

The Washington Apple Industry

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Updated Evaluation of Contributions to the State
Economy and the Important Role of Exports

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In Association with

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Washington's apple industry is a primary contributor to the state's agriculture and also holds a very prominent place in the state economy. The apple industry has continued its strong growth trend even during the recent deep recession. The industry is also becoming highly reliant on export markets. Since the domestic market is not growing, further expansion of export markets will be critical in maintaining state jobs, incomes and tax revenues.

 globalwise inc.



Acknowledgements

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Photos of the Washington apple industry used in this report were provided by the WAC.

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Executive Summary

Major Findings

Washington's apple industry has proven to be a pillar of recent economic strength in the state. Recovering from setbacks in the last two decades, apple growers, packers, processors and marketing agencies have revamped and reinvigorated themselves. This report measures many aspects of the industry's economic contributions over the three most recent seasons that run from fall to summer in 2010-11, 2011-12 and 2012-13. This time period encompasses the latter part of the recent deep recession in the U.S., making the rising economic trend exhibited more impressive in this context.

The apple industry consistently generated major productive output, employment and income for the state's residents. The value of apples after packing was \$3.4 billion in 2012-13. Marked by growth over the three years of the study, the total output generated with direct, indirect and induced business activity ended in 2012-13 year at over \$7.5 billion. With indirect and induced activity, the apple industry accounted for 61,000 jobs and just over \$2.0 billion in employee compensation as of 2012-13. Business owners' income in the state also rose and stood at \$1.15 billion in the final year of analysis.

Tax revenue growth followed this upswing in economic activity. At the state and local level the total revenues to government with all direct, indirect and induced activity of the apple industry were estimated at \$254 million in 2012-13. Federal tax revenues were \$384 million for the same period.

Export market growth has helped propel the industry and is critical to its continuing success. Apple orchards produce annual crops for many years and need reliable markets to balance the steady supply. Exports have filled this role as seen from the analysis of how the loss of just a small share of export markets would mean lower prices for growers when the displaced export sales revert to the domestic market. Again, using 2012-13 as the example, if 5,000 carlots¹ were added to the normal level of domestic sales, the growers would lose an estimated \$116.7 million in income, and with indirect and induced losses the total decrease in output to the Washington economy would be \$272 million. In turn the state would suffer by losing about 1,100 jobs, have employee compensation decline by \$45.5 million, state and local tax revenues drop by \$10.4 million and the federal government would see tax revenues decline by \$12.8 million.

There is no question the apple industry has been on a strong rising trend in recent years. Yet no large industry can escape cyclical downtrends caused by outside forces so this is not a forecast of unending future growth. The industry however, has positioned itself for strength and advantage as new opportunities arise.



Washington's apple industry boosted the state economy by over \$7.5 billion in 2012-2013.

Apple exports are a key element of future economic prosperity for the industry and Washington state.

¹ A carlot is 1,000 40 pound packed boxes of apples.

The Washington Apple Industry

UPDATED EVALUATION OF CONTRIBUTIONS TO THE STATE ECONOMY AND THE IMPORTANT ROLE OF EXPORTS

Introduction

In 2012, the Washington Apple Commission funded a study to measure the contribution of the Washington apple industry to the state economy. The most recent season for which data were available was the 2010-11 season, from the fall of 2010 to the summer of 2011. This study gave a snapshot of the contribution of the industry in a single season. Because the industry has changed substantially since, the Washington Apple Commission funded an update of the study for the 2011-12 and 2012-13 seasons. The goal was to provide a dynamic picture of how the industry's contribution to the state economy has changed over time.

The benchmark data used for all three seasons was collected for the 2010-11 season. Twenty firms cooperated by disclosing confidential business and financial information on four major aspects of the industry, growing, packing, marketing and processing. For the 2011-12 and 2012-13 seasons, this benchmark data was adjusted to take account of changes in industry output, prices, employment, input costs, taxes and other economic variables. The analysis was jointly conducted by Globalwise, Inc., located in Vancouver, Washington and Belrose, Inc., located in Pullman, Washington. Both firms conduct a broad array of economic research and analysis services.

A traditional economic impact approach was used in these analyses. In the course of operating their businesses, apple industry firms generate what are called direct economic impacts. These direct impacts include production (also referred to as output), employment, wages, proprietor's income, tax revenue and other economic benefits to an economy. Data for these direct impacts were collected from firms that responded to detailed surveys. These direct impacts were extrapolated to estimates for the entire Washington apple industry.

The next step in the process was to relate these industry-wide direct impacts to so-called indirect and induced economic impacts on output, employment and other economic activities within Washington State. The indirect effects for the apple industry result when the apple industry buys goods and services from other industries in Washington, and this in turn supports other economic activity. The induced effects result from the re-spending of income within the state, which is initiated by households whose income is earned from direct employment in the apple industry.

The method commonly used to estimate related indirect and induced economic impacts is input-output modeling. Further discussion of this technique and the model used for this analysis is in Appendix A. Essentially the analysis considers how an industry that produces products demanded by society (here, apples in all product forms) affects:

- other businesses who sell goods and services to the industry being analyzed and themselves have employees that also purchase goods and services;
- households that earn income from all industry sectors and spend it in the economy;
- business owners who gain income and spend or invest it in the economy; and

- taxpayers of all types who make tax payments in the economy under study.

This report focuses on the apple industry as a distinct sector apart from other related segments of the state tree fruit industry, especially pears, sweet cherries and other soft fruits. The apple industry is the anchor of these other segments. It accounts for about 80 percent of total tree fruit acreage and production. To some extent, the distinction is artificial. At all levels of the tree fruit industry – growing, packing, processing and marketing – the business activities involving apples are intricately connected with those of other tree fruits. Apple growers typically also grow one or more other tree fruits. Apple packers use the same, or associated, operations for packing pears and sweet cherries. The infrastructure of the entire fruit industry is “built around” core apple operations such as controlled atmosphere storage, other warehousing, packaging, transportation, field services, marketing and other functions. The labor force analyzed in this study predominantly earns income from apple-related work, but also realizes income from work in other tree fruits.

Many operations in the apple industry also conduct activities unrelated to the tree fruit industry, such as production of blueberries and wine-making. In all cases, survey respondents were asked to include only apple-related activity and to exclude all non-apple activity. Therefore, this analysis is a conservative estimate of the economic impacts and contributions of the Washington State apple industry.

Washington Apple Industry Background

Growth Continues

The previous analysis of the economic impact of the Washington apple industry, completed in August 2012, showed the dramatic growth of the industry since the 1960s. Utilized apple production quadrupled from 1.3 billion pounds in the 1960s to 5.2 billion pounds in the 1990s. The industry suffered a number of setbacks in the last twenty years, beginning with the Alar crisis in the late 1980s, the Asian financial crisis in the late 1990s, and the emergence of China as a major competitor in the early 2000s. These helped slow industry expansion for almost a decade. In response to these challenges, the industry introduced new cost-saving and productivity-increasing technologies in its orchard, packing, storage and marketing operations. It removed many older orchards and diversified production into a wide array of new varieties (Table 1). It increased the proportion of production that qualified for the higher-priced fresh market. Orchards and agribusinesses grew larger to gain economies of scale, and formed marketing consortiums to more effectively deal with the mega-retailers that now dominate food distribution and retailing.



Apple orchards create a green landscape in many parts of Eastern Washington. There are about 146,000 bearing acres in the state.

**Table 1: Fresh Apple Pack,
by Major Varieties in Washington State,
Selected Years, 2000-2013
(carlots*)**

Variety	2000-01	2005-06	2010-11	2013-14p
Red Delicious	45,192	33,612	34,169	33,468
Golden Delicious	15,109	14,209	11,033	9,145
Granny Smith	8,453	13,104	12,985	16,073
Gala	9,920	16,735	22,211	24,695
Fuji	12,894	12,878	15,066	14,539
Jonagold	1,105	1,191	1,066	886
Braeburn	2,752	3,259	3,275	1,813
Cameo	530	1,337	821	399
Cripps Pink	618	2,106	2,902	3,359
Honeycrisp	0	456	2,821	4,349
Jazz	0	0	501	500
Ambrosia	0	0	324	400
Rome	500	303	218	200
All Others	1,352	1,719	1,858	3,677
Totals	98,335	100,909	109,222	113,503

* Carlots are defined as equivalent to 1,000 40-lb packed boxes of fresh apples.

Source: Wenatchee Valley Traffic Association: "A Statistical Review, Washington State Fresh Apple Crops, 2003-04 through 2010-11, and Washington Growers Clearing House, Annual Price Summaries.

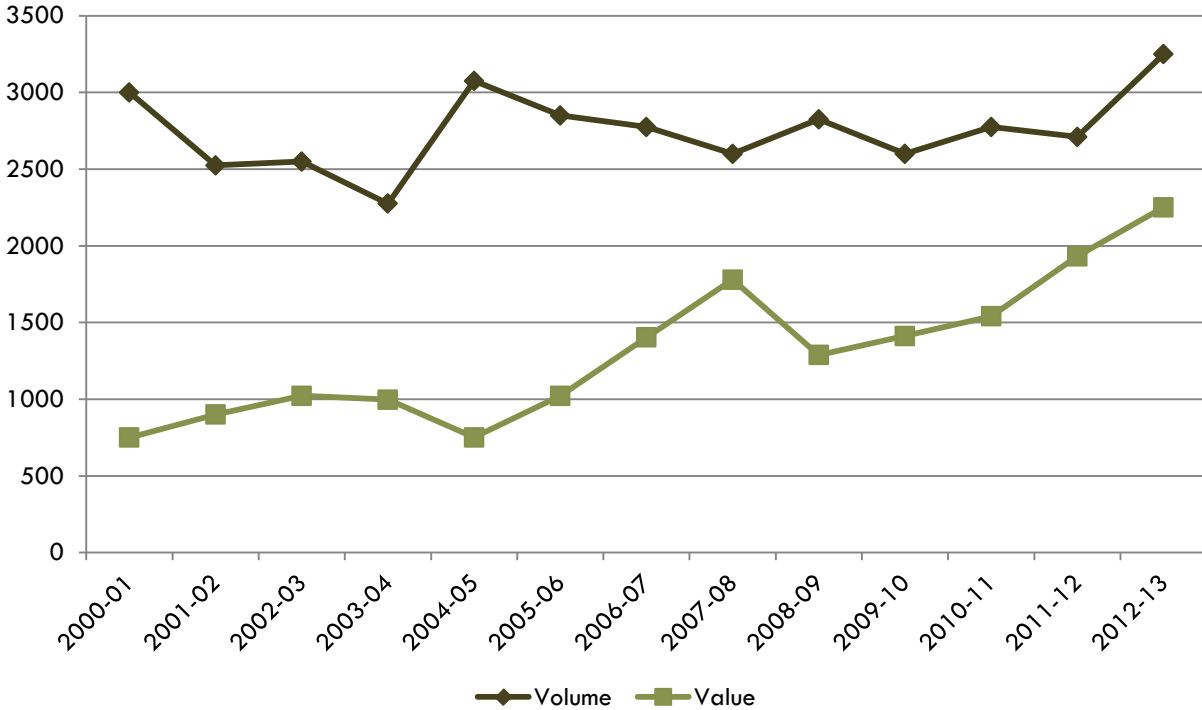
The share of Washington production accounted for by Red Delicious and Golden Delicious has fallen over the last 13 seasons, from over 60 percent to less than 38 percent. In contrast, there have been big gains in production of Gala, Fuji, Cripps Pink, Honeycrisp, Pacific Rose, and Lady Alice. Production of many other newer varieties like Jazz, Ambrosia, Pinata, Kanzi, Sweetango and Opal has also been increasing.

Restructuring Pays Off

The major restructuring of the industry paid off handsomely in the second half of the 2000s (Chart 1). While the volume of production grew little for much of the period until 2012, the value of production set new records in 2006-07, 2007-08, 2011-12 and 2012-13.

Chart 1: Volume and Value of Utilized Apple Production in Washington State, 2001-2013

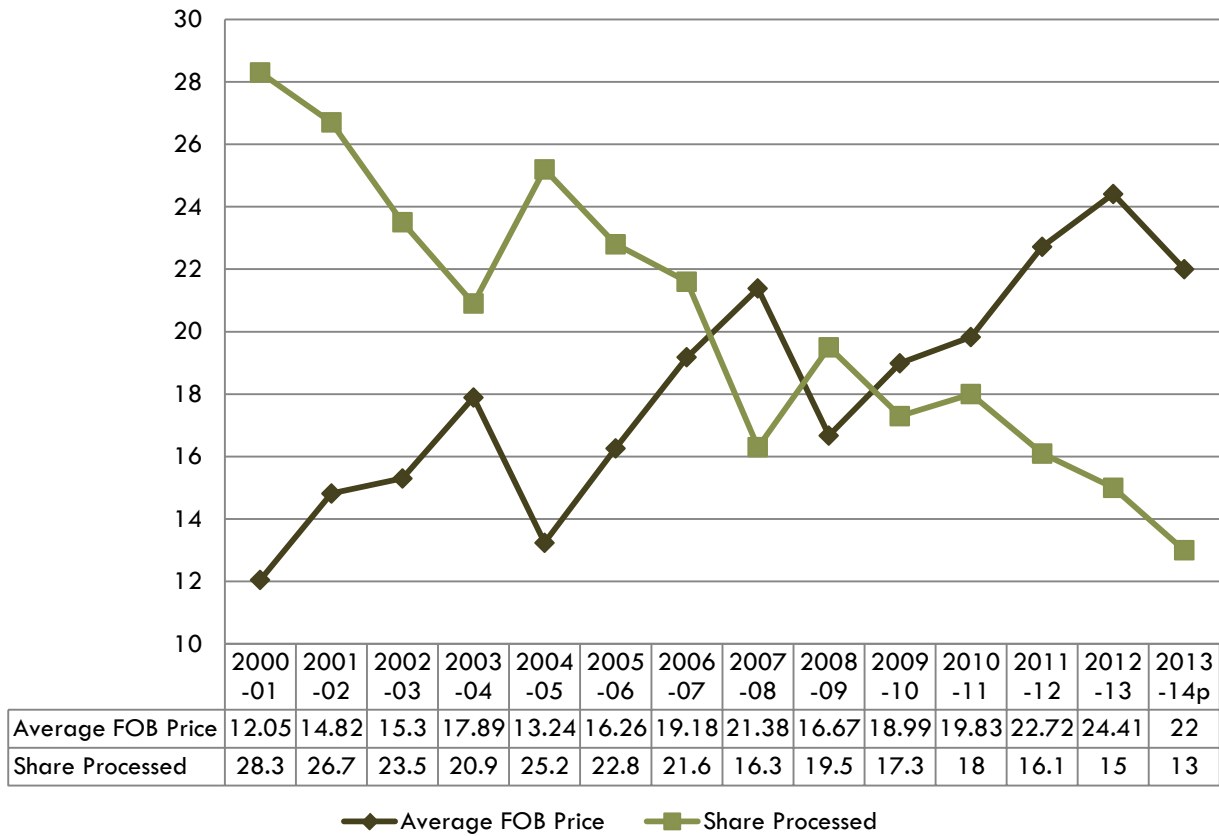
(1,000 tons and \$ million)



Source: National Agricultural Statistics Service, USDA, "2013 Washington Annual Agricultural Bulletin"

Two major factors contributed to the increased value of production: the strong upward trend in FOB shipping point prices, and the percentage of the Washington apple crop that could be sold fresh. Chart 2 shows how FOB prices have risen while the percent processed (the inverse of the percent sold fresh) has fallen since 2000-01.

Chart 2: Average FOB shipping Point Prices for Fresh Apples, and Percent of Total Production Processed in Washington State, 2000-01 to 2013-14



Sources: National Agricultural Statistics Service, USDA, "2013 Washington Annual Agricultural Bulletin" and Washington Growers Clearing House "Apple Price Summary 2012-13 Marketing Season"

In the last decade, the character of the Washington apple industry has also changed. Many smaller growers have left the industry, and total bearing area has fallen. However, more and more of the production is now generated by large, integrated operators. These have increased the density of plantings and introduced improved management systems in order to get earlier yields in young orchards as well as higher average yields. The first evidence of this change appeared in the 2012-13 season when the volume of apples sold fresh set a new record of almost 129,000 carlots, 18 percent above the previous record set in 2010-11.

Continuing Challenges

A number of challenges face the Washington apple industry in the near future. Total fresh apple supplies in the United States are expected to continue to grow as all the major competing states have increased the density of their plantings and have sought to achieve higher packouts of fresh apples. Demand in the U.S. domestic market has been growing very slowly. Per capita consumption of fresh apples has been on a slow downward trend for two decades as consumers seek increasing diversity in the fruits they enjoy. The rate of population growth in the U.S. has also been slowing, and no longer fully offsets declining per capita consumption.

The best opportunities for the Washington apple industry to find outlets for its increased production lie in export markets where populations and per capita incomes are still growing rapidly. However, export markets continue to be difficult because of increased competition and increased trade barriers. As tariff barriers have fallen under various free trade agreements, many countries have resorted to non-tariff barriers to block imports. Apples are a specialty crop and it is difficult to persuade U.S. trade negotiators to place liberalization of the fresh apple trade high on the negotiating agenda with the offending countries.

Another ongoing challenge will be finding adequate harvest labor for the expected future increases in Washington's apple production. In the past, Washington apple producers relied heavily on undocumented, migrant workers to meet peak harvest needs. That supply is threatened by tighter regulation of immigration. More recently, there has been a rapid increase in the number of orchards using the H-2A guest worker program to bring in legal temporary workers. However, the H-2A program is costly, complex and inconsistent. The agricultural industry has been lobbying for reforms in the U.S. immigration system and the H-2A guest worker program that would improve availability of domestic and foreign labor, but those efforts remain caught in Congressional gridlock.

Finally, the Washington apple industry will have to compete for scarce and more costly supplies of water, energy and transportation. Final regulations due to be announced shortly by the U.S. Food and Drug Administration under the Food Safety Modernization Act could increase industry costs and lead to further financial stress particularly for smaller growers.

All these factors increase the urgency for elected officials and opinion leaders to understand how important the apple industry remains to the state economy. It is vital that they support policies that allow the industry to reach its full potential, and to avoid missteps that prevent the industry competing effectively in global markets.

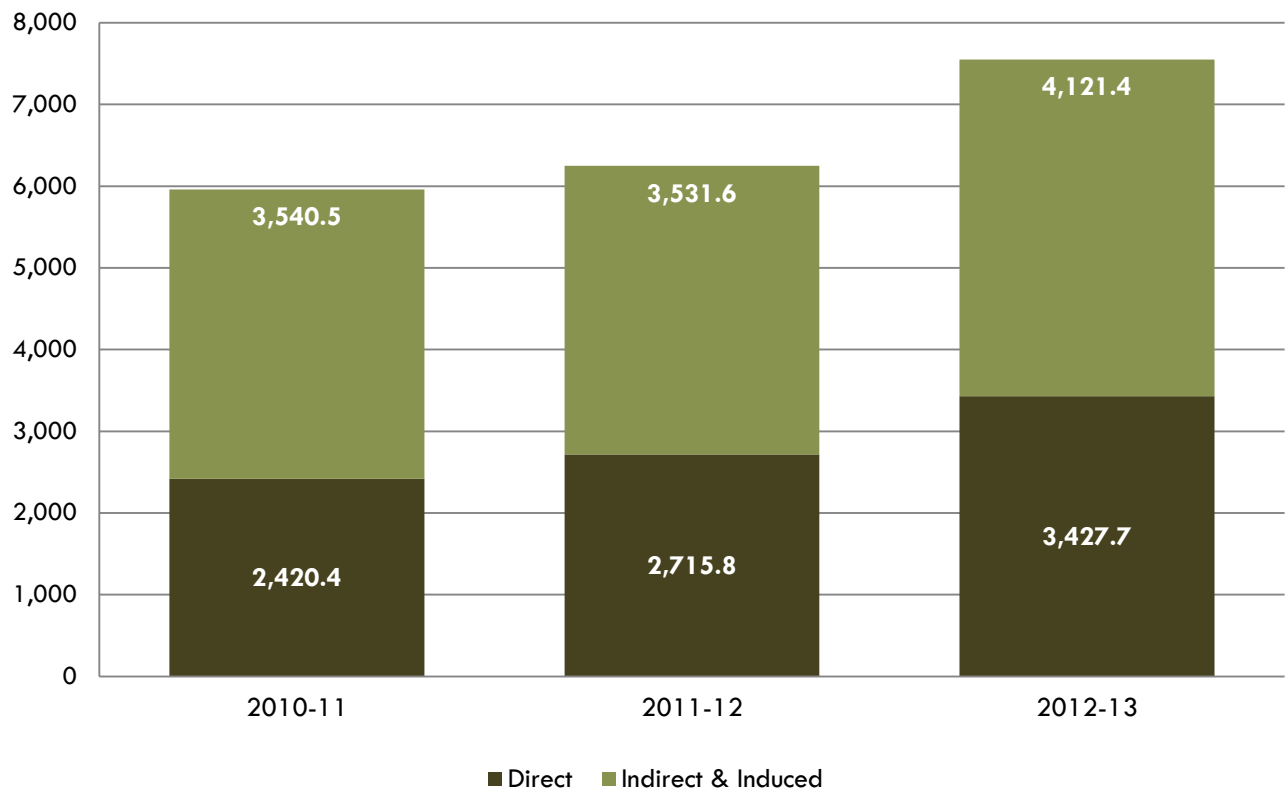
Economic Contributions of the Washington Apple Industry

Impacts on the Washington Economy

VALUE OF OUTPUT

Output measures the value of an industry's total production. In the apple industry it is appropriate to measure the value of the output for fresh apple packing and for processed apple production as the direct industry value of output. The value of fruit at the grower level is included in the value of fresh and processed production. The value of the output that is indirectly created and induced by the apple industry is also estimated. The total value of the output of the apple industry includes the direct value as well as the indirect and induced value. The total value is shown for the three seasons in Chart 3. The detailed composition of total value for each year is shown in Appendix B, Table B-1.

Chart 3: Value of Output Generated by the Washington State Apple Industry, Direct and Indirect & Induced, 2010-11, 2011-12 and 2012-13 (\$ million)



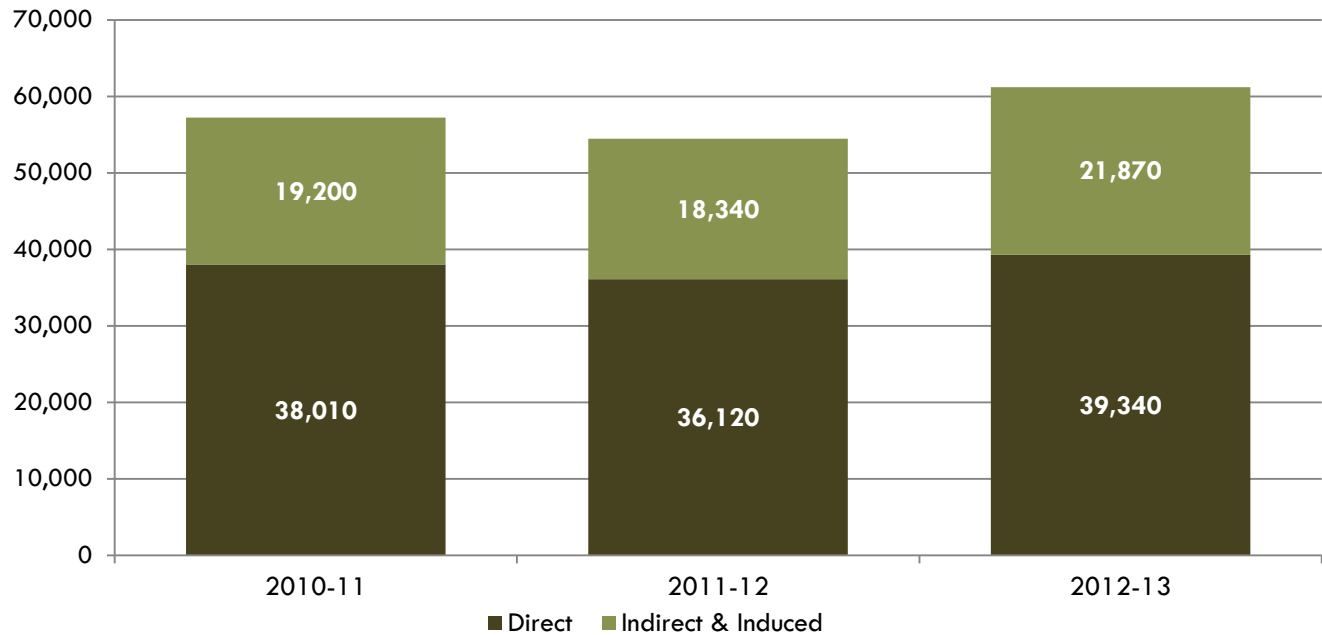
Sources: 2012 survey of apple industry, data analysis and IMPLAN economic impact analysis.

Total crop size changed little between 2010-11 and 2011-12, so the direct value of output rose by only 12.2 percent. The indirect & induced value was virtually unchanged. However, with the much larger crop in 2012-13, the direct value of output exceeded that of 2010-11 by 41.6 percent, and the indirect & induced value rose by 16.4 percent. Total industry value increased from \$5.96 billion in 2010-11 to \$6.25 billion in 2011-12 and \$7.55 billion in 2012-13.

Employment

The Washington apple industry is a major employer in the state and especially supports rural communities across Central Washington. The employment profile of the industry for the three seasons is shown in Chart 4. The detailed composition of employment in each year is shown in Appendix B, Table B-2.

Chart 4: Employment Contributions of the Washington State Apple Industry, Direct and Indirect & Induced, 2010-11, 2011-12 and 2012-13 (jobs)



Sources: Washington Department of Employment Security, 2012 survey of apple industry and IMPLAN economic impact analysis.

The employment contribution of the Washington apple industry appears to have fallen modestly in 2011-12 when the volume of packed boxes fell by about one percent. There was a shortage of harvest labor in that season. In addition, packing plants and processors moved to increase the efficiency of labor use. In 2012-13, the volume of packed boxes rose by almost 20 percent to a new record close to 129 million packed boxes. Direct employment rebounded by about 9 percent and indirect & induced employment by over 19 percent. The industry's total employment contribution rose to 61,210 jobs, 7 percent above the level in 2010-11.

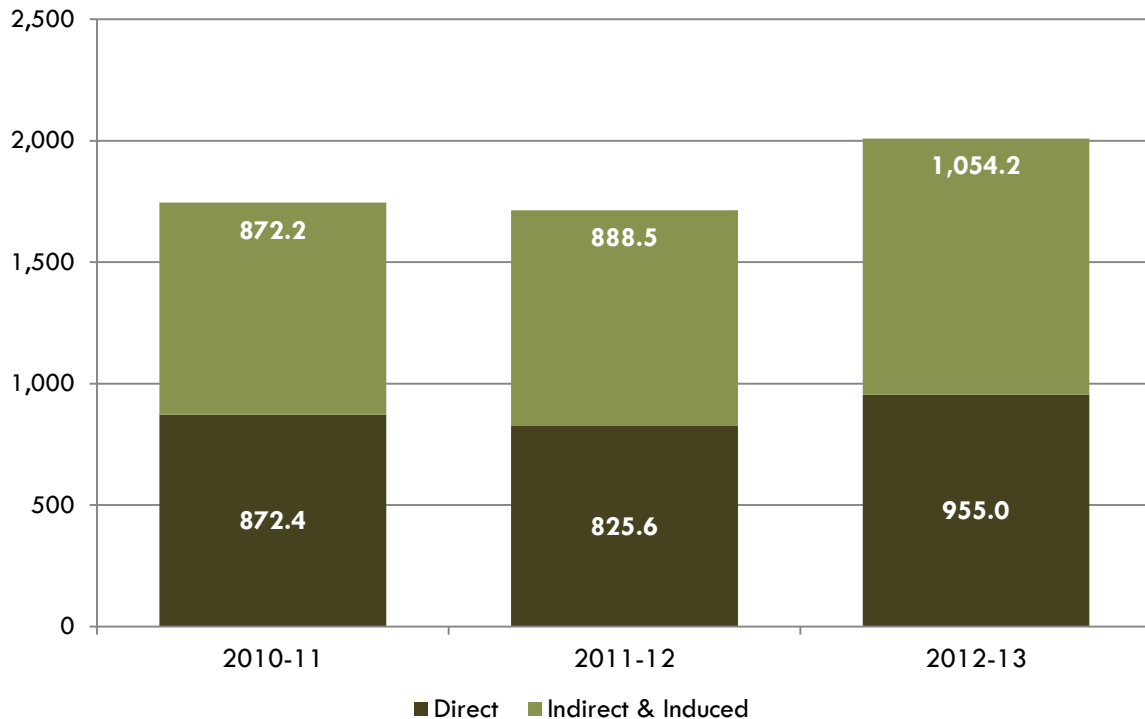
About 60 percent of the jobs in 2012-13 were the result of orchard production activities, about 30 percent from fresh apple packing, 5 percent from apple processing and 3.3 percent from marketing activities. Clearly, the size of the apple crop has a major influence on the apple industry's contribution to the state's employment.

Employee Compensation

Employee compensation contributed by the Washington apple industry is also influenced by the size of the apple crop and by changes in wage rates. In Washington State, wage rates are underpinned by the state's minimum wage law. Its minimum wage is the highest in the nation, and is also adjusted upwards annually in

step with inflation. Employee compensation generated by the industry is shown in Chart 5. The detailed composition of employee compensation is shown in Appendix B, Table B-3.

Chart 5: Employee Compensation Contributed by the Washington State Apple Industry, Direct and Indirect & Induced, 2010-11, 2011-12 and 2012-13 (\$ million)



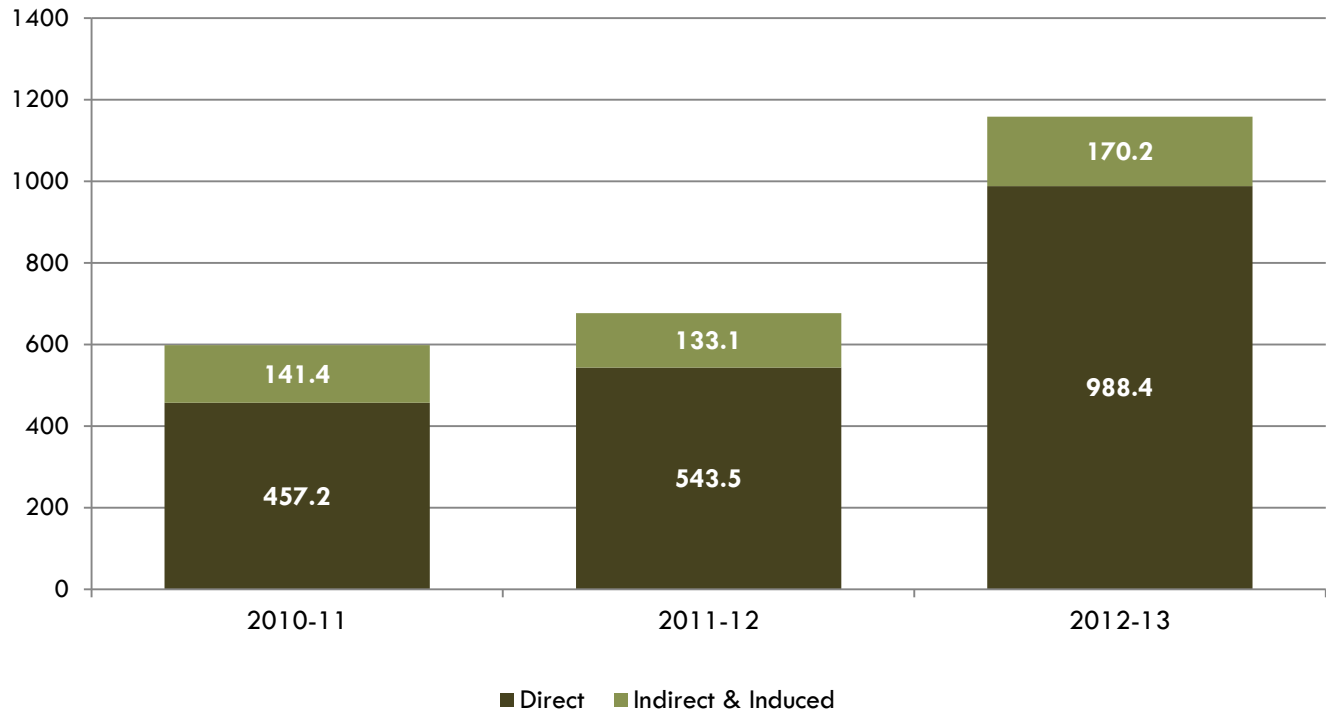
Sources: Washington Department of Employment Security, 2012 survey of apple industry and IMPLAN economic impact analysis.

In 2010-11, the apple industry provided about \$1.74 billion in employee compensation to workers in Washington State, about half direct, and about half indirect & induced. Employee compensation fell slightly in 2011-12, largely due to the reduced number of jobs documented in Chart 3. However, employee compensation soared by over 17 percent between 2011-12 and 2012-13 to just over \$2.0 billion to handle the much larger apple crop. Slightly over half the employee compensation was generated from orchard production, almost 36 percent from fresh apple packing, over 7 percent from processing and almost 6 percent from apple marketing.

Proprietor's Income

Proprietor's income is the income received by self-employed persons and business owners, after they have paid employee wages and all other expenses. The 2010-11 survey of apple industry growers, packers, processors and sales agencies obtained benchmark data on proprietor's income that was the estimated at the state level. Data for 2011-12 and 2012-13 were adjusted from the 2010-11 base for changed economic conditions in the industry in the two later years. Proprietor's income generated by the industry is shown in Chart 6. The detailed composition of proprietor's income is shown in Appendix B, Table B-4.

Chart 6: Proprietor's Income Generated by the Washington State Apple Industry, Direct and Indirect & Induced, 2010-11, 2011-12 and 2012-13 (\$ million)



Sources: 2012 survey of apple industry, data analysis and IMPLAN economic impact analysis.

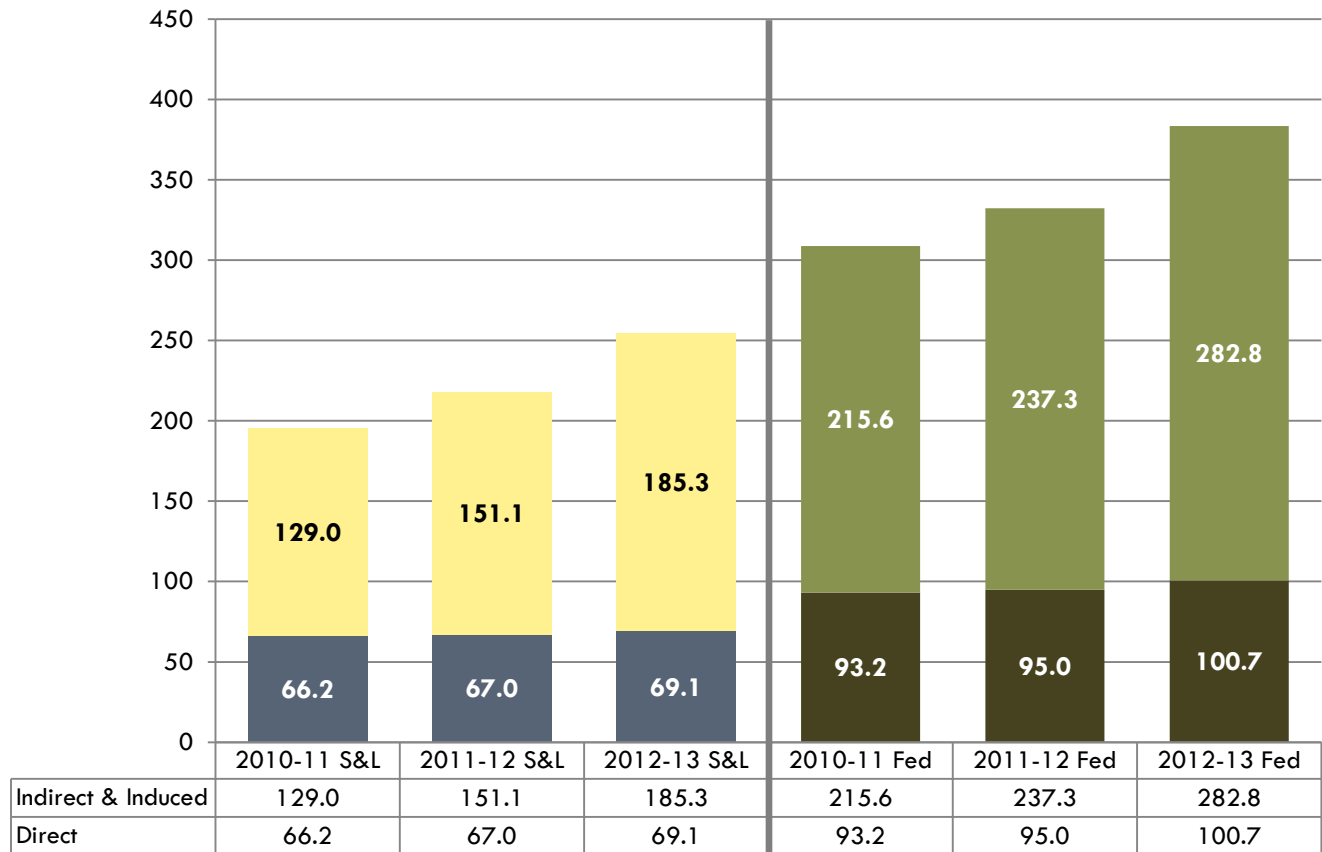
Proprietor's income from perennial crop production is quite variable because of the high percentage of fixed costs in the business. Very small changes in price or in volume can also significantly alter proprietor's income. In 2011-12, proprietor's income in the Washington apple industry was boosted by higher average prices. In 2012-13, it was boosted even further by the unusual combination of record volume and higher prices. The higher prices were due primarily to crop failures elsewhere in North America and Europe.

Proprietor's income rose by 13 percent between 2010-11 and 2011-12 to \$676.6 million. However, it rose by a further 70 percent in 2012-13 because of the extremely favorable conditions in that year. The orchard production sector and the fresh apple packing and apple marketing sectors all gained in 2012-13, but the apple processing sector saw a slight decline because of depressed prices for processed apples.

Tax and Related Revenues

The Washington apple industry contributes very significantly to the tax base in Washington State through payment of state and local taxes. The industry also pays an even greater amount of federal taxes. Estimates of these payments for the three years are shown in Chart 7. Detailed breakdowns are included in Appendix B, Tables B-5 and B-6. In Chart 7 direct state and local taxes are shown in dark blue and indirect & induced are shown in yellow. Direct federal taxes are shown in brown and indirect & induced in green.

Chart 7: State & Local and Federal Taxes Paid by the Washington State Apple Industry, Direct and Indirect & Induced, 2010-11, 2011-12 and 2012-13 (\$ million)



Sources: 2012 survey of apple industry, data analysis and IMPLAN economic impact analysis.

The amount of state and local taxes paid by the apple industry has averaged about two-thirds of the federal taxes paid. In both cases, direct taxes paid have risen slowly, but there have been large percentage increases in indirect & induced taxes paid. Total taxes generated by the Washington apple industry rose from about \$500 million in 2010-11 to \$550 million in 2011-12 and about \$638 million in 2012-13. Note that the IMPLAN model does not include all fees and permits payments made by businesses.

The Role of Export Markets

As previously noted, sluggish demand for fresh apples in the U.S. domestic market and expected future increases in Washington State supplies of fresh apples implies that it will be vital for the apple industry to continue to increase its exports over time. Since the apple orchards produce crops over many years, the industry has turned to export markets for stable and expanded market demand. We used an econometric model of apple demand and the IMPLAN model to estimate the direct and indirect & induced effects of changes in Washington apple exports.

Table 2 provides one illustration of the short run effects if 5 million less boxes of fresh apples had been sold in export markets in each of the three different seasons.

Table 2: Change in Value of Shipments at the FOB Level and at the Grower Level If 5 Million Fresh Packs Were Diverted from Export to Domestic Markets, 2010-11, 2011-12 and 2012-13 (\$ thousand)

Season	Direct Effect	Indirect & Induced Effects	Total Effects
2010-11	- 55,169	- 77,490	- 132,659
2011-12	- 97,375	- 122,160	- 219,535
2012-13	-116,734	- 155,380	- 272,114

Source: IMPLAN economic analysis

Clearly, the higher the average prices and the greater the volume to be sold, the greater the penalty the industry suffers if it fails to export sufficient volume to keep the domestic market in balance.

Table 3: Indirect and Induced Economic Impacts If 5 Million Fresh Packs Were Diverted from Export to Domestic Markets, 2010-11, 2011-12, and 2012-13 (jobs and \$ thousand)

Economic Component (All Impacts are Indirect and Induced)	Economic Impact
2010-2011	
Change in Employment	-580
Change in Employee Compensation	-\$21,830
Change in Proprietor's Income*	-\$3,350
Change in State & Local Tax Revenue	-\$3,570
Change in Federal Tax Revenue	-\$5,640
2011-2012	
Change in Employment	-890
Change in Employee Compensation	-\$35,910
Change in Proprietor's Income*	-\$5,810
Change in State & Local Tax Revenue	-\$8,200
Change in Federal Tax Revenue	-\$10,130
2012-2013	
Change in Employment	-1,110
Change in Employee Compensation	-\$45,520
Change in Proprietor's Income*	-\$7,280
Change in State & Local Tax Revenue	-\$10,370
Change in Federal Tax Revenue	-\$12,810

* Here proprietor's income refers to the change in indirect and induced proprietor's income in other business sectors as apple industry proprietor's income changes.

Source: IMPLAN economic analysis

Conclusions

This analysis shows that the total economic output of the apple industry has grown appreciably over the three seasons analyzed here. The direct, indirect and induced value of output was just under \$6.0 billion in 2010-11 and increased to over \$7.5 billion in 2012-13. The increase is attributable to expanded production, higher prices for fresh apples, and greater industry expenditures for both capital and annual operating requirements.

Direct employment in the apple industry has been less expansionary, especially in 2011-12 when orchard labor supply was tight and direct employment declined from about 24,135 the previous year to 23,920. The orchard labor supply was particularly tight in 2011-12. However, overall employment rose in 2012-13 to 26,410 as growers addressed the large crop requirements and were able to secure more workers. This growth in orchard-level employment was a major cause for the major growth in overall economic contributions by the apple industry to the state economy in 2012-13. For example, indirect and induced employment grew from about 7,450 in 2010-2011 to about 10,650 in 2012-13.

While employment declines slightly in the middle year of this analysis compared to the 2010-11 year, it rebounded in 2012-13 which brought significant growth in employee compensation by the last year of this analysis. Direct compensation in the apple industry in 2010-11 stood at about \$872 million and rose to about \$955 million by 2012-13, for a two-year increase of over 9 percent.

The apple industry contributes significantly to tax revenues at both the state/local level and the federal level. This analysis shows that the apple industry directly pays over \$65 million annually to state and local governments and over \$90 million annually directly to the federal government. When the indirect and induced tax payments are added, this ranges from \$195 million to \$254 million to state and local governments in Washington and \$308 million to \$383 million at the federal level.

Export sales are vital to the economic contributions of the apple industry. This analysis considers the impacts if 5 million fresh packs of apples that were shipped to export markets in the years of this analysis had to be diverted to domestic sales. This volume represents from 12 to 14 percent of total Washington apple exports in the three years of analysis. Using the 2012-13 year as an example, the impact of this shift has these impacts:

- Washington loses over 1,100 jobs
- state employee compensation declines by \$45.5 million
- state and local government tax revenues decline by \$10.4 million, and
- Federal tax revenues drop by \$12.8 million.

This analysis has focused on the economic contributions of the apple industry. The industry also promotes Washington residents in many ancillary ways. Transportation systems in the state, from highways to ports are boosted by the large volume of apple shipments. Growers and packers support community services with financial contributions to hospitals, health clinics, and student scholarships and other local community causes. The industry also funds research at Washington State University that expands educational and research opportunities.

The Washington apple industry has proven to be a growth-oriented segment of the state's economy. It offers a solid basis for business strength to citizens across the state, and is especially important in rural parts of Washington where other economic opportunities are often not plentiful.

Appendix A – Brief Description of the Economic Impact Model Framework

Input-output (I-O) models provide an accounting framework that links the impacts of changes in the final demand of a given industry (Washington apples in this case) to changes in supply in other sectors of the economy. Final consumption and exports initiate the analysis. Note that in I-O model terms, exports as used here refer to sales of Washington apple products anywhere outside the state. In the body of this report, the term export is used in the conventional way, namely sales outside the U.S.

Significant effort was made in the initial study in 2012 to accurately estimate the linkages between final consumption and exports of the state's apple industry to all other sectors who supply goods and services to the industry. In the I-O model adopted for that study and again for the current update, purchases from others sectors are primarily estimated from surveys of Washington growers, packers, sales agencies and key organizations that have knowledge of the industry. These surveys were conducted by Globalwise and Belrose and gave the authors of this report more keen insight into business practices and financial operations of the Washington apple industry.

The basic I-O model structure used here is based on the economic model structure known as IMPLAN, the acronym for Impact Analysis for Planning. This economic input-output model was originally designed in the mid-1970s by the USDA Forest Service for community impact analysis. Currently the model is maintained and sold by the Minnesota IMPLAN Group (MIG), Inc. This modeling framework is accepted and widely used by economists and business analysts to measure the economic contributions of industries and projects. The IMPLAN model is frequently utilized for the same purpose as in this study. It measures how the direct changes of one industry lead to indirect and induced effects on the other industries within the study area. This model analyzes the backward linkages in the economy and may actually understate the total overall contribution of the agricultural export sector to the Washington economy.

The Washington State 2012 IMPLAN model has been modified by specifying the spending patterns of the Washington apple industry in the 2011-12 and 2012-13 crop years. In the original study a detailed review of the purchases made by the Washington firms was related to the total production of the firms, and this in turn has been aggregated to estimate total purchases by the entire state apple industry. These same relationships were used in the two subsequent years of analysis for this report. Prices for each analysis year were adjusted to estimate current year price levels.

While we did collect employment and wage data at all levels for the apple industry from the earlier survey, we used the Washington Department of Employment Security data for grower and packer employment and wages in all years. The state wage and employment data is gathered by a comprehensive, frequent survey of the industry and it is considered accurate and consistent in terms of data collection methods.

Appendix B – Impact Analysis Data Tables

Appendix Table B-1

Value of Output Generated by the Washington State Apple Industry
(2010-11, 2011-12 and 2012-13)
(\$ million)

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	(Included with Packing)	1,372.6	1,372.6
Fresh Apple Packing	2,161.5	1,728.5	3,890.0
Apple Processing	258.9	305.6	564.5
Apple Marketing	N.A.	130.2	130.2
Apple Research (WSU/USDA)	N.A.	3.6	3.6
TOTAL, 2010-11	2,420.4	3,540.5	5,960.9
2011-12			
Orchard Production	(Included with Packing)	1,571.5	1,571.5
Fresh Apple Packing	2,454.9	1,525.7	3,980.6
Apple Processing	260.9	300.2	561.1
Apple Marketing	N.A.	130.2	130.2
Apple Research (WSU/USDA)	N.A.	4.0	4.0
TOTAL, 2011-12	2,715.8	3,531.6	6,247.4
2012-13			
Orchard Production	(Included with Packing)	1,919.0	1,919.0
Fresh Apple Packing	3,144.0	1,725.9	4,869.9
Apple Processing	283.7	334.8	618.5
Apple Marketing	N.A.	137.9	137.9
Apple Research (WSU/USDA)	N.A.	3.8	3.8
TOTAL, 2012-13	3,427.7	4,121.4	7,549.1
Ratio Relative to 2010-11			
2011-12			
Orchard Production	(Included with Packing)	114.5	114.5
Fresh Apple Packing	113.6	88.3	102.3
TOTAL, 2011-12	112.2	99.7	104.8
2012-13			
Orchard Production	(Included with Packing)	139.8	139.8
Fresh Apple Packing	145.5	99.8	125.2
TOTAL, 2012-13	141.6	116.4	126.6

Appendix Table B-2

**Employment Contributions of the Washington State Apple Industry
(2010-11, 2011-12 and 2012-13)
(number of jobs)**

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	24,135	7,445	31,580
Fresh Apple Packing	11,365	9,080	20,445
Apple Processing	1,380	1,725	3,105
Apple Marketing	1,070	920	1,990
Apple Research (WSU/USDA)	60	30	90
TOTAL, 2010-11	38,010	19,200	57,210
2011-12			
Orchard Production	23,920	8,490	32,410
Fresh Apple Packing	9,690	7,280	16,970
Apple Processing	1,380	1,630	3,010
Apple Marketing	1,070	910	1,980
Apple Research (WSU/USDA)	60	30	90
TOTAL, 2011-12	36,120	18,340	54,460
2012-13			
Orchard Production	26,410	10,665	37,075
Fresh Apple Packing	10,400	8,495	18,895
Apple Processing	1,380	1,740	3,120
Apple Marketing	1,090	940	2,030
Apple Research (WSU/USDA)	60	30	90
TOTAL, 2012-13	39,340	21,870	61,210
Ratio Relative to 2010-11			
2011-12			
Orchard Production	99.1	114.0	102.6
Fresh Apple Packing	85.3	80.2	83.0
TOTAL, 2011-12	95.0	95.5	95.2
2012-13			
Orchard Production	109.4	143.3	117.4
Fresh Apple Packing	91.5	93.6	92.4
TOTAL, 2012-13	103.5	113.9	106.8

Appendix Table B-3

**Employee Compensation Contributed by the Washington State Apple Industry
(2010-11, 2011-12 and 2012-13)
(\$ million)**

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	463.8	327.0	790.8
Fresh Apple Packing	276.2	430.5	706.7
Apple Processing	60.4	76.5	136.9
Apple Marketing	68.6	37.1	105.7
Apple Research (WSU/USDA)	3.4	1.1	4.5
TOTAL, 2010-11	872.4	872.2	1,744.6
2011-12			
Orchard Production	450.9	388.1	839.0
Fresh Apple Packing	242.4	383.6	626.0
Apple Processing	61.0	76.6	137.6
Apple Marketing	67.9	38.9	106.8
Apple Research (WSU/USDA)	3.4	1.3	4.7
TOTAL, 2011-12	825.6	888.5	1,714.1
2012-13			
Orchard Production	537.8	486.2	1,024.0
Fresh Apple Packing	278.7	440.8	719.5
Apple Processing	61.0	84.8	145.8
Apple Marketing	74.1	41.1	115.2
Apple Research (WSU/USDA)	3.4	1.3	4.7
TOTAL, 2012-13	955.0	1,054.2	2,009.2
Ratio Relative to 2010-11			
2011-12			
Orchard Production	97.2	118.7	106.1
Fresh Apple Packing	87.8	89.1	88.6
TOTAL, 2011-12	94.6	101.9	98.3
2012-13			
Orchard Production	116.0	148.7	129.5
Fresh Apple Packing	100.9	102.4	101.8
TOTAL, 2012-13	109.5	120.9	115.2

Appendix Table B-4

**Proprietor's Income Generated by the Washington State Apple Industry
(2010-11, 2011-12 and 2012-13)
(\$ million)**

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	260.0	58.9	318.9
Fresh Apple Packing	108.0	64.4	172.4
Apple Processing	34.2	11.4	45.6
Apple Marketing	55.0	6.5	51.5
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2010-11	457.2	141.4	598.6
2011-12			
Orchard Production	331.0	68.1	399.1
Fresh Apple Packing	122.7	48.5	171.2
Apple Processing	32.0	9.9	41.9
Apple Marketing	57.8	6.4	64.2
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2011-12	543.5	133.1	676.6
2012-13			
Orchard Production	642.0	84.9	726.9
Fresh Apple Packing	251.5	67.5	319.0
Apple Processing	30.0	10.8	40.8
Apple Marketing	64.9	6.8	71.7
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2012-13	988.4	170.2	1,158.6
Ratio Relative to 2010-11			
2011-12			
Orchard Production	127.3	115.6	125.1
Fresh Apple Packing	113.6	75.3	99.3
TOTAL, 2011-12	118.9	94.1	113.0
2012-13			
Orchard Production	246.9	144.1	227.9
Fresh Apple Packing	232.9	104.8	185.0
TOTAL, 2012-13	216.2	120.4	193.6

Appendix Table B-5

**State and Local Tax Payments Generated by the Washington State Apple Industry
(2010-11, 2011-12 and 2012-13)
(\$ million)**

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	24.9	53.2	78.1
Fresh Apple Packing	24.9	60.5	85.4
Apple Processing	12.5	9.5	22.0
Apple Marketing	3.9	5.6	9.5
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2010-11	66.2	129.0	195.2
2011-12			
Orchard Production	25.4	75.3	100.7
Fresh Apple Packing	25.1	56.4	81.5
Apple Processing	12.5	11.7	24.2
Apple Marketing	4.0	7.5	11.5
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2011-12	67.0	151.1	218.1
2012-13			
Orchard Production	26.5	97.0	123.5
Fresh Apple Packing	25.9	67.5	93.4
Apple Processing	12.5	12.7	25.2
Apple Marketing	4.2	7.9	12.1
Apple Research (WSU/USDA)	0.0	0.2	0.2
TOTAL, 2012-13	69.1	185.3	254.4
Ratio Relative to 2010-11			
2011-12			
Orchard Production	102.0	141.5	128.9
Fresh Apple Packing	100.8	93.2	95.4
TOTAL, 2011-12	101.2	117.1	111.7
2012-13			
Orchard Production	106.4	182.3	158.1
Fresh Apple Packing	104.0	111.6	109.4
TOTAL, 2012-13	104.4	143.6	130.3

Appendix Table B-6

Federal Tax Payments Generated by the Washington State Apple Industry (2010-11, 2011-12 and 2012-13) (\$ million)

Season and Sector	Direct Apple Industry Value of Output	Indirect & Induced Value of Output	Total Value of Output
2010-11			
Orchard Production	44.4	82.8	127.2
Fresh Apple Packing	44.4	104.4	148.8
Apple Processing	4.4	18.8	23.2
Apple Marketing	0.0	9.3	9.3
Apple Research (WSU/USDA)	0.0	0.3	0.3
TOTAL, 2010-11	93.2	215.6	308.8
2011-12			
Orchard Production	46.2	107.5	153.7
Fresh Apple Packing	44.4	98.9	143.3
Apple Processing	4.4	20.0	24.4
Apple Marketing	0.0	10.6	10.6
Apple Research (WSU/USDA)	0.0	0.3	0.3
TOTAL, 2011-12	95.0	237.3	332.3
2012-13			
Orchard Production	49.7	135.0	184.7
Fresh Apple Packing	46.6	114.3	160.9
Apple Processing	4.4	22.0	26.4
Apple Marketing	0.0	11.2	11.2
Apple Research (WSU/USDA)	0.0	0.3	0.3
TOTAL, 2012-13	100.7	282.8	383.5
Ratio Relative to 2010-11			
2011-12			
Orchard Production	104.1	129.8	120.8
Fresh Apple Packing	100.0	94.7	96.3
TOTAL, 2011-12	101.9	110.1	107.6
2012-13			
Orchard Production	105.0	163.0	145.2
Fresh Apple Packing	105.0	109.5	108.1
TOTAL, 2012-13	108.0	131.2	124.2



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