars		
Year	Washington	Oregon	California	Washington	Oregon	California
2004	$8.73	$8.73	$8.50	$10.48	$10.48	$10.20
2005	$9.03	$9.03	$8.56	$10.48	$10.48	$9.93
2006	$9.01	$9.01	$9.00	$10.12	$10.12	$10.11
2007	$9.77	$9.77	$9.20	$10.68	$10.68	$10.05
2008	$9.94	$9.94	$9.72	$10.44	$10.44	$10.21
2009	$10.12	$10.12	$10.16	$10.70	$10.70	$10.74
2010	$10.85	$10.85	$10.25	$11.23	$11.23	$10.61
2011	$10.60	$10.60	$10.31	$10.60	$10.60	$10.31
2012	$10.92	$10.92	$10.24	$10.68	$10.68	$10.01
2013	$12.00	$12.00	$10.74	$11.74	$11.74	$10.50

The AEWR increase since 2004 exceeds the increase due to the rise in the CPI-W by 16 percent.

Seasonal employment and wage rate data – the monthly Agricultural Employment and Wage survey

The Agricultural Employment and Wage survey is a monthly survey of the employment and wages for a probability sample of 2,000 agricultural growers in the state. This is a scientific survey with greater weight in the sample estimates given to larger growers.[35] Agricultural operators are surveyed for employment data for seasonal workers, type of crop, work activity and wage rates.

Based on these data, estimates are developed on the size of the workforce and average piece rates or hourly earnings for each activity. For the purpose of the survey, seasonal workers are those working less than 150 days per year. All total and seasonal employment numbers represent jobs rather than workers. A single worker could hold more than one job over the growing and harvesting seasons of different crops.

Some variation in reporting of seasonal data can be attributed to the requirement that employment be reported in the pay period including the 12th of the month. Because the timing of a given crop's harvest and other activities can be affected by weather and other conditions, periods of peak employment do not always fit precisely within the reporting period. This reporting condition can lead to some variation of estimated employment by crop when comparing a given activity for similar time periods. This is especially true for the cherry harvest period.

[35] Technically, the sample is selected from the population frame of all growers in the state based a probability that is proportional to grower size (PPS), where grower size is measured as the number of employees the grower has at the point of development of the population frame. Growers having 50 or more employees are drawn into the sample with certainty. The population frame is defined by the Quarterly Census of Employment and Wages (QCEW).

The state is grouped into six areas based on agricultural economic similarity as shown in *Figure 2-8* in *Chapter 2*. Considerable detail is provided for apple, cherry and pear production since the seasonal surge in employment is concentrated in and driven by these three fruit crops. The fresh fruit crops, especially apples, significantly affect the agricultural infrastructure of the state. The cherry crop has a significant impact on state agriculture since the harvest period is concentrated in such a short time period. The volume of the apple harvest over the harvest season is the major factor affecting longer-term seasonal employment. The pear harvest is important as a bridge in labor demand from the tapering off of the cherry harvest to the full surge in labor demand for the apple harvest.

The tables and charts presented in this report compare the seasonal agricultural employment for the state and the six areas for the peak month of 2012, the previous month and the previous year for that same month as shown in *Figures 4-3* and *4-5*. Employment for each crop activity is noted as a percent change relative to the previous month and previous year. Crops having the greatest increase and greatest decrease in employment are highlighted in the narrative. *Figures 4-4* and *4-6* show the top four crop activities by employment and wage rate for each of the six agricultural reporting areas.

Employment – cherries

Figure 4-3 shows the regional structure of seasonal employment for the peak cherry harvest period of July 2012. An estimated 92,840 jobs were reported for that month. The harvest was concentrated in the South Central and North Central geographic regions of the state where 56,780 jobs were reported, 61.2 percent of the total seasonal jobs that month. From June through July 2012, total agricultural employment jumped by 43,590 jobs, of which 35,120 were seasonal jobs.

Wage rates – cherries

Figure 4-4 shows the estimated average hourly wage and piece rates offered for the top four crop activities in each reporting area for the peak cherry harvest period of 2012. Workers receiving piece rates often earn more than those paid by the hour for the same activity. Median and average before-tax earnings were shown in *Figure 2-14*, where all earnings were converted to hourly rates.

Variations in demand and supply conditions are revealed by the data. Take, for instance, the apple hand thinner. This job paid $9.88 per hour in the Eastern area; $9.40 in the South Eastern area; $9.47 per hour in the North Central area; $9.70 per hour in the Columbia Basin area; and $9.21 per hour in the South Central area. Cherry harvester wage rates reflect regional differences as well for the same harvest month.

Employment – apples

Total and seasonal employment for the peak apple harvest month of October 2012 is shown in *Figure 4-5*. Total employment was not as high in October as it was in July, 107,180 jobs versus 139,220 jobs. However, the apple harvest season extended over a much longer time period, with different varieties of apples maturing at different times.

The South Central and North Central areas held 37,670 jobs out of the seasonal total of 64,860 jobs or 58.1 percent of all seasonal jobs in that month. Statewide, total agricultural employment dropped by 11,700 jobs from September to October. An estimated 6,990 of this drop, 59.7 percent, were seasonal jobs.

Wage rates – apples

Average hourly and piece rates are shown in *Figure 4-6* for the peak month of the apple harvest in 2012. As with the peak harvest month for cherries, there were differences in average hourly wage rates for the same job across the different agricultural reporting areas. Apple harvesters earned the lowest average hourly wage rate of $10.30 in the Columbia Basin area and the highest ($10.80) in the North Central area. Growers needing apple harvesters had to compete against growers who paid pear harvesters an average hourly wage of $14.00 per hour in the North Central area. Growers needing apple harvesters in the Columbia Basin and South Eastern areas had to compete against growers paying slightly higher wage rates to grape harvesters.

Figure 4-3. Agricultural employment[1] during the month of peak cherry employment
Washington state and six agricultural reporting areas, June and July, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Agricultural employment July 2012						
Agricultural reporting area	Seasonal employment	Percent of seasonal employment	Permanent employment	Percent of permanent employment	Total employment	Percent of total employment
Statewide	**92,840**	**100%**	**46,380**	**100%**	**139,220**	**100%**
Western	8,790	9.5%	7,210	15.5%	16,000	11.5%
South Central	26,620	28.7%	17,120	36.9%	43,740	31.4%
North Central	30,160	32.5%	8,360	18%	38,520	27.7%
Columbia Basin	10,940	11.8%	4,740	10.2%	15,680	11.3%
South Eastern	15,450	16.6%	8,070	17.4%	23,520	16.9%
Eastern	880	0.9%	880	1.9%	1,760	1.3%

Total agricultural employment June and July, 2011 and 2012							
Agricultural reporting area	July 2012 preliminary	June 2012 revised	July 2011 revised	Change June 2012 to July 2012	Change July 2011 to July 2012	Percent change June 2012 to July 2012	Percent change July 2011 to July 2012
Statewide	**139,220**	**95,630**	**129,160**	**43,590**	**10,060**	**45.6%**	**7.8%**
Western	16,000	10,820	14,080	5,180	1,920	47.9%	13.6%
South Central	43,740	32,480	42,310	11,260	1,430	34.7%	3.4%
North Central	38,520	19,750	34,210	18,770	4,310	95%	12.6%
Columbia Basin	15,680	12,470	14,730	3,210	950	25.7%	6.4%
South Eastern	23,520	18,510	22,260	5,010	1,260	27.1%	5.7%
Eastern	1,760	1,600	1,570	160	190	10%	12.1%

Seasonal agricultural employment June and July, 2011 and 2012							
Agricultural reporting area	July 2012 preliminary	June 2012 revised	July 2011 revised	Change June 2012 to July 2012	Change July 2011 to July 2012	Percent change June 2012 to July 2012	Percent change July 2011 to July 2012
Statewide	**92,840**	**57,720**	**86,030**	**35,120**	**6,810**	**37.8%**	**7.9%**
Westernzz	8,790	3,770	7,130	5,020	1,660	57.1%	23.3%
South Central	26,620	21,450	30,100	5,170	-3,480	19.5%	-11.6%
North Central	30,160	12,260	24,370	17,900	5,790	59.4%	23.8%
Columbia Basin	10,940	8,340	9,740	2,600	1,200	23.7%	12.3%
South Eastern	15,450	11,330	14,250	4,120	1,200	26.7%	8.4%
Eastern	880	570	440	310	440	35.2%	100%

[1]Employment estimates published in this report are not seasonally adjusted and are not adjusted for multiple jobholders; the number of jobs is being counted, not the number of workers.

Statewide seasonal employment increased month over month.

Figure 4-4. Average hourly wage rates and piece rates, selected occupations and activities
Washington state's six agricultural reporting areas, July 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Reporting area and activity	Employment	Hourly wage rate	Piece rate
Western			
Raspberry harvester	1,930	$9.10/hr	
Raspberry sorter/grader/packer	1,490	$9.04/hr	
Strawberry harvester	*	*	
Nursery worker	410	$10.08/hr	
South Central			
Cherry harvester	7,160	$9.76/hr or	$4.20 - $7.25 per lug
Apple hand thinner	6,710	$9.21/hr or	$0.50 - $3.00 per tree
Cherry sorter/grader/packer	5,260	$9.17/hr	
Apple worker	1,050	$9.84/hr	
North Central			
Cherry harvester	21,010	$9.23/hr or	$3.00 - $7.25 per lug
Apple hand thinner	2,410	$9.47/hr or	$0.80 - $1.60 per tree
Contract post-harvest sorter/grader/packer	1,850	$9.04/hr	
Cherry sorter/grader/packer	1,610	$9.06/hr	
Columbia Basin			
Cherry harvester	4,200	$9.04/hr or	$3.50 - $6.50 per lug
Apple hand thinner	2,850	$9.70/hr or	$0.60 - $5.00 per tree
Mint harvester	*	*	
Blueberry harvester	550	Not Reported	
South Eastern			
Cherry harvester	5,260	$9.43/hr or	$5.00 - $6.00 per lug
Blueberry harvester	4,050	$9.04/hr	
Apple hand thinner	3,040	$9.40/hr	
Grapes trainer	540	$9.46/hr	
Eastern			
Apple hand thinner	120	$9.88/hr	
Cherry harvester	120	$9.09/hr	
Wheat worker	100	$11.64/hr	
Apple harvester	50	Not Reported	

*Not published due to lack of statistical significance or to ensure employer confidentiality.

Average wage rates for given agricultural activities vary by agricultural reporting area, reflecting local differences in demand and supply conditions.

Figure 4-5. Agricultural employment[1] during the month of peak apple employment
Washington state and six agricultural reporting areas, September and October, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Agricultural employment October 2012						
Agricultural reporting area	Seasonal employment	Percent of seasonal employment	Permanent employment	Percent of permanent employment	Total employment	Percent of total employment
Statewide	**64,870**	**100%**	**42,310**	**100%**	**107,180**	**100%**
Western	4,630	7.1%	7,370	17.4%	12,000	11.2%
South Central	20,830	32.1%	12,920	30.5%	33,750	31.5%
North Central	16,840	26.0%	9,510	22.5%	26,350	24.6%
Columbia Basin	10,850	16.7%	4,590	10.8%	15,440	14.4%
South Eastern	11,290	17.4%	6,560	15.5%	17,850	16.7%
Eastern	520	0.8%	1,270	3.0%	1,790	1.7%

Total agricultural employment September and October, 2011 and 2012							
Agricultural reporting area	October 2012 preliminary	September 2012 revised	October 2011 revised	Change September 2012 compared to October 2012	Change October 2011 compared to October 2012	Percent change September 2012 compared to October 2012	Percent change October 2011 compared to October 2012
Statewide	**107,180**	**118,880**	**103,100**	**-11,700**	**4,080**	**-9.8%**	**4%**
Western	12,000	12,780	11,250	-780	750	-6.1%	6.7%
South Central	33,750	39,930	33,650	-6,180	100	-15.5%	0.3%
North Central	26,350	28,020	25,440	-1,670	910	-6%	3.6%
Columbia Basin	15,440	16,350	14,280	-910	1,160	-5.6%	8.1%
South Eastern	17,850	19,690	16,740	-1,840	1,110	-9.3%	6.6%
Eastern	1,790	2,110	1,740	-320	50	-15.2%	2.9%

Seasonal agricultural employment September and October, 2011 and 2012							
Agricultural reporting area	October 2012 preliminary	September 2012 revised	October 2011 revised	Change September 2012 compared to October 2012	Change October 2011 compared to October 2012	Percent change September 2012 compared to October 2012	Percent change October 2011 compared to October 2012
Statewide	**64,860**	**71,850**	**65,520**	**-6,990**	**-660**	**-9.7%**	**-1%**
Western	4,630	5,580	3,960	-950	670	-17%	16.9%
South Central	20,830	23,690	23,690	-2,860	-2,860	-12.1%	-12.1%
North Central	16,840	18,610	17,340	-1,770	-500	-9.5%	-2.9%
Columbia Basin	10,750	11,560	11,950	-810	-1,200	-7.0%	-10%
South Eastern	11,290	11,440	8,980	-150	2,310	-1.5%	25.7%
Eastern	520	970	600	-450	-80	-46.4%	-13.3%

[1]Employment estimates published in this report are not seasonally adjusted and are not adjusted for multiple jobholders; the number of jobs is being counted, not the number of workers.

Statewide seasonal employment declined month over month.

Figure 4-6. Average wage rates and piece rates, selected occupations and activities
Washington state's six agricultural reporting areas, October 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Reporting area and activity	Employment	Hourly wage rate	Piece rate
Western			
Other general farm worker	440	$9.06/hr	
Blueberry harvester	430	$9.04/hr	
Pumpkin worker	*	*	
Raspberry pruner	340	$9.53/hr or	$0.21 - $0.27 per plant
South Central			
Apple harvester	16,090	$10.56/hr or	$16.00 - $28.00 per bin
Pear harvester	740	$9.04/hr	
Apple sorter/grader/packer	580	$9.24/hr	
Hops worker	*	*	
North Central			
Apple harvester	14,780	$10.80/hr or	$15.00 - $40.00 per bin
Pear harvester	510	$14.00/hr or	$19.00 - $23.00 per bin
Apple worker	420	$10.77/hr	
Nursery and tree worker	360	$9.04/hr	
Columbia Basin			
Apple harvester	7,370	$10.30/hr or	$16.00 - $30.00 per bin
Apple worker	640	$10.44/hr	
Grapes harvester	550	$10.50/hr	
Sweet corn sorter/grader/packer	*	*	
South Eastern			
Apple harvester	8,290	$10.45/hr or	$15.00 - $30.00 per bin
Grapes harvester	820	$10.98/hr	
Potato worker	450	$9.05/hr	
Potato harvester	260	$9.49/hr	
Eastern			
Miscellaneous fruit trees worker	200	$ 9.04/hr	
Wheat tractor operator	60	$12.86/hr	
Wheat worker	50	$13.67/hr	
Pumpkin harvester	*	*	

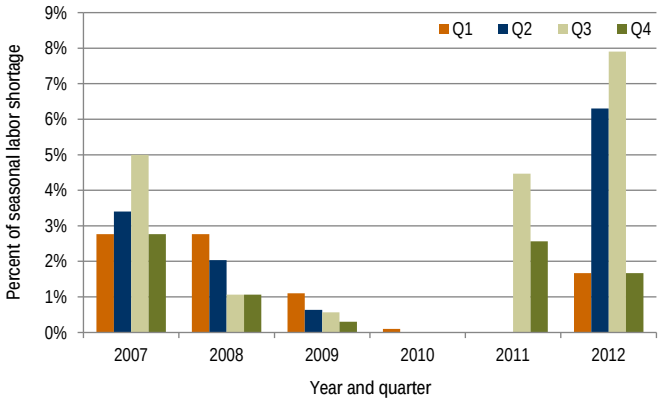
*Not published due to lack of statistical significance or to ensure employer confidentiality.

Average wage rates for given agricultural activities vary by agricultural reporting area, reflecting local differences in demand and supply conditions.

The issue of seasonal labor shortage

Washington state growers did not report agricultural labor shortages during the depths of the Great Recession. This situation has changed. Generalized shortages, not spot shortages,[36] have been reported beginning in August 2011 and continuing into most of 2012 based on the monthly Agricultural Employment and Wage survey. These shortages are presented in *Figure 4-7* as a percent of the total labor force desired by the grower. Shortages exceeded five percent every month from April through September for the first time in 2012.

Figure 4-7. Seasonal agricultural labor shortage[1] as reported by agricultural producers, in percent, weighted by the total labor force reporting
Washington state, 2007 through 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



[1]Labor shortage percent is the total reported additional seasonal labor needed divided by total reported seasonal labor.

Generalized, not spot shortages were reported in 2012.

The reasons for these reported labor shortages are not fully understood. Improved economic conditions in Washington may be leading to a tighter labor market and more opportunities for work outside of agriculture. Bumper crops also push up demand for labor.

Tighter labor supply may also be causing shortages. A large number of seasonal agricultural workers in Washington are from Latin America, in particular, Mexico. The Pew Hispanic Research Center estimated in 2012 that overall migration from Mexico fell to zero following the Great Recession – that is, the number of Mexican migrants (authorized and unauthorized) to America equaled the number of Mexicans who emigrated back to Mexico. Pew reports:

> "The standstill appears to be the result of many factors, including the weakened U.S. job and housing construction markets, heightened border enforcement, a rise in deportations, the growing dangers associated with illegal border crossing, the long-term decline in Mexico's birth rates and broader economic conditions in Mexico."[37]

[36] The term "spot shortage" refers to a localized shortage situation that may simply be due to, say, insufficient timely advertising for labor on the part of a grower or growers in a given locale. A "generalized shortage" refers to a shortage situation in which due to, say, increased border surveillance and enforcement, there are fewer workers to meet the seasonal demand for labor. In this case, the shortage pervades the entire agricultural labor market.

[37] Passel, Jeffrey, D'Vera Cohn and Ana Gonzalez-Barrera, "Net Migration from Mexico Falls to Zero–and Perhaps Less," Pew Research, Hispanic Center, Updated May 3, 2012. This update includes the full methodology appendix and a statistical profile of Mexican immigrants in the United States.

Analyzing the seasonal agricultural labor shortage issue is complicated by the fact that federal officials do not know the full extent of the use of unauthorized workers. The U.S. Department of Labor estimated that 48 percent of all hired crop workers were found to be unauthorized.[38]

The H-2A program was set up to alleviate worker shortages. It adds legal agricultural workers to the state's agricultural labor force but only makes a small contribution to meeting the seasonal demand for workers during critical fresh fruit harvest periods. For example, the H-2A program certified 3,953 seasonal workers for Washington state during 2012, while total employment during the peak cherry harvest month of July was 139,220 workers, including 92,840 seasonal workers. These H-2A workers thus comprised only 4.8 percent of the seasonal jobs for July.

Grower response to reported shortages of hired agricultural labor

We analyzed the response of growers to reported labor shortages by looking at changes in employment and average wages, both year-to-year and within growing seasons. *Figure 4-8* presents month-over-month and year-over-year employment and piece rates for apple, cherry and pear harvest periods. The data are shown for the relevant harvest months for each type of tree fruit for 2011 and 2012. It should be noted that different fruit varieties have differing piece rates, which will account for some portion of the wage rate changes during the harvest season.

Apples

In 2011, employment peaked in October, whereas it peaked in September in 2012. Bin rates were higher each month in 2012 than in 2011, peaking both years in November. In this case, the correlation between bin (wage) rates and employment was not consistent over time.

Cherries

Between 2011 and 2012, there was a piece rate increase and an employment increase for cherries during the month of July, the peak harvest month, but not in June or August when the opposite was noted.

Pears

Between 2011 and 2012, there was evidence of a relationship between piece rate increases and employment increases in August, but not in September or October. There was no lagged relationship between piece rate increases in August and employment in September.

Analysis

The overall picture when comparing 2011 with 2012 is that there was a period of peak employment and one of peak wages, but they did not exactly coincide or move in the same direction for the various crops. The evidence presented here is from a two-year comparison of data and does not constitute a trend.

[38] U.S. Department of Labor, Employment and Training Administration, National Agricultural Workers Survey (NAWS), Public Data for 2007-2009 (www.doleta.gov/agworker/naws.cfm). A review of the sampling methods for this survey of agricultural workers (the workers are the sample unit of observation, not the employer) shows that non-response to the survey at any given sample point is treated as random. If there are 10 workers to be sampled at a given site and only four are located and agree to be interviewed (strict anonymity of the responses is guaranteed), the four responses are weighted up to the total of 10 that were selected for the sample site. This assumption of randomness of nonresponse is a very strong assumption. It is reasonable to assume, since undocumented workers have an incentive not to be interviewed in spite of the guarantee of anonymity, that undocumented workers are underrepresented in the total sample and in the weighted population estimates. Thus, the 48 percent estimate may be at the low end of the range of actual percent of undocumented workers.

Figure 4-8. Average piece rates and employment for apple, cherry and pear harvest periods, current dollars
Washington state, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

Piece rates and seasonal employment	2011	2012	Percent change from 2011 to 2012	2011	2012	Percent change from 2011 to 2012	2011	2012	Percent change from 2011 to 2012
Apples	**September**			**October**			**November**		
Apple bin rates	$20.41	$21.12	3.5%	$20.03	$21.28	6.2%	$22.80	$23.15	1.5%
Employment	5,993	9,362	56.2%	8,021	8,763	9.3%	4,443	2,672	-39.9%
Cherries	**June**			**July**			**August**		
Cherry lug rates	$4.40	$5.38	22.3%	$4.37	$5.18	18.5%	$4.40	$4.30	-2.3%
Employment	660	575	-12.9%	2,255	2,511	11.4%	1,910	2,121	11%
Pears	**August**			**September**			**October**		
Pear bin rates	$16.34	$16.85	3.1%	$17.72	$20.39	15.1%	$18.73	$20.43	9.1%
Employment	187	537	187.2%	778	699	-10.1%	480	124	-74.2%

Wages and employment increased in 2012 peak harvest months compared to 2011.

Graphic relationships between year-over-year piece rate levels and 2012 monthly estimates of labor shortages

Figures 4-9, *4-10* and *4-11* graph the year-over-year piece rates for apple, cherry and pear harvests in 2011 and 2012 and monthly reports of labor shortages in 2012. The shortage reports are not limited to just apple, cherry or pear harvesting, but include all seasonal crop activities.

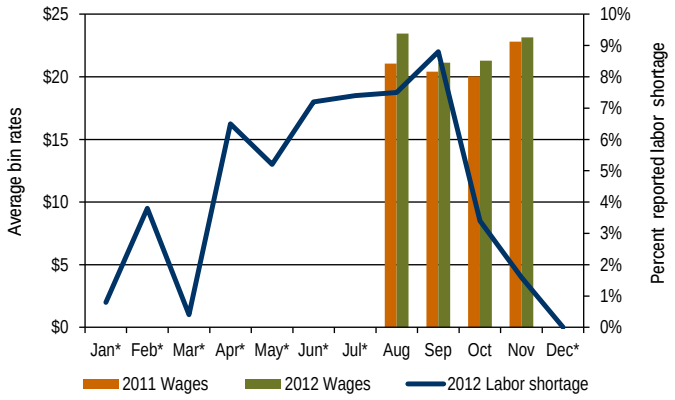
Most tree-fruit growers produce multiple crops. In 2012, 36 percent of growers grew only apples, 16 percent grew apples, cherries and pears, 13 percent grew apples and pears and 35 percent grew apples and cherries.[39] Thus, any correspondence between the reports of labor shortages and a specific bin or lug piece rate is limited. It is important to note that while wage rate levels have generally increased year over year, it is the month-to-month change in wage rate levels that may indicate that there is a labor shortage during that time period. Year-over-year increases in wage rate levels can be due to factors other than a labor shortage, such as adjustments to inflation.

Figure 4-9 for apples shows monthly reports of shortages increasing in April 2012, prior to the surge in the harvest season in August and peaking in September.

Figure 4-10 for cherry harvest shows that the lug rates paid during 2012 had little relation to changes in the report of labor shortages. Lug rates were higher in June, July and September of 2012 than in 2011, but were not statistically significant month over month. In this time period, other seasonal crop activities may have had a larger influence on the reported labor shortages. Factors other than labor shortages, such as an inflation adjustment to maintain real wage levels, could have contributed to the year-over-year increase in average earnings.

[39] Source: ESD 2011 H-2A tree fruit wage surveys

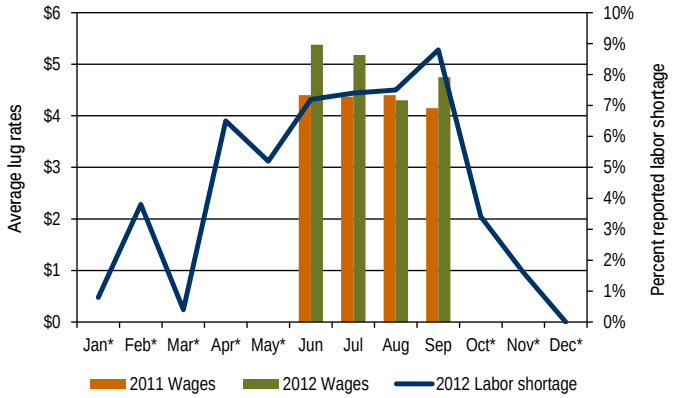
Figure 4-9. Apple harvest average bin rates in current dollars and reported labor shortage
Washington state, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



*No apple harvest occurred in these months.

Grower reports of labor shortages before and during the apple harvest season were followed by statistically significant year-over-year bin piece-rate increases.

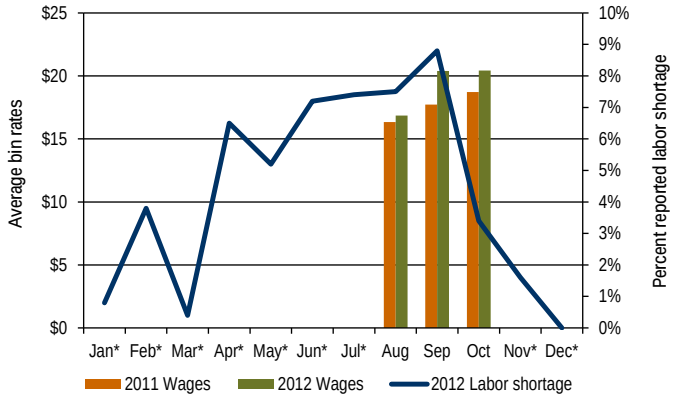
Figure 4-10. Cherry harvest average lug rates in current dollars and reported labor shortage
Washington state, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



*No cherry harvest occurred in these months.

Grower reports of shortages during the harvest period were followed by higher year-over-year lug rates for June, July and September 2012, but these were not statistically significant.

Figure 4-11. Pear harvest average bin rates in current dollars and reported labor shortage
Washington state, 2011 and 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey



*No pear harvest occurred in these months.

Grower reports of labor shortages during the pear harvest season were followed by a statistically significant month-over-month wage increase in September 2012 compared to 2011.

Figure 4-11 indicates that average pear bin rates in the harvest months of 2012 exceeded bin rates for the same months in 2011. Bin rates in 2012 peaked in October following the peak in reports of shortages. Grower reports of shortages during the pear harvest period were followed by a statistically significant month-over-month wage increase in September 2012 compared to 2011. Again, these changes in monthly and year-over-year average earnings can have explanations other than the monthly report of labor shortages.

Conclusion

The comparison of monthly wage-level changes, year over year, while suggestive, is not proof of an existing monthly labor shortage, since factors other than labor shortages can also contribute to monthly or year-over-year increases in wage levels, the most likely candidate being wage inflation adjustments. A complex statistical study would be needed to sort out the effect of these competing explanations for increases in annual average wage-rate levels.

Summary

- The federal H-2A guest worker program is intended to supply needed agricultural labor over the growing and harvest seasons in U.S. agriculture.
- Shortages of hired agricultural workers to fill seasonal thinning and harvest jobs have been consistently reported by Washington growers beginning in August 2011 and continuing into 2012.
- Average wage increases during peak harvest months for apples, cherries and pears may indicate a shortage of labor.
- In recent years, in-migration from Mexico and out-migration to Mexico has cancelled each other out.

Chapter 5: The impact of irrigation on agricultural production and employment

Irrigation in Washington state

Irrigation has helped to make Eastern Washington one of the nation's showpieces of agricultural success. Before the 1930s, lack of irrigation water remained the major obstacle to expanding productive agricultural land and economic development in the region. Then the federal government began the major land reclamation projects that involved building the Grand Coulee Dam, a high dam begun in 1933 and completed in 1942. This added significant irrigation capacity to Eastern Washington agriculture.

In the 1950s, the Columbia Basin Irrigation Project expanded the amount of water going to the state's eastern agricultural region. The Columbia River mainstem currently has 11 dams, resulting in an increase in potential irrigation acreage. For a detailed description of their water utilization, see http://www.ecy.wa.gov/programs/wr/cwp/cr_wtrbud.html

Based on data from the 2007 Census of Agriculture, irrigated acreage as a percent of total acreage on farms that have some irrigated acres has gradually increased. Starting with 1982, 20 percent of the land on farms with some irrigation was irrigated; for 1987, 18.6 percent; for 1992, 20.5 percent; for 1997, 21.6 percent; for 2002, 22.7 percent; and for 2007, 22.8 percent.[40]

There are four basic water delivery systems: gravity; sprinkler; drip, trickle or low-flow micro sprinklers; and sub-irrigation. In some water delivery systems, fertilizer and insecticides can be added to the water directly. Nationally, for 2008, irrigation water was delivered through those systems in the following percents: 40.1 percent; 56.2 percent; 6.8 percent and 0.4 percent, respectively. For Washington state in 2008, the respective percents were 11.9 percent, 82.3 percent and 8.3 percent. Sub-irrigation was not employed in the state in 2008.[41]

The value of farmland irrigation

Though not all increases in the value of Washington state agriculture have been due to changes in irrigated acreage and irrigation technology, the following data are of interest. In 1930, irrigated acreage in Washington state comprised less than 500,000 total acres, as shown in *Figure 5-1*. The 1930 value of production of all agricultural crops in 2011 inflation-adjusted dollars approached $985 million. This includes irrigated and non-irrigated crops.

By 1950, irrigated farm acreage stood at 589,035 acres, an increase of 18 percent compared to 1930, while the value of crops in inflation-adjusted dollars fell by 1.4 percent to $971 million. By 1974, farms had 1,309,018 irrigated acres, an increase of 162.2 percent relative to 1930. The inflation-adjusted value of production rose to over $4.3 billion, an increase of 342.9 percent.

By 2007, the latest data based on the U.S. Census of Agriculture, irrigated acreage amounted to 1,735,917 acres, a drop of 87,238 irrigated acres compared to 2002, but an increase of 247.7 percent compared to 1930. Over that period, the inflation-adjusted value of crops increased by 382.8 percent from $985 million in 1930 to $4.8 billion in 2007.

[40] U.S. Department of Agriculture, 2007 Census of Agriculture – State Data, Table 1. Historical Highlights: 2007 and Earlier Census Years.

[41] U.S. Department of Agriculture, 2007 Census of Agriculture, Table 4. Land Irrigation by Method of Water Distribution: 2008 and 2003.

Figure 5-1. Irrigated acreage, crop value in current and inflation-adjusted dollars, Index for all farm products, 2007 = 100
Washington state, selected years, 1930 through 2007
Source: U.S. Department of Agriculture, National Agricultural Statistics Service

		Washington state irrigated acreage and crop value				
		Cumulative percent change	Crop value	Cumulative percent change	Crop value	Cumulative Percent Change
Year	Irrigated land - acres[1]	Irrigated land - acres	All crops (current dollars)	Crop value (current dollars)	All crops (inflation-adjusted dollars)	Crop value (inflation-adjusted dollars)
1930	499,283	*	$144,836,829	*	$984,890,437	*
1945	520,153	4.2%	$301,723,221	108.3%	$1,243,465,396	26.3%
1950	589,035	18%	$292,784,413	102.1%	$971,187,321	-1.4%
1954	778,135	55.9%	$403,645,840	178.7%	$1,407,585,493	42.9%
1959	1,006,969	101.7%	$344,738,000	138%	$1,233,799,158	25.3%
1964	1,149,852	130.3%	$374,994,000	158.9%	$1,416,644,000	43.8%
1969	1,224,238	145.2%	$420,872,000	190.6%	$1,331,130,047	35.2%
1974	1,309,018	162.2%	$1,154,631,000	697.2%	$4,361,939,333	342.9%
1978	1,639,189	228.3%	$1,293,857,000	793.3%	$4,291,818,341	335.8%
1982	1,638,470	228.2%	$1,714,741,000	1083.9%	$4,664,095,520	373.6%
1987	1,518,684	204.2%	$1,688,656,000	1065.9%	$3,145,989,260	219.4%
1992	1,641,437	228.8%	$2,451,605,000	1592.7%	$3,547,002,979	260.1%
1997	1,705,025	241.5%	$3,403,524,000	2249.9%	$5,200,890,607	428.1%
2002	1,823,155	265.2%	$3,582,818,000	2373.7%	$4,972,073,959	404.8%
2007	1,735,917	247.7%	$4,754,898,000	3182.9%	$4,754,898,000	382.8%

*Data not available.
[1]The recorded acreage is for farms having some irrigated land. For example, in 2002 and 2007, actual irrigated cropland was approximately 23 to 24 percent of the total acres of land in farms containing some irrigated acres.

Irrigated acres have dramatically increased in the post-WWII decades from 1930 levels.

Apples

Though many crops benefited from the availability of irrigation, the situation with respect to apples is of interest, since apple production dominates the agricultural economy in portions of Eastern Washington. Apples are a water-intensive crop, requiring somewhat more than 40 inches of rain per year. In contrast, average annual rainfall in Richland from 1948 through 2010 was 7.14 inches; in Wenatchee, from 1877 through 2010, 8.85 inches; and in the Yakima region, 8.11 inches over the period 1946 through 2010.[42]

As shown in *Figure 5-2*, 874,000 tons of apples were produced on 86,500 acres in 1930 in Washington. Both acreage and production declined during the 1930s and it was not until 1982 that acreage once again reached the 1930 level and 1974 that production reached the 1930 level. Acreage has since stabilized at 153,000 acres after peaking at 170,000 in 1997. Production, on the other hand, has increased since 1997 to 2,775,000 tons in 2010, an increase of 218 percent since 1930, well above the 77 percent acreage increase. Yield per acre thus increased from an estimated 10.1 tons per acre in 1930 to an estimated 18.2 tons per acre in 2010, an increase of 80 percent. Some of this increased yield is due to increased irrigation water and improved irrigation technology. Both irrigated acreage and production per acre increased.

Cherries

Figure 5-3 displays the historical evolution of cherry production in the state. Cherry acreage was estimated at 8,200 acres in 1940. Acreage declined to 5,400 acres by 1959. Starting in 1964, with 7,600 acres in production, cherry acreage expanded continually, reaching 35,000 acres by 2009. Cherry acreage declined slightly, to 34,000 acres, in 2010. Production in 1935 was an estimated 13,200 tons. Production fluctuated over the years as acreage changed, reaching 95,000 in 1997.

The availability of annual data from 2002 through 2010 provides an indication of the year-to-year volatility in cherry yields. Acreage increased moderately during the period and then declined slightly in 2010. However, production almost doubled from 2002 to 2006, followed by a modest decline in 2007. Production then seesawed, reaching a trough of 100,000 tons in 2008 before rebounding to 245,000 tons in 2009. An estimated 156,000 tons were produced in 2010.

Yield fluctuated accordingly. Over the long term, improved yields were due to technological changes, including irrigation, while short-term fluctuations are affected by weather. These year-to-year changes in production increase grower uncertainty with respect to planning for the needed seasonal labor force from year to year.

Pears

Figure 5-4 displays the historical evolution of pear production in the state. Pear acreage increased by a much smaller amount than either apples or cherries since 1930. Production more than tripled, however, leading to greatly increasing yields. In 2010, 390,000 tons of pears were grown on 23,000 acres.

[42] Western Regional Climate Center, Historical Climate Information, Comparative Data for Western States, Washington, Monthly Average Precipitation (inches).

Figure 5-2. Apple acreage, acreage yield and total production
Washington state, selected years, 1930 through 2010
Source: U.S. Department of Agriculture, National Agricultural Statistics Service

Washington state apple acreage and crop value					
Year	Apple acreage	Cumulative percent change in apple acreage	Yield per acre (tons)	Cumulative percent change in yield per acre	Total production (in 000 tons)
1930	86,500	*	10.1	*	874
1935	63,500	-27%	11.3	12%	718
1940	64,000	-26%	9.2	-9%	590
1945	65,100	-25%	9.4	-7%	610
1950	57,000	-34%	14.4	43%	821
1954	53,300	-38%	9.9	-2%	528
1959	55,600	-36%	9.5	-6%	528
1964	80,000	-8%	8.1	-20%	645
1969	58,000	-33%	14.6	45%	848
1974	72,200	-17%	12.5	24%	903
1978	81,000	-6%	13.3	31%	1,074
1982	95,000	10%	13.8	36%	1,308
1987	135,000	56%	18.5	83%	2,500
1992	142,000	64%	16.4	62%	2,325
1997	170,000	97%	14.7	46%	2,500
2002	155,000	79%	16.5	63%	2,550
2003	155,000	79%	14.7	46%	2,275
2004	155,000	79%	19.9	97%	3,075
2005	154,000	78%	18.5	83%	2,850
2006	154,000	78%	18.0	78%	2,775
2007	153,000	77%	17.00	68%	2,600
2008	153,000	77%	18.45	83%	2,825
2009	153,000	77%	17.00	68%	2,600
2010	153,000	77%	18.15	80%	2,775

*Data not available.

Yield per acre has increased by 80 percent since 1930.

Figure 5-3. Cherry acreage, acreage yield and total production
Washington state, selected years, 1930 through 2010
Source: U.S. Department of Agriculture, National Agricultural Statistics Service

Washington state cherry acreage and crop value					
Year	Cherry acreage	Cumulative percent change in cherry acreage	Yield per acre (tons)	Cumulative percent change in yield per acre	Total production (in tons)
1930	*	*	*	*	*
1935	*	*	*	*	13,200
1940	8,200	*	2.8	*	23,000
1945	9,400	15%	3.5	23%	32,400
1950	9,000	10%	1.8	-35%	16,500
1954	7,400	-10%	3.0	9%	22,500
1959	5,400	-34%	2.7	-5%	14,400
1964	7,600	-7%	2.9	4%	22,200
1969	9,200	12%	2.7	-5%	24,500
1974	11,200	37%	4.0	44%	45,000
1978	11,800	44%	4.5	61%	59,300
1982	11,200	37%	5.9	110%	66,000
1987	12,200	49%	6.1	117%	74,000
1992	14,000	71%	6.9	148%	86,000
1997	18,000	120%	5.3	89%	95,000
2002	26,000	217%	3.4	20%	87,000
2003	27,000	229%	4.4	56%	118,000
2004	29,000	254%	4.6	65%	134,000
2005	31,000	278%	4.4	58%	137,000
2006	32,000	290%	5.3	88%	168,000
2007	33,000	302%	4.8	70%	157,000
2008	33,000	302%	3.03	8%	100,000
2009	35,000	327%	7.00	150%	245,000
2010	34,000	315%	4.59	64%	156,000

*Data not available.

Cherry acreage has more than tripled since 1940.

Figure 5-4. Pear acreage, acreage yield and total production
Washington state, selected years, 1930 through 2010
Source: U.S. Department of Agriculture, National Agricultural Statistics Service

Washington state pear acreage and crop value					
Year	Pear acreage	Cumulative percent change in pear acreage	Yield per acre (tons)	Cumulative percent change in yield per acre	Total production (in tons)
1930	16,800	*	7.02	*	117,930
1935	19,400	15%	7.85	12%	152,280
1940	19,100	14%	8.40	20%	160,500
1945	19,600	17%	9.91	41%	194,250
1950	18,600	11%	6.83	-3%	127,000
1954	16,900	1%	9.09	29%	136,750
1959	17,000	1%	6.00	-15%	102,000
1964	20,800	24%	6.08	-13%	126,500
1969	21,200	26%	5.52	-21%	117,000
1974	19,000	13%	11.20	60%	213,300
1978	20,300	21%	12.10	72%	246,000
1982	20,300	21%	13.00	85%	264,800
1987	22,900	36%	14.70	109%	336,000
1992	23,800	42%	14.20	102%	337,000
1997	24,400	45%	18.60	165%	455,000
2002	24,800	48%	15.70	124%	389,000
2003	25,500	52%	16.50	135%	422,000
2004	25,500	52%	14.40	105%	336,000
2005	24,700	47%	16.70	138%	413,000
2006	24,000	43%	15.00	114%	361,000
2007	24,000	43%	16.80	139.3%	402,000
2008	24,000	43%	15.70	123.6%	377,000
2009	24,000	43%	18.80	167.8%	452,000
2010	23,000	37%	17.00	142.2%	390,000

*Data not available.

Yield per acre has more than doubled since 1930.

Employment effects

The expansion of Eastern Washington agriculture due in large part to the spread of irrigation had an important effect on agricultural employment in the state. In 1900, according to U.S. Census data which undercounts agricultural workers,[43] there was an estimated 16,760 farmworkers in Washington. By 1930, this number had risen to 35,451 workers. The count fell to 27,386 workers by 1950, but then rose to 53,904 by 1960. In 10 years, from 1950 to 1960, the agricultural labor force had effectively doubled, as did irrigated land acreage. Over this same period, the number of employed agricultural workers in the United States declined from 7,160,000 in 1950 to 5,458,000 in 1960.[44] The correlation between irrigation expansion, tree fruit production increases and increases in the agricultural labor force is clear, though the exact degree of causality is not.[45]

The Census also revealed the changing ethnic composition of the agricultural labor force. In 1900, 99 percent of total farmworkers were white, non-Hispanic and 1 percent were Hispanic. In 1950, 87 percent were white, non-Hispanic; 6 percent were Hispanic; 4 percent were Native American; and 3 percent were of Asian race/ethnicity. By 2000, 35 percent of the Census-enumerated agricultural labor force was white; 59 percent was Hispanic; 3 percent was Native American; and, 2 percent was Asian.[46]

Summary

- Irrigation has helped to create a tree-fruit industry, particularly apples and sweet cherries, in Washington state.
- Average yield per acre of cherries varies sharply from year to year as a function of weather, thus creating uncertainty in growers' planning for needed harvest labor.
- Agricultural employment has expanded in Washington because of increased production aided by an expansion of irrigation.

[43] See James N. Gregory, "Toward a History of Farm Workers in Washington State," Chapter 1, Farm Workers in Washington State History Project, 2009. The decennial Census is taken in the spring and thus misses those workers employed during the peak harvest seasons for tree fruit and other crops. Highly mobile workers are also often missed by the Census. Finally, "…those who work part of the year in agriculture and part of the year in other jobs may call themselves 'laborer'" instead of farm workers."

[44] Daly, Patricia A., "Agricultural employment: has the decline ended?" Monthly Labor Review, November 1981, Table 2. Page 13.

[45] James N. Gregory, "Toward a History of Farm Workers in Washington State," Chapter 1, Farm Workers in Washington State History Project, 2009.

[46] James N. Gregory, "Toward a History of Farm Workers in Washington State," Chapter 1, Farm Workers in Washington State History Project, 2009.

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Appendices

Appendix Figure A1-1. Total expenses incurred in agricultural-sector production, current dollars in millions
Washington state, 2011
Source: U.S. Department of Agriculture, Economic Research Service, U.S. and State Farm Income and Wealth Statistics, Production expenses, U.S. and State-level tables, 1949 to 2011, February 13, 2013

Expense category[1]	2011 expenses in millions, current dollars	Percent of value of total expenses incurred shown in row 1a.
1. a. Total expenses incurred in production of agricultural-sector output, including operator dwellings[4]	**$6,916.3**	**100%**
b. Total expenses incurred in production of agricultural-sector output, excluding operator dwellings[4]	**$6,655.6**	**96.2%**
2. Nonfactor payments, excluding dwellings[2]	$4,915.5	71.1%
3. Payments to stakeholders[3]	$1,758.9	25.4%
4. Factor payments to non-operators, excluding operator dwellings	$1,740.2	25.2%
5. a. Purchased inputs, including operator dwellings[4]	$4,292.6	62.1%
b. Purchased inputs, excluding operator dwellings[4]	$4,193.3	60.6%
6. Farm origin expenses	$1,201.1	17.4%
7. Purchased feed expenses	$800	11.6%
8. Purchased livestock and poultry expenses	$151.1	2.2%
9. Purchased seed expenses	$250	3.6%
10. Manufactured input expenses	$1,168.2	16.9%
11. Fertilizer and lime expenses	$380	5.5%
12. Pesticide expenses	$360	5.2%
13. Fuel and oil expenses	$326.5	4.7%
14. Electricity expenses	$101.7	1.5%
15. Other purchased inputs, including operator dwellings	$1,923	27.8%
16. Repair and maintenance, including operator dwellings	$363.2	5.3%
17. Machine hire and custom work expenses	$128.3	1.9%
18. Marketing, storage and transportation expenses	$804.9	11.6%
19. Motor vehicle and licensing fees	$14	0.2%
20. Total labor expenses	$1,363.1	19.7%
21. a. Contract labor expenses[5]	$53.4	0.8%
b. Hired labor expenses[5]	$1,309.7	18.9%
22. Cash labor expenses	$1,327.9	19.2%
23. a. Interest expenses, including operator dwellings[4]	$260.4	3.8%
b. Interest expenses, excluding operator dwellings[4]	$241.7	3.5%
24. Non-real estate interest expenses	$105.9	1.5%
25. Net rent to non-operator landowners, including landlord capital consumption	$188.7	2.7%
26 a. Property taxes, including operator dwellings[4]	$210	3.0%
b. Property taxes, excluding operator dwellings[4]	$183.2	2.6%
27 a. Capital consumption, including operator dwellings[4]	$601.4	8.7%
b. Capital consumption, excluding operator dwellings[4]	$485.6	7%

[1]These expense categories are not always mutually exclusive. Each entry in this figure is an individual component of cost. Each component comes from a separate table that details the definition of the cost or expense category as a relatively long footnote. These percents do not, therefore, add up to 100%.
[2]Nonfactor payments are the sum of intermediated product expenses, capital consumption and property taxes.
[3]Payments to stakeholders are expenses incurred for the use of the principal factors of production: land, labor and capital.
[4]These components are defined the same except for the clearly indicated inclusion or exclusion.
[5]The sum of 21a and 21b equals item 20.

Appendix Figure A2-1. Number of agricultural jobholders[1] by month and annual average statewide and by county, metropolitan division (MD) and metropolitan statistical area (MSA)
Washington state, 2012
Source: Employment Security Department/LMPA; U.S Bureau of Labor Statistics, Local Area Unemployment Statistics

Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Washington	**72,820**	**79,230**	**86,130**	**91,390**	**96,790**	**131,630**	**165,350**	**133,650**	**133,030**	**122,670**	**86,180**	**71,100**	**105,830**
Bellingham MSA	2,680	3,000	3,250	3,180	3,390	3,790	6,310	6,160	3,980	3,290	2,600	2,930	3,710
Bremerton MSA	310	340	380	400	430	460	450	410	380	390	380	330	390
Olympia MSA	1,290	1,410	1,550	1,600	1,760	1,850	1,910	1,870	1,790	1,500	1,360	1,320	1,600
Kennewick-Pasco-Richland MSA	8,580	9,320	10,130	11,170	12,850	19,340	20,750	15,950	16,130	13,990	9,370	7,600	12,030
Seattle-Bellevue-Everett MD	2,880	3,170	3,430	3,670	3,930	4,030	4,380	4,210	3,810	3,800	3,050	2,920	3,610
Spokane MSA	1,170	1,320	1,480	1,650	1,800	1,880	1,880	1,790	1,680	1,560	1,290	1,190	1,560
Tacoma MD	1,100	1,160	1,360	1,320	1,380	1,400	1,440	1,330	1,260	1,300	1,070	1,070	1,270
Wenatchee MSA	9,200	9,780	9,880	9,860	9,900	16,770	26,460	19,400	16,690	17,290	11,480	8,950	13,810
Yakima MSA	19,480	20,880	22,530	22,830	24,490	35,810	45,990	33,580	38,100	33,250	23,450	18,800	28,270
Adams	1,310	1,410	1,640	2,280	2,100	2,740	3,060	2,820	2,880	2,790	1,650	1,300	2,170
Asotin	110	130	150	170	180	170	180	170	170	150	130	130	150
Clallam	280	300	320	350	370	400	460	420	400	330	300	290	350
Clark	1,000	1,100	1,180	1,260	1,420	1,860	2,140	1,810	1,370	1,210	1,070	1,040	1,370
Columbia	210	230	250	260	280	310	340	390	330	290	220	230	280
Cowlitz	360	390	430	510	560	580	750	690	530	450	390	390	500
Ferry	90	100	110	120	130	140	140	130	120	100	90	80	110
Garfield	130	150	160	160	170	190	190	220	180	170	140	140	170
Grant	7,060	7,740	8,490	9,720	10,250	14,350	15,180	12,970	14,960	12,430	9,010	6,450	10,720
Grays Harbor	410	520	620	650	630	640	630	580	530	500	400	380	540
Island	280	300	320	330	350	370	400	370	350	320	300	310	330
Jefferson	130	130	140	150	160	170	170	170	160	150	130	130	150
Kittitas	900	1,010	1,090	1,890	1,270	1,400	1,420	1,510	1,380	1,620	1,050	700	1,270
Klickitat	1,100	1,430	1,570	1,760	1,880	2,100	2,790	2,340	2,130	2,100	1,430	1,180	1,820
Lewis	950	1,040	1,130	1,200	1,290	1,310	1,360	1,520	1,310	1,190	1,130	1,030	1,210
Lincoln	590	640	700	670	710	740	800	930	780	710	590	580	700
Mason	350	360	390	440	460	480	490	500	460	430	410	380	430
Okanogan	3,600	4,020	4,550	4,510	4,970	7,110	12,310	9,350	9,470	8,570	5,010	3,980	6,450
Pacific	300	320	340	370	390	410	430	410	390	380	300	280	360
Pend Oreille	110	130	140	150	160	170	180	160	160	130	120	110	140
San Juan	130	140	150	180	190	210	210	200	180	170	150	130	170
Skagit	2,370	2,530	3,130	3,110	3,200	3,050	4,150	3,910	3,710	3,690	2,530	2,350	3,140
Skamania	80	90	100	130	110	120	120	120	130	150	100	80	110
Stevens	490	550	600	690	750	810	810	740	700	610	520	490	650
Wahkiakum	40	50	60	60	70	70	70	70	60	50	50	40	60
Walla Walla	2,830	3,060	3,320	3,520	3,640	5,180	5,680	4,980	5,050	4,530	4,000	2,880	4,060
Whitman	920	980	1,060	1,070	1,170	1,220	1,320	1,470	1,320	1,090	910	910	1,120

[1]All numbers rounded to the nearest 10.
Total agricultural employment includes covered and non-covered employment, not adjusted for multiple jobholders.

Appendix Figure A2-2. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
Washington state, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, Washington state												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
State totals, all activities**	**18,393**	**19,608**	**23,858**	**27,443**	**33,197**	**65,940**	**94,976**	**64,914**	**67,717**	**62,174**	**33,980**	**17,903**	**44,175**
Apples, total	10,726	10,455	10,924	13,143	12,888	25,793	20,800	19,114	44,738	47,135	25,400	9,974	20,925
Apple pruning	9,116	9,018	8,615	4,006	2,464	95	0	676	108	73	1,115	7,915	3,600
Apple thinning	*	*	0	2,927	4,505	21,861	17,879	11,567	1,036	*	0	0	4,981
Apple harvester	0	0	0	0	0	41	278	2,651	40,748	44,902	19,730	495	9,070
Apple sort, grade, pack	845	778	388	272	428	377	316	0	1,053	655	1,789	732	636
Other apple activities	761	651	1,921	5,938	5,491	3,419	2,327	4,220	1,793	1,502	2,766	832	2,635
Cherries, total	1,758	1,283	1,226	1,046	3,005	20,036	46,921	16,984	1,046	374	821	1,172	7,973
Cherry pruning	1,658	1,137	1,050	386	515	75	0	108	55	69	462	974	541
Cherry harvester	0	0	0	0	0	13,294	38,505	15,558	585	*	0	0	5,662
Other cherry activities	100	146	176	660	2,490	6,667	8,416	1,318	406	299	359	198	1,770
Pears, total	784	610	527	288	561	1,492	694	3,253	2,944	1,184	587	1,562	1,207
Pear pruning	773	523	475	207	76	38	37	0	0	26	494	1,478	344
Pear thinning	0	57	48	51	396	1,315	406	76	0	0	0	57	201
Pear harvester	0	0	0	0	0	0	30	2,815	2,694	1,119	93	0	563
Other pear activities	*	30	*	30	89	139	221	362	250	52	0	40	102
Other tree fruit workers	*	*	*	254	334	372	1,187	1,722	152	136	0	0	349
Grape workers	628	1,851	2,520	1,927	1,499	1,461	1,976	1,085	1,502	1,541	434	276	1,392
Blueberry workers	303	328	378	150	110	286	107	3,196	1,691	825	331	109	651
Raspberry workers	468	307	481	470	483	747	3,467	1,741	217	400	575	268	802
Strawberry workers	0	0	*	*	85	327	1,765	24	*	0	0	0	183
Bulb workers[1]	0	0	0	*	30	43	22	53	39	*	64	72	27
Hop workers	85	284	938	981	1,643	1,468	1,120	827	2,337	569	770	497	960
Nursery workers	347	654	1,534	1,607	1,568	1,357	951	775	672	263	578	545	904
Wheat/grain workers	34	35	149	167	256	352	502	1,334	593	303	169	92	332
Asparagus workers	0	0	67	561	2,115	1,910	102	70	0	0	0	0	402
Cucumber workers	0	0	0	0	0	*	20	204	190	69	0	0	41
Onion workers	352	404	514	993	1,210	1,494	1,317	2,295	1,938	743	819	1,063	1,095
Potato workers	814	706	777	1,336	1,140	1,010	829	1,708	1,790	2,232	654	565	1,130
Miscellaneous vegetable workers	197	445	434	750	1,263	1,347	2,983	2,751	2,350	2,294	438	240	1,291
Other seasonal workers	1,886	2,242	3,361	3,753	5,007	6,432	10,213	7,766	5,516	4,079	2,340	1,455	4,504

[1]The 2007 conversion from SIC to NAICS industry codes placed most bulb growers into the nursery sector.
*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-3. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
Western Area 1, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, Western Area 1												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**1,720**	**1,882**	**3,134**	**3,120**	**3,572**	**4,077**	**8,363**	**8,003**	**5,012**	**4,187**	**2,213**	**1,682**	**3,914**
Blueberry workers	303	328	378	150	110	286	107	3,196	1,691	825	331	109	651
Raspberry workers	468	307	481	470	483	747	3,467	1,741	217	400	575	268	802
Strawberry workers	0	0	*	*	85	327	1,765	*	*	0	0	0	181
Bulb workers[1]	0	0	0	*	30	43	22	53	39	*	64	72	27
Cucumber workers	0	0	0	0	0	*	20	204	190	69	0	0	41
Potato workers	370	277	352	135	193	99	60	73	96	444	307	158	214
Misc. Vegetable workers	104	179	258	386	505	588	871	941	991	1,072	420	235	546
Nursery workers	274	520	1,383	1,292	1,303	1,128	917	700	608	257	216	451	754
Rhubarb workers	47	64	*	41	170	98	129	80	44	0	0	*	57
Other Seasonal workers	154	207	265	629	693	748	1,005	1,003	1,134	1,106	300	384	636

[1]The 2007 conversion from SIC to NAICS industry codes placed most bulb growers into the nursery sector.
*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-4. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
South Central Area 2, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, South Central Area 2												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**6,211**	**6,140**	**7,021**	**7,825**	**10,393**	**23,073**	**29,312**	**17,000**	**22,176**	**20,345**	**12,010**	**6,524**	**14,003**
Apples, total	4,431	3,716	3,400	3,450	3,238	10,002	8,549	6,438	15,818	16,944	10,527	4,906	7,618
Apple pruning	4,044	3,070	2,830	960	904	91	0	52	0	0	153	4,031	1,345
Apple thinning	0	0	0	760	988	8,814	7,308	5,054	0	0	0	0	1,910
Apple harvester	0	0	0	0	0	0	0	928	14,975	15,925	7,970	0	3,317
Apple sort, grade, pack	205	207	74	111	242	373	0	0	554	655	1,384	705	376
Other apple activities	182	439	496	1,619	1,104	724	1,241	404	289	364	1,020	170	671
Cherries, total	239	334	222	312	1,358	7,063	14,582	1,453	31	31	111	278	2,168
Cherry pruning	176	197	203	81	50	*	0	0	0	0	20	278	85
Cherry harvester	0	0	0	0	0	2,806	8,510	800	0	6	0	0	1,010
Other cherry activity	63	137	*	231	1,308	4,246	6,072	653	31	25	91	0	1,073
Pears, total	325	268	194	110	200	465	162	2,725	955	688	150	602	570
Pear pruning	325	225	194	33	46	*	0	0	0	0	150	545	128
Pear thinning	0	*	0	51	108	379	132	43	0	0	0	57	65
Pear harvester	0	0	0	0	0	0	30	2,507	955	688	0	0	348
Other pear activities	0	30	0	26	46	69	0	175	0	0	0	0	29
Other tree fruit, total	0	0	*	79	68	143	824	1,543	152	136	0	0	246
Other tree fruit pruner	0	0	0	79	0	0	0	0	0	0	0	0	*
Other tree fruit harvester	0	0	0	0	0	34	730	1,371	148	136	0	0	202
Other tree fruit activities	0	0	*	0	68	109	94	172	*	0	0	0	38
Grapes, total	358	1,030	1,285	939	868	694	1,021	653	992	423	121	186	714
Grape pruning	219	1,015	1,118	192	*	0	0	0	0	0	0	157	227
Grape harvester	0	0	0	0	0	0	212	50	826	328	52	0	122
Other grape activity	139	*	167	747	851	694	809	603	166	95	69	29	365
Asparagus workers	0	0	67	299	1,119	1,016	73	20	0	0	0	0	216
Hops, total	85	284	938	877	1,562	1,335	1,120	827	2,337	569	770	497	933
Hop twining & training	0	0	98	423	94	544	0	0	0	61	0	228	121
Hop harvester	0	0	0	0	0	0	0	419	2,247	0	0	0	222
Other hop activity	85	284	840	454	1,468	791	1,120	408	90	508	770	269	591
Onion workers	0	73	153	187	216	163	278	402	437	93	0	0	167
Potato workers	0	38	40	129	116	140	549	776	0	98	0	0	157
Misc. vegetable workers	44	184	107	252	315	566	1,095	388	437	724	0	0	343
Other seasonal workers	729	213	611	1,191	1,333	1,486	1,059	1,775	1,017	639	331	55	870

*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-5. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
North Central Area 3, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, North Central Area 3												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**3,383**	**3,664**	**4,390**	**5,010**	**5,413**	**13,621**	**29,106**	**19,322**	**16,490**	**14,876**	**6,822**	**4,136**	**10,519**
Apples, total	2,101	2,317	2,786	3,884	3,248	6,628	3,271	3,979	12,938	13,617	5,123	2,539	5,203
Apple pruning	1,304	1,722	1,910	1,562	789	*	0	53	87	71	847	2,213	880
Apple thinning	*	*	0	46	843	5,104	2,435	1,525	644	*	0	0	883
Apple harvester	0	0	0	0	0	41	278	616	11,504	13,088	3,147	95	2,397
Apple sort, grade, pack	640	571	314	161	186	*	316	0	499	0	405	27	260
Other apple activities	153	*	562	2,115	1,430	1,475	242	1,785	204	455	724	204	780
Cherries, total	515	609	627	430	1,040	3,640	22,462	13,752	960	274	586	313	3,767
Cherry pruning	478	605	565	232	381	49	0	0	0	0	442	279	253
Cherry harvester	0	0	0	0	0	1,661	20,667	13,310	585	0	0	0	3,019
Other cherry activity	37	*	62	198	659	1,930	1,795	442	375	274	144	34	496
Pears, total	459	342	333	178	361	993	532	528	1,989	496	437	960	634
Pear pruning	448	298	281	174	30	21	37	0	0	26	344	933	216
Pear thinning	0	44	48	0	288	936	274	33	0	0	0	0	135
Pear harvester	0	0	0	0	0	0	0	308	1,739	431	93	0	214
Other pear activities	*	0	*	*	43	36	221	187	250	39	0	27	69
Other tree fruit workers	0	*	*	0	50	70	126	83	0	0	0	0	28
Other seasonal workers	308	392	637	518	714	2,290	2,715	980	603	489	676	324	887

*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-6. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
South Central Area 4, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, South Central Area 4												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**3,012**	**3,634**	**3,776**	**6,017**	**6,360**	**10,640**	**11,756**	**9,644**	**11,864**	**11,138**	**6,184**	**2,642**	**7,222**
Apples, total	2,138	2,070	1,989	3,182	3,005	6,366	3,603	5,079	8,943	8,411	4,452	1,592	4,236
Apple pruning	2,075	2,038	1,736	879	324	0	0	571	21	0	96	1,191	744
Apple thinning	0	0	0	1,119	783	5,999	3,092	2,896	0	0	0	0	1,157
Apple harvester	0	0	0	0	0	0	0	563	8,365	7,775	3,730	0	1,703
Other apple activities	63	32	253	1,184	1,898	367	511	1,049	557	636	626	401	631
Cherries, total	136	142	68	185	306	1,622	5,128	1,584	48	69	124	290	809
Cherry pruning	136	142	40	*	0	0	0	103	48	69	0	223	64
Cherry harvester	0	0	0	0	0	1,499	4,594	1,448	0	0	0	0	628
Other cherry activity	0	0	28	178	306	123	534	33	0	0	124	67	116
Pear workers	0	0	0	0	0	34	0	0	0	*	0	*	*
Mint workers	0	0	0	0	0	0	519	195	*	46	0	0	65
Other tree fruit workers	0	0	0	70	53	0	237	0	0	0	0	0	30
Asparagus workers	0	0	0	200	298	298	0	0	0	0	0	0	66
Onion workers	158	131	182	413	391	747	393	736	529	323	178	23	350
Potatoes, total	243	383	72	587	405	285	161	162	821	732	213	376	370
Potato harvester	0	0	0	50	*	0	0	0	398	145	69	0	55
Potato sort, grade, pack	48	71	23	381	315	234	72	59	295	406	39	261	184
Other potato activities	195	312	49	156	87	51	89	103	128	181	105	115	131
Misc. vegetable workers	0	*	42	*	126	60	318	194	453	463	*	0	140
Wheat/grain workers	*	*	*	*	42	75	137	205	43	36	25	*	51
Nursery workers	42	105	140	226	183	203	*	54	*	0	350	0	110
Other seasonal workers	291	792	1,265	1,139	1,551	950	1,258	1,435	1,001	1,045	824	334	990

*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-7. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
South Eastern Area 5, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, South Eastern Area 5												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**3,871**	**4,136**	**5,378**	**5,248**	**7,141**	**13,981**	**15,621**	**9,786**	**11,310**	**11,099**	**6,599**	**2,773**	**8,079**
Apples, total	2,056	2,352	2,749	2,627	3,397	2,797	5,377	3,618	7,039	8,163	5,298	937	3,868
Apple pruning	1,693	2,188	2,139	605	447	0	0	0	0	*	*	480	631
Apple thinning	0	0	0	1,002	1,891	1,944	5,044	2,092	392	0	0	0	1,030
Apple harvester	0	0	0	0	0	0	0	544	5,904	8,114	4,883	400	1,654
Other apple activities	363	164	610	1,020	1,059	853	333	982	743	47	396	57	552
Cherries, total	868	198	309	119	301	7,711	4,749	195	*	0	0	291	1,229
Cherry pruning	868	193	242	66	84	*	0	*	*	0	0	194	140
Cherry harvester	0	0	0	0	0	7,328	4,734	0	0	0	0	0	1,005
Other cherry activity	0	*	67	53	217	368	*	190	0	0	0	97	84
Other tree fruit workers	*	0	*	105	163	159	0	96	0	0	0	0	44
Grape workers	270	821	1,235	988	631	767	955	432	510	1,118	313	90	678
Asparagus workers	0	0	0	62	698	596	29	50	0	0	0	0	120
Hop workers	0	0	0	104	81	133	0	0	0	0	0	0	27
Onion workers	194	200	179	393	603	584	646	1,157	972	327	641	1,040	578
Potatoes, total	201	*	313	485	426	486	59	697	873	958	134	31	389
Potato harvester	0	0	0	0	0	0	0	140	372	287	91	0	74
Potato sort, grade, pack	196	0	234	379	358	411	0	443	*	*	0	0	170
Other potato activities	*	*	79	106	68	75	59	114	490	659	43	31	145
Misc. vegetable workers	*	*	22	70	147	35	570	1,148	425	35	0	0	205
Wheat/grain workers	0	*	102	80	91	85	130	350	156	56	44	*	93
Nursery workers	0	0	0	0	0	0	0	0	53	0	0	94	*
Strawberry workers	0	0	0	0	0	0	0	24	0	0	0	0	*
Other seasonal workers	269	540	464	215	603	628	3,106	2,019	1,275	442	169	272	834

*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-8. Employment of covered seasonal agricultural workers by crop and agricultural reporting area
Eastern Area 6, 2012
Source: Employment Security Department/LMPA, Agricultural Employment and Wage survey

	Covered seasonal employment, Eastern Area 6												
Activity	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Average**
Total**	**196**	**152**	**159**	**223**	**318**	**548**	**818**	**1,159**	**865**	**529**	**152**	**146**	**439**
Wheat/grain, total	30	25	29	73	123	192	235	779	394	211	100	60	188
Wheat/grain harvester	0	0	0	0	0	48	38	415	249	46	*	*	67
Wheat/grain equipment operator	0	0	0	42	53	24	25	260	90	65	43	22	52
Other wheat/grain activity	30	25	29	31	70	120	172	104	55	100	51	32	68
Nursery workers	31	29	*	89	82	26	32	21	0	*	*	0	28
Other seasonal workers	135	98	119	61	113	330	551	359	471	312	40	86	223

*Monthly and annual estimates that are less than 20 workers are not reported due to insufficient information.
**Totals do not add up to sum of detail breakouts due to screening out of monthly and annual estimates to ensure employer confidentiality.

Appendix Figure A2-9. Average hourly before-tax earnings, apples, cherries and pears, current and inflation-adjusted dollars, CPI-W 2011 = 100
Washington state, 2002 through 2012
Source: Employment Security Department/LMPA, Unemployment Insurance Wage File

Year	Apples, current dollars	Apples, inflation-adjusted dollars	Cherries, current dollars	Cherries, inflation-adjusted dollars	Pears, current dollars	Pears, inflation-adjusted dollars
2002	$9.83	$12.38	$10.79	$13.59	$9.47	$11.93
2003	$9.75	$12.02	$11.58	$14.28	$9.99	$12.32
2004	$10.06	$12.08	$11.33	$13.60	$9.83	$11.80
2005	$10.31	$11.96	$11.68	$13.55	$10.49	$12.17
2006	$11.42	$12.83	$14.32	$16.09	$11.02	$12.38
2007	$12.22	$13.36	$16.88	$18.45	$14.27	$15.60
2008	$12.19	$12.80	$16.48	$17.31	$13.45	$14.13
2009	$12.14	$12.83	$16.07	$16.99	$12.47	$13.18
2010	$11.90	$12.32	$13.17	$13.63	$11.91	$12.33
2011	$12.45	$12.45	$14.44	$14.44	$12.26	$12.26
2012	$13.13	$12.84	$15.65	$15.31	$12.95	$12.67

Appendix Figure A4-1. Median wage rates for H-2A workers by type of pruning, thinning or harvest activity, selected crops and orchard configurations Washington state, 2011
Source: U.S. Department of Labor, Employment and Training Administration, Office of Foreign Labor Certification, Agricultural Online Wage Library

Type of fruit, activity and orchard configuration	Pay rates
Golden apple, harvest - all cultivations	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Golden apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Golden apple, harvest - strip picking, low density, non-trellised	$19.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Golden apple, harvest - strip picking, medium density, non-trellised	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - all cultivations	$23.25 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - strip picking, medium density, trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - color picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - strip picking, high density, trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - strip picking, medium density, non-trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - all cultivations	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - strip picking, medium density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - color picking, medium density, non-trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - all cultivations	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - strip picking, medium density, trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - color picking, medium density, trellised	$24.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - strip picking, low density, non-trellised	$30.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - strip picking, medium density, non-trellised	$22.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - all cultivations	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - color picking, medium density, trellised	$22.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - strip picking, medium density, trellised	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - strip picking, low density, non-trellised	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - strip picking, medium density, non-trellised	$22.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - color picking, medium density, non-trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - all cultivations	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - strip picking, medium density, non-trellised	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - strip picking, low density, non-trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - all cultivations	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - color picking, medium density, trellised	$26.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - strip picking, low density, non-trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - color picking, low density, non-trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - all cultivations	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - strip picking, medium density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - strip picking, low density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - strip picking, medium density, trellised	$16.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Apple tree, thinning - all cultivations	$8.67 per hour
Apple tree, thinning - medium tree size, low density, non-trellised	$9.00 per hour
Apple tree, thinning - medium tree size, medium density, trellised	$9.00 per hour
Apple tree, thinning - medium tree size, medium density, non-trellised	$8.67 per hour
Apple tree, thinning - medium tree size, high density, trellised	$8.67 per hour
Apple tree, thinning - medium tree size, low density, trellised	$8.67 per hour
Apple tree, thinning - large tree size, low density, non-trellised	$8.75 per hour

Appendix Figure A4-1. (continued)

Type of fruit, activity and orchard configuration	Pay rates
Red cherry, harvest - all cultivations	$5.00 per 30 lb. lug
Red cherry, harvest - medium density, medium tree size	$5.00 per 30 lb. lug
Red cherry, harvest - low density, large tree size	$5.00 per 30 lb. lug
Red cherry, harvest - low density, medium tree size	$5.00 per 30 lb. lug
Yellow cherry, harvest - all cultivations	$5.00 per 20 lb. lug
Yellow cherry, harvest - low density, medium tree size	$5.00 per 20 lb. lug
Yellow cherry, harvest - low density, small tree size	$6.00 per 20 lb. lug
Yellow cherry, harvest - medium density, medium tree size	$5.50 per 20 lb. lug
D'Anjou pear, harvest - all cultivations	$19.00 per bin (47 inch X 47 inch X 24 1/2 inch)
D'Anjou pear, harvest - medium tree size	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
D'Anjou pear, harvest - large tree size	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Bartlett pear, harvest - all cultivations	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Bartlett pear, harvest - medium tree size	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Bartlett pear, harvest - large tree size	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Bartlett pear, harvest - small tree size	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Golden apple, harvest - strip picking, medium density, non-trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - strip picking, medium density, trellised	$23.25 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - strip picking, medium density, non-trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - strip picking, low density, non-trellised	$25.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - strip picking, low density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Apple tree, thinning	$8.67 per hour
Red cherry, harvest	$5.00 per 30 lb. lug
Yellow cherry, harvest	$5.00 per 20 lb. lug
D'Anjou pear, harvest	$19.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Bartlett pear, harvest	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Granny Smith apple, harvest - strip picking, low density, non-trellised	$18.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Honey Crisp apple, harvest	No finding[1]
Junami apple, harvest	No finding[1]
Cameo apple, harvest	No finding[1]
Lady Alice apple, harvest	No finding[1]
Bosc pears, harvest	No finding[1]
Golden apple, harvest - strip picking, medium density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Pink Lady apple, harvest - strip picking, medium density, trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Braeburn apple, harvest - strip picking, medium density, non-trellised	$17.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Red Delicious apple, harvest - strip picking, low density, non-trellised	$15.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Fuji apple, harvest - strip picking, low density, non-trellised	$22.00 per bin (47 inch X 47 inch X 24 1/2 inch)
Gala apple, harvest - strip picking, medium density, trellised	$20.00 per bin (47 inch X 47 inch X 24 1/2 inch)

[1]For all criteria job orders, if a prevailing wage determination results in a No Finding for the particular crop activity, the employer shall offer and pay the worker(s) the legal state or Federal minimum, the agreed-upon collective bargaining wage rate or the Adverse Effect Wage Rate (AEWR) for that state, whichever is highest.

Glossary

Following are definitions of terms and concepts used in this report.

Current dollars – The dollar value or price of a good or service that is not adjusted for inflation in the economy. In general, when there is a continuous increase in the general price level over time it is not correct to compare the dollar value of goods or services between time periods in current dollar prices, especially as the time interval increases.

Foreign exchange rate – This is the price of one international currency in terms of another. This is also termed the exchange rate.

Inflation-adjusted dollars – The adjustment of the dollar value or price of a good or service to compensate for general inflation in the economy over time. Inflation adjustment of a good or service relative to some base year of comparison allows one to observe changes in what is termed the real value of that good or service over time.

Input-output table – An economic model and analytical technique that simultaneously relates all of the inputs bought by a given production sector from all other production sectors in the economy and at the same time also relates all of the outputs of that sector sold to all other productive sectors. This model is also known as inter-industry analysis.

Multiplier – With respect to input-output analysis, the process whereby the addition of one more unit of output or expenditure in the economy generates additional output, employment or income.

NAICS – The North American Industry Classification System developed using a production-oriented conceptual framework, groups establishments into industries based on the activity in which they are primarily engaged. Establishments using similar raw material inputs, similar capital equipment and similar labor are classified in the same industry. In other words, establishments that do similar things in similar ways are classified together. See: http://www.bls.gov/bls/naics.htm.

Not seasonally adjusted – This term is used to describe data series that have not been subjected to the seasonal-adjustment process. In other words, the effects of regular or seasonal patterns have not been removed from these series.

Seasonal worker – A person employed in work of a seasonal or other temporary nature who is not required to be absent overnight from his or her permanent place of residence. The same exceptions previously listed for migrant agricultural worker apply here.

Shortage of labor – There is no official definition of a labor shortage. Empirically, a shortage is the difference between the quantity of labor supplied and the quantity of labor demanded when the hourly wage rate (or its piece-rate equivalent) lies below the equilibrium market wage rate – the wage rate that exactly balances the quantity supplied and the quantity demanded. The shortage concept can also be thought of as excess demand at the price or wage currently being offered. For this kind of shortage to exist, the wage rate being offered is below what workers are willing to accept. Increasing the wage rate will tend to reduce or eliminate the shortage.

Value added – In general, the difference between the price at which some quantity of output can be sold, such as a metric ton of apples and the cost of all intermediate inputs used to produce that output. Gasoline and fertilizer would be intermediate inputs since these inputs are purchased from other producers. However, inputs provided directly by the producer or grower, such as the labor of the agricultural producer and any labor hired by him or her, is a contribution to value added.

Wage bill – The product of the earnings or wages paid to workers times the number of workers hired. From the growers and society's standpoint, this is a cost of production. From society's standpoint this is also a contribution to value added.