

The Economic Impact of the Wisconsin Cranberry Industry: 1995 Update

A Report to the Wisconsin Cranberry Board, Inc.

**College of Agricultural and Life Sciences
University of Wisconsin-Madison
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Foreword

This study was conducted by a team of faculty and staff in the College of Agricultural and Life Sciences, University of Wisconsin-Madison. Professor Ed Jesse (Agricultural and Applied Economics) was the project coordinator. Co-investigators were Steven Deller (Agricultural and Applied Economics), Teryl Roper (Horticulture), and Gary Frank (Center for Dairy Profitability).

Project funding from the Wisconsin Cranberry Board, Inc., is gratefully acknowledged. We also thank the Cranberry Marketing Committee for providing data on cranberry acreage.

Summary

This report provides 1995 estimates of the economic value of cranberry production and processing in Wisconsin. The estimates are based on a census of cranberry production costs conducted in 1991. Costs of production from the 1991 census were updated to 1995 using U.S. Department of Agriculture Index of Prices Paid sub-component values. Grower expenditures were estimated for the state and for Northern and Southern production regions within the state by applying per acre costs to 1995 acreage. The acreage data were made available through the Cranberry Marketing Committee, which participated in a major aerial/GIS project to obtain comprehensive information on existing acreage and new cranberry plantings during the 1995 crop year. Additional information on expenditures made by cranberry handling, marketing and processing firms was obtained to estimate overall economic impacts.

Costs to produce cranberries in 1995 were estimated at \$7,171 per bearing acre, or \$48 per barrel. There was little difference in costs between the Northern and Southern producing regions. Total expenditures for producing the 1995 crop were estimated at \$85 million. In addition, growers spent an estimated \$17 million on marsh development and new equipment.

Direct employment in the cranberry production sector was estimated at 3,341 jobs in 1995. Another 1,011 jobs were associated with cranberry handling and processing. Through their purchases of goods and services in the state, these employees added about 2,800 more Wisconsin jobs. Employment in production and processing directly contributed over \$50 million in personal income to the state's economy and indirectly added another \$60 million through the multiplier effect. Total value added by cranberry production and processing was estimated at \$173 million, and total industry output was estimated at \$334 million.

Industry Background

Cranberries represent a remarkable success story in U.S. Agriculture. Once considered a seasonal fruit consumed primarily in fresh form as a side dish with turkey at Thanksgiving, cranberries are now consumed year-round, mainly as juice and juice blends. Cranberry juice in combination with other fruit juices, adds “zip” to fruit drinks, and the consumer popularity of these drinks has created strong industrial demand for cranberry juice concentrate. Recently, new cranberry products (e.g., “craisins”) have gained consumer popularity, and the publication of new medical studies suggesting beneficial health effects from consuming cranberries (e.g., preventing urinary tract infection and arteriosclerosis) has further stimulated demand.

Per capita consumption of cranberries has grown from less than 0.7 pounds in the 1950’s to about 1.8 pounds in the 1990’s. Over the same period, per capita consumption of cranberries as fresh fruit has declined from about 0.3 pounds to less than 0.1 pounds, while processed cranberry consumption has increased from 0.3 pounds to more than 1.6 pounds.

Cranberry production has grown in response to the rapid growth in consumption. But land suitable for cranberry production is limited – cranberries grow best in (increasingly scarce) natural wetland conditions – so supply has not kept up with the seemingly insatiable demand. There have been two notable consequences: cranberry prices have remained very strong, and new acreage is increasingly in areas that are less adapted to cranberry production.

Cranberries are the most economically important commercial fruit crop in Wisconsin. Growth in the Wisconsin industry has mirrored that of the U.S. industry. Between 1970 and 1996, bearing acreage more than doubled, from 5,700 acres to nearly 13,000 acres. Industry growth was particularly large between 1993 and 1996, when bearing acreage jumped by about 1,000 acres per year. Bearing acreage has recently been well above the 1970-96 linear trend, and will likely exceed 15,000 acres by the turn of the century.

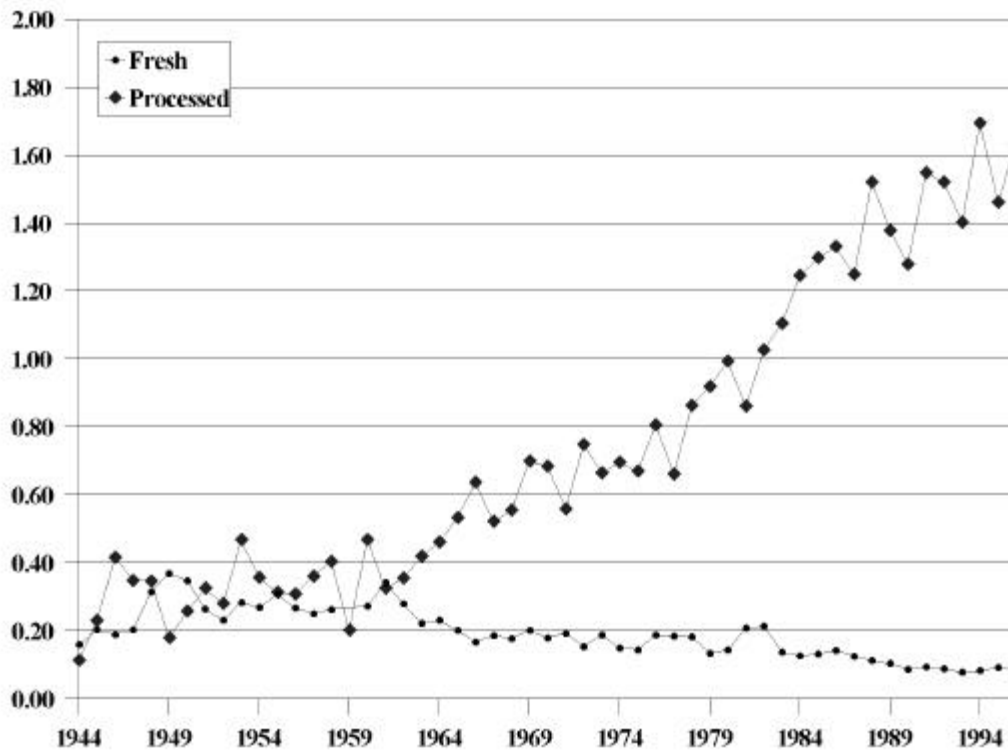
Compared to bearing acreage, Wisconsin cranberry yields have been highly variable, and the trend in yield is comparatively weak. Yield per acre peaked in 1982 at 180 barrels (100 pounds) per acre. Since then, yields have exceeded 160 barrels on only three occasions. Reasons for the stagnation in Wisconsin cranberry yields are not completely clear. But it is likely that expanded plantings on less suitable land has negatively affected yields.

Wisconsin cranberry production about tripled between the early 1970’s and the mid-1990’s. Production in 1997 is estimated at 2.1 million barrels. Prices have increased steadily, leading to large increases in crop value. In nominal (undeflated) terms, the farm value of Wisconsin cranberries in 1996 was 20 times the 1970 value.

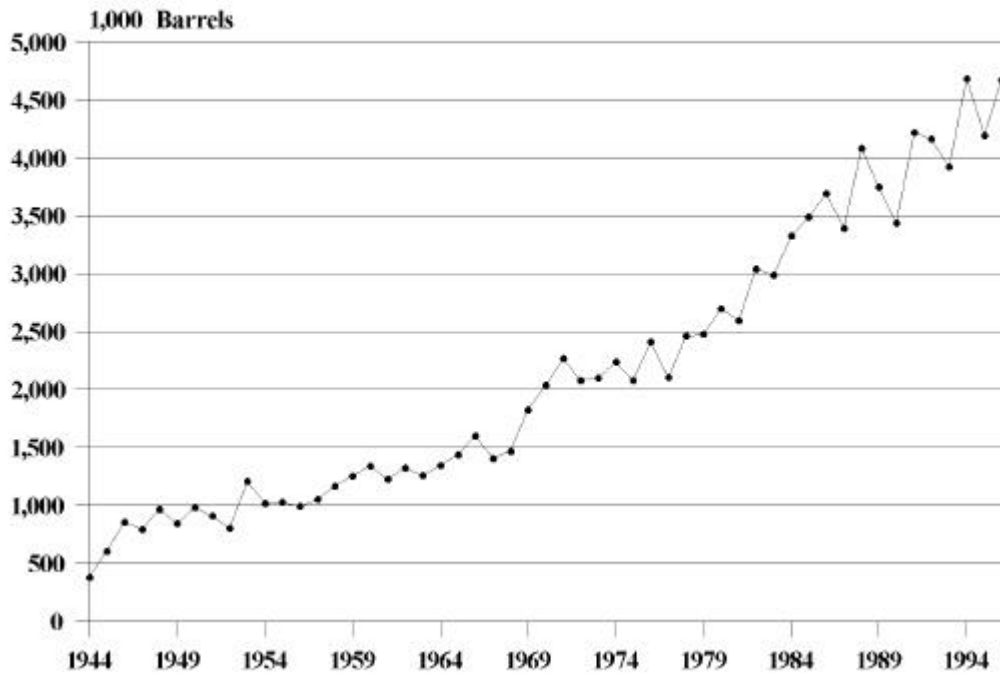
In the last two years (1996 and 1997), Wisconsin has held the number one rank among cranberry producing states. A comparison of nonbearing acreage between Wisconsin and Massachusetts (the second leading state) strongly suggests that Wisconsin will retain its number one spot into the foreseeable future.

The following charts and tables provide a statistical picture of the cranberry industry. Trend lines shown for Wisconsin acreage, yield and production are based on 1970-96 values. Source data for all charts is the National Agricultural Statistics Service, U.S. Department of Agriculture.

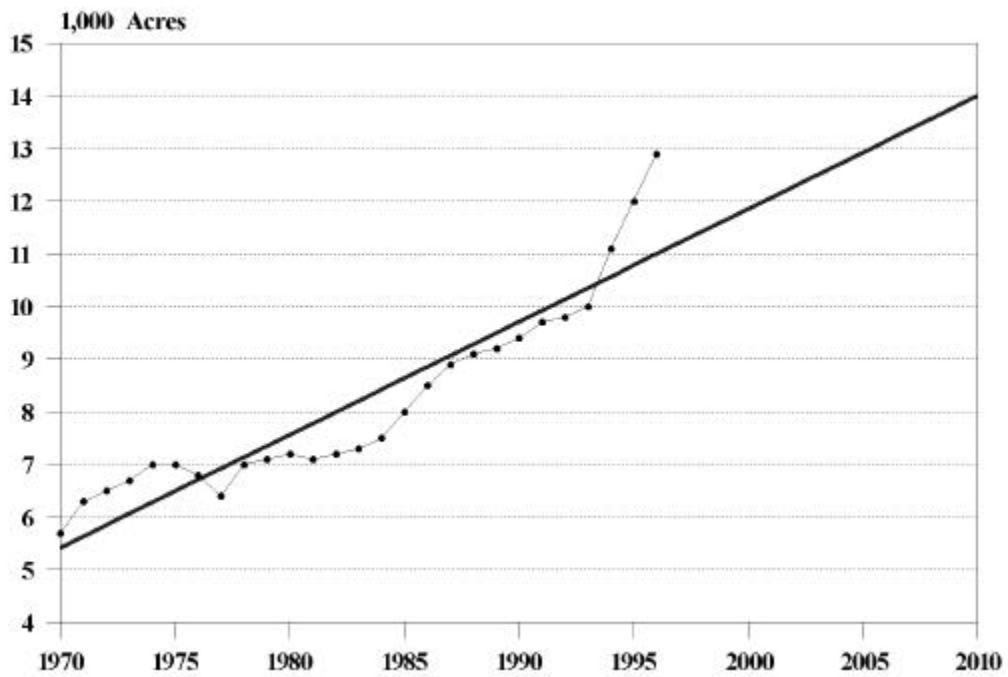
U.S. Per Capita Cranberry Consumption



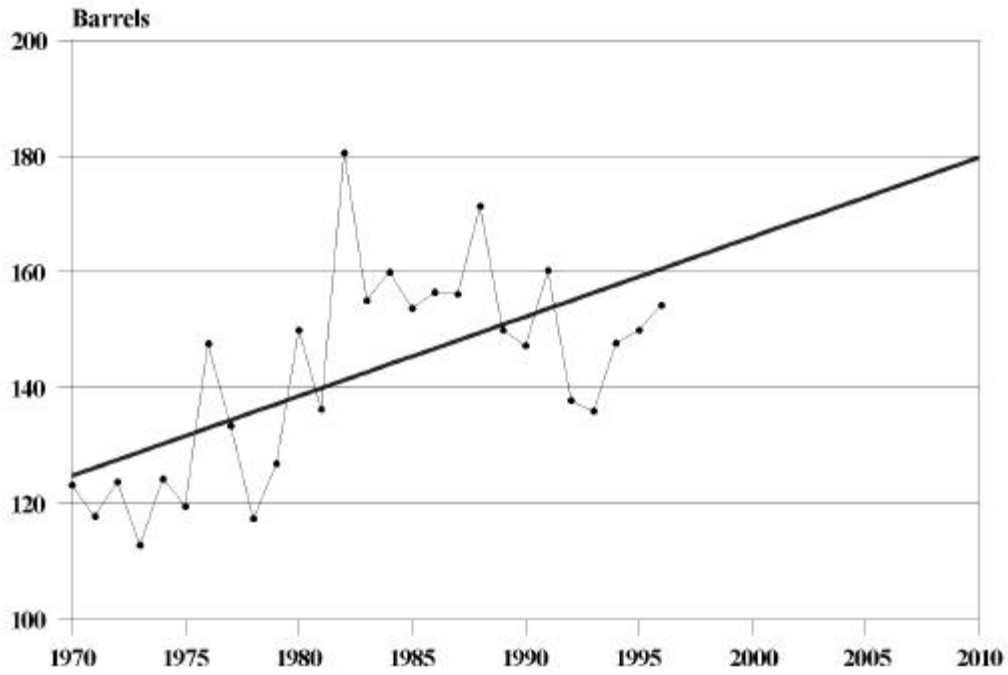
U.S. Cranberry Production



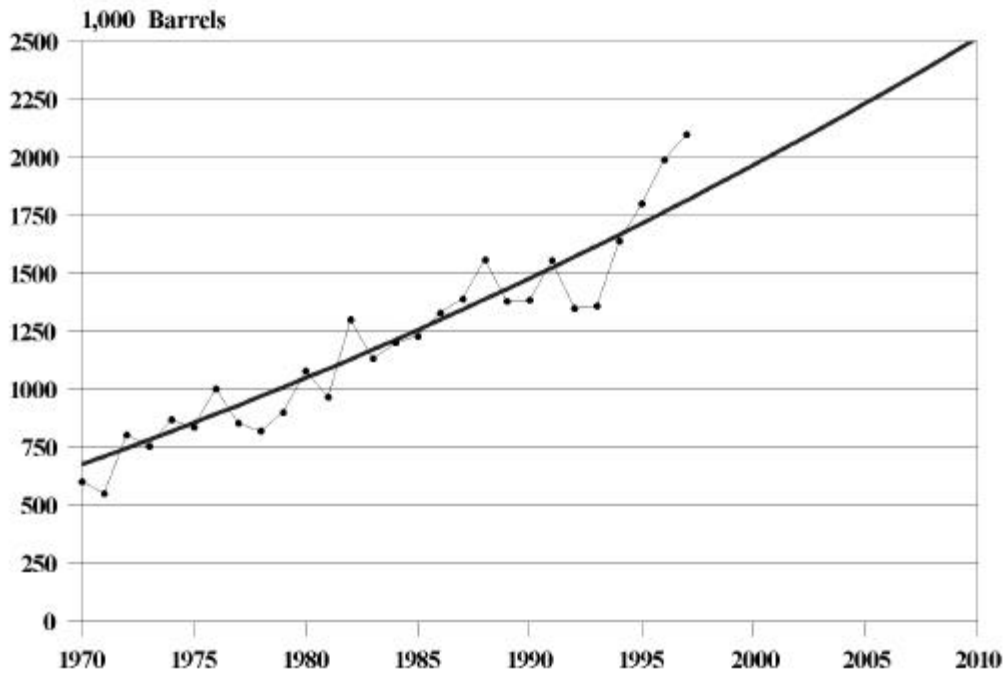
Wisconsin Cranberries - Bearing Acres



Wisconsin Cranberries - Yield per Bearing Acre



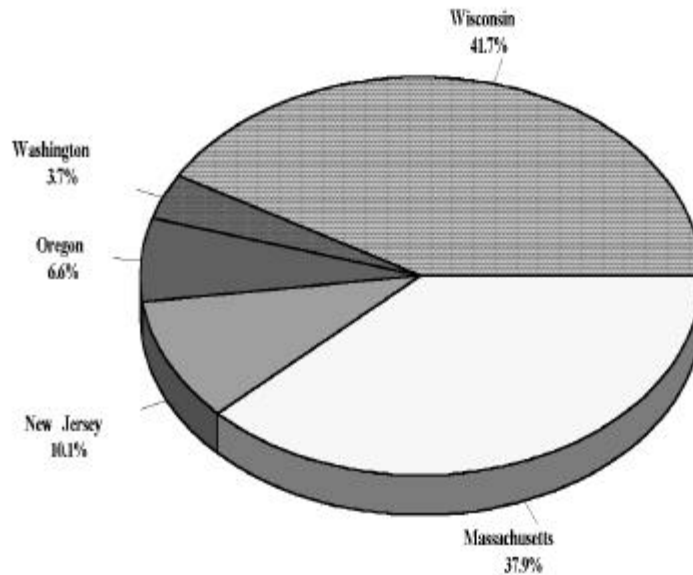
Wisconsin Cranberries - Berry Production



Wisconsin Cranberry Production and Value Statistics

Year	Hvst. Acres	Yield Bbls/Acre	Prod 1,000 Bbls	Price \$/Bbl	Value \$1,000
1970	5,700	123.2	603	10.60	6,392
1971	6,300	117.8	552	10.70	5,906
1972	6,500	123.8	805	12.40	9,978
1973	6,700	112.8	756	13.30	10,052
1974	7,000	124.3	870	11.70	10,180
1975	7,000	119.6	837	13.00	10,884
1976	6,800	147.6	1,004	13.50	13,550
1977	6,400	133.4	854	18.30	15,624
1978	7,000	117.4	822	21.30	17,504
1979	7,100	126.9	901	26.70	24,056
1980	7,200	150.0	1,080	32.80	35,424
1981	7,100	136.3	968	41.30	39,967
1982	7,200	180.6	1,300	39.70	51,623
1983	7,300	155.1	1,132	44.10	49,931
1984	7,500	160.0	1,200	46.10	55,320
1985	8,000	153.8	1,230	45.70	56,229
1986	8,500	156.5	1,330	44.40	59,063
1987	8,900	156.2	1,390	44.40	61,724
1988	9,100	171.4	1,560	45.20	70,500
1989	9,200	150.0	1,380	40.00	55,200
1990	9,400	147.3	1,385	45.30	62,741
1991	9,700	160.3	1,555	48.60	75,573
1992	9,800	137.8	1,350	50.90	68,715
1993	10,000	136.0	1,360	49.70	67,592
1994	11,100	147.7	1,640	49.50	81,124
1995	12,000	150.0	1,800	54.20	97,581
1996	12,900	154.3	1,990	60.40	120,107
1997			2,100		

Relative Shares of U.S. Cranberry Production 1997



Cranberry Production Expenditures, 1995

Cranberries are a high-value, high cost crop. Management requirements are intensive due to demanding nutrient and water requirements, susceptibility to numerous pests and diseases, weather-related risks, and unique harvesting procedures. The same factors result in labor use per acre that is much higher than for most horticultural crops.

To estimate current cranberry costs of production and total grower expenditures for growing cranberries, we updated 1991 cost estimates that we calculated in an earlier study.¹ The 1991 costs were derived from a special census of cranberry growers conducted by the Wisconsin Agricultural Statistics Service (WASS). WASS enumerators personally contacted all cranberry growers from its confidential name list of known cranberry growers in the state to obtain information on land use, cranberry and cranberry vine sales, input and service expenditures, in-

¹ See *The Economic Impact of the Wisconsin Cranberry Industry*, College of Agricultural and Life Sciences, University of Wisconsin-Madison, July 1993

vestment and employment for the 1991 crop year. The response rate for this census exceeded 90 percent. We expanded the expenditure data to account for non-respondents based on the proportion of respondent acreage to total acreage.

The first step in the updating process was to obtain current acreage estimates to compare with the 1991 census acreage. The latest acreage estimates available from public sources were from 1996, published in August 1997 by the U.S. Department of Agriculture, National Agricultural Statistics Service. Reported USDA bearing acreage for 1996 appeared to be low based on other information. More important, the USDA acreage estimates are only for bearing acreage, while costs are incurred for both bearing and nonbearing acres.

Accordingly, we elected to use total acreage values provided by the Cranberry Marketing Committee. The Cranberry Marketing Committee administers the federal marketing order for cranberries, which requires the committee to maintain acreage records for growers in affected districts, including Wisconsin. In collaboration with others, the committee commissioned a GIS-based survey of cranberry acreage during 1995. The survey yielded very precise estimates by county. Thus, while the data are not current, they do represent an accurate acreage baseline to compare with the estimates derived from the 1991 Wisconsin census.

We defined two cranberry producing districts, North and South, by combining counties. Counties included in these districts are identified on the Wisconsin State map found at the end of this section.

The procedures used to derive the 1995 acreage distribution (bearing acres harvested as berries, bearing acres harvested as vines, and nonbearing acreage) and 1995 crop values are shown in table 1. We simply calculated the ratios of 1995 total acreage to 1991 total acreage and applied these ratios to 1991 values to obtain the 1995 distributions. We multiplied 1991 vine sales, expressed per total bearing acres, by 1995 estimates of bearing acres harvested for vines to derive 1995 revenues from sales of cranberry vines.

To obtain 1995 production of cranberries, we multiplied estimated 1995 acres harvested for berries by 1995 yields as reported by the National Agricultural Statistics Service (NASS). We adjusted the reported state average yield by the ratio of each district's 1991 yield relative to the state average. Calculated in this fashion, estimated state production was 1,873,951 barrels in 1995. This compares with the NASS production estimate of 1,800,000 barrels, a four- percent difference.

Total revenue from berry sales was calculated by multiplying the 1995 NASS reported season-average price by production. We assumed that the price was the same in each district.

Table 1. Derivation of 1995 Cranberry Acreage and Revenue Estimates

	North	South	State
1991 Growers	30	96	126
1995 Growers	43	167	210
1991 Bearing + Nonbearing Acres	2,897	9,034	11,931
1991 Bearing Acres	2,531	7,991	10,522
1991 Nonbearing Acres	366	1,043	1,409
1991 Acres Harvested as Vines	58	651	709
1991 Production	379,107	1,164,272	1,543,379
1991 Yield per Acre	153.3	158.6	157.3
1995 Bearing + Nonbearing Acres	3,263	11,933	15,196
Ratio, 1995:1991	1.13	1.32	
1995 Bearing Acres	2,851	10,555	13,406
1995 Nonbearing Acres	412	1,378	1,790
1995 Acres Harvested as Vines	65	860	925
1991 Vine Sales per Bearing Acre	195.78	215.30	
X 1995 Bearing Acreage	2,851	10,555	13,406
= 1995 Vine sales (\$)	558,122	2,272,557	2,830,679
1995 Acres Harvested for Berries	2,785	9,695	12,481
X Estimated Yield per Acre	146.2	151.3	150.1
= 1995 Berry Sales (bbls)	407,240	1,466,711	1,873,951
X Reported NASS SAP	53.40	53.40	
= Revenue from Berry Sales	21,746,637	78,322,355	100,068,992

To update individual components of cranberry production costs from 1991 values, we used USDA's Index of Prices Paid series, published by NASS. The NASS Index of Prices Paid is a weighted average of a number of sub-indices, each of which represents a category of costs experienced by farmers. The index and its sub-indices are expressed relative to a base period, most recently, 1990-92. They measure costs as a percent of the base period. The several indices and sub-indices reported in the Index of Prices Paid are shown in Table 2.

Table 2. Components of Index of Prices Paid, 1990-92=100

Component	1991	1995	Ratio 95/91
Commodities & Services, Interest, Taxes, & Wage Rates*	100	110	1.10
Items Used for Production, Interest, Taxes, & Wage Rates	100	109	1.09
Items used for Production	100	109	1.09
Feed	98	104	1.06
Livestock and Poultry	102	82	0.80
Seeds	99	110	1.11
Fertilizer	103	122	1.18
Ag Chemicals	101	115	1.14
Fuels	104	91	0.88
Farm Supplies and Repairs	100	112	1.12
Autos and Trucks	100	121	1.21
Farm Machinery	100	121	1.21
Building Materials	100	114	1.14
Farm Services	99	118	1.19
Rent	100	116	1.16
Interest	100	103	1.03
Taxes	104	117	1.13
Wage Rates	100	113	1.13
Family Living	100	113	1.13
Production Items with Farm Origin	100	97	0.97
Production Items with Nonfarm Origin	100	116	1.16

*Aggregate Index of Prices Paid

The ratios in the right-hand column of Table 2 show costs in 1995 relative to costs in 1991. For example, farmers paid 14 percent more for fertilizer in 1995 than in 1991, and 12 percent less for fuels.

We identified an Index of Prices Paid sub-index that most closely matched each of the major categories of cranberry production costs reported in the 1991 study. The assignment is shown in Table 3. We then applied the 1995:1991 ratio for the sub-index to the 1991 per acre cost estimated for the category to derive an estimate of the category cost in 1995. In other words, we assumed that the cranberry production costs within the category increased by the same percentage as the associated Index of Prices Paid sub-index.

The 1995 cost estimates for the Northern and Southern districts and for the state are shown in tables 4-6. Both per acre and per barrel costs are shown. For the state, costs per acre totaled \$7,171, or \$47.76 per barrel. These costs compared to \$6,342 per acre and \$45.79 per barrel in 1991.

Some caveats regarding the interpretation of these cost estimates that we made in our 1991 report bear repeating here:

“In reporting these costs, we had to assume whether the individual items pertained to all marsh acreage, only bearing acreage, or only acreage harvested for berries. We assumed that all of the cost items applied to bearing acreage, whether the acreage was harvested for berries or vines. However, in reporting costs per barrel, we adjusted total costs for the proportion of bearing acreage that was harvested for vines. In other words, the costs per barrel reflect costs for the portion of bearing acreage that was actually harvested as berries. We further assumed that custom harvesting and marketing expenses applied only to acreage harvested as berries. For these two cost items, total costs were divided by bearing acreage to obtain cost per bearing acre. For all other cost items, total costs were divided by the sum of bearing acreage plus new acreage.

The cost of production estimates should be interpreted with some caution for at least three reasons. First, while the costs per bearing acre represent total costs expressed per acre of established beds, we are not comfortable with the assumptions we used to separate reported expenditures between established and new beds. Some of the costs might more appropriately be considered investment expenditures than annual production costs.

Second, we are equally uncomfortable with the assumptions we used to separate costs between acreage harvested as berries and acreage harvested as vines. It is likely that some of the cost items are sensitive to how the acreage was utilized, but we had no means of discriminating.

Third, the reported costs do not include imputed costs such as opportunity interest on equity or operating capital, operator labor, or return to management and risk. While these are not out-of-pocket costs, they should be counted in a complete enumeration of costs of production.”

We updated 1991 cranberry grower investment expenditures to 1995 using the same approach as we used to update production costs. Matching investment categories and Index of Prices Paid sub-indices were as follows: Bed Preparation and Marsh Construction – aggregate index; Planting – farm services; Planting Stock – seeds; Office Equipment – aggregate index; Field Equipment – machinery. The 1995 updated investment summary is shown in Table 7.

Tables 8-10 summarize estimated 1995 cash expenditures and receipts for Wisconsin cranberry growers. In 1995, growers incurred total expenditures of more than \$100 million. Forty percent of that total was labor-related – wages and salaries along with fringe benefits. Production expenses were about \$85 million, and investment costs were \$17.6 million.

In 1995, Wisconsin cranberry growers received an estimated \$100 million from cranberry sales and another \$2.8 million from sales of vines. Total receipts just about matched expenditures. But the difference between receipts and expenditures should not be interpreted as profits. Cash expenditures do not include depreciation and investment expenditures do not represent current costs.

Table 4. Estimated Cranberry Production Costs, Northern Wisconsin Counties, 1995

Cost Item	Cost per:	
	Bearing Acre	Barrel
Cash Operating Expenses:		
Custom Work Hired - Bed sanding	16.45	0.11
Harvesting	7.19	0.05
Other	48.05	0.33
Crop Insurance	213.42	1.46
General Business Expense	125.76	0.86
Fuel and Lubricants	124.01	0.85
Farm Supplies	79.43	0.54
Marketing Expenses	84.25	0.58
Wages and Salaries	2,091.02	14.30
Other Payroll Expenses	613.08	4.19
Fertilizer	141.86	0.97
Pollination	39.77	0.27
Pesticides - Materials and Application	169.84	1.16
Integrated Pest Management/Scouting	14.25	0.10
Total Cash Operating Costs	<u>3,768.37</u>	<u>25.78</u>
Cash Overhead Expenses:		
Cash Rent	171.16	1.17
Insurance (Non-Payroll)	236.34	1.62
Mortgage Interest	608.11	4.16
Other Interest	184.35	1.26
Vehicle Registration	7.79	0.05
Property Taxes	228.95	1.57
Other Taxes	201.90	1.38
Equipment and Building Repairs	211.41	1.45
Other Repairs	26.04	0.18
Utilities	96.64	0.66
Other Expenses, Not Elsewhere Specified	35.11	0.24
Total Cash Overhead Expenses	<u>2,007.79</u>	<u>13.74</u>
Total Cash Expenses	5,776.16	39.51
Depreciation	<u>1,412.67</u>	<u>9.66</u>
Total Cost of Production Before Returns To Mgt., Owner Labor, and Owner Equity	7,188.83	49.18

Table 5. Estimated Cranberry Production Costs, Southern Wisconsin Counties, 1995

Cost Item	Cost per:	
	Bearing Acre	Barrel
Cash Operating Expenses:		
Custom Work Hired - Bed sanding	13.14	0.09
Harvesting	20.46	0.14
Other	37.17	0.25
Crop Insurance	179.56	1.19
General Business Expense	209.42	1.38
Fuel and Lubricants	126.16	0.83
Farm Supplies	80.96	0.54
Marketing Expenses	60.79	0.40
Wages and Salaries	2,120.47	14.02
Other Payroll Expenses	555.59	3.67
Fertilizer	189.88	1.26
Pollination	40.08	0.26
Pesticides - Materials and Application	144.85	0.96
Integrated Pest Management/Scouting	33.27	0.22
Total Cash Operating Costs	<u>3,811.79</u>	<u>25.20</u>
Cash Overhead Expenses:		
Cash Rent	92.06	0.61
Insurance (Non-Payroll)	192.89	1.28
Mortgage Interest	509.78	3.37
Other Interest	120.44	0.80
Vehicle Registration	8.89	0.06
Property Taxes	282.78	1.87
Other Taxes	112.62	0.74
Equipment and Building Repairs	222.96	1.47
Other Repairs	37.54	0.25
Utilities	92.35	0.61
Other Expenses, Not Elsewhere Specified	40.32	0.27
Total Cash Overhead Expenses	<u>1,712.63</u>	<u>11.32</u>
Total Cash Expenses	5,524.42	36.52
Depreciation	<u>1,641.55</u>	<u>10.85</u>
Total Cost of Production Before Returns To Mgt., Owner Labor, and Owner Equity	7,165.97	47.37

Table 6. Estimated Cranberry Production Costs, Wisconsin State-Wide Averages, 1995

Cost Item	Cost per:	
	Bearing Acre	Barrel
Cash Operating Expenses:		
Custom Work Hired - Bed sanding	13.84	0.09
Harvesting	16.32	0.11
Other	39.47	0.26
Crop Insurance	187.38	1.25
General Business Expense	192.23	1.28
Fuel and Lubricants	125.64	0.84
Farm Supplies	80.59	0.54
Marketing Expenses	65.58	0.44
Wages and Salaries	2,113.44	14.08
Other Payroll Expenses	566.94	3.78
Fertilizer	180.18	1.20
Pollination	39.99	0.27
Pesticides - Materials and Application	149.87	1.00
Integrated Pest Management/Scouting	29.41	0.20
Total Cash Operating Costs	<u>3,800.88</u>	<u>25.31</u>
Cash Overhead Expenses:		
Cash Rent	111.33	0.74
Insurance (Non-Payroll)	202.93	1.35
Mortgage Interest	532.53	3.55
Other Interest	135.22	0.90
Vehicle Registration	8.66	0.06
Property Taxes	270.26	1.80
Other Taxes	134.29	0.89
Equipment and Building Repairs	220.24	1.47
Other Repairs	34.87	0.23
Utilities	93.15	0.62
Other Expenses, Not Elsewhere Specified	39.25	0.26
Total Cash Overhead Expenses	<u>1,782.74</u>	<u>11.87</u>
Total Cash Expenses	5,583.62	37.19
Depreciation	<u>1,587.52</u>	<u>10.57</u>
Total Cost of Production Before Returns To Mgt., Owner Labor, and Owner Equity	7,171.15	47.76

Table 7. Wisconsin cranberry investment summary, 1995

	\$ Per Acre 1991	Total Real \$ 1995	Index of Prices Paid	Total Nominal \$ 1995
<i>North - Bearing Acres =</i>	2,851			
Expenditures for:				
Bed Prep. & Marsh Const.	2.01	5,722	1.10	6,294
Planting	89.41	254,895	1.19	303,325
Planting Stock	78.23	223,036	1.11	247,570
Total Marsh Development				<u>557,189</u>
Office Equipment	7.30	20,810	1.10	22,891
Field Equipment	550.35	1,569,037	1.21	1,898,535
Total Other Investment				<u>1,921,426</u>
Total Investment				<u><u>2,478,616</u></u>
<i>South - Bearing Acres =</i>	10,555			
Expenditures for:				
Bed Prep. & Marsh Const.	280.28	2,958,311	1.10	3,254,143
Planting	11.01	116,228	1.19	138,311
Planting Stock	141.78	1,496,490	1.11	1,661,104
Total Marsh Development				<u>5,053,557</u>
Office Equipment	13.25	139,839	1.10	153,823
Field Equipment	774.13	8,170,894	1.21	9,886,781
Total Other Investment				<u>10,040,605</u>
Total Investment				<u><u>15,094,162</u></u>
<i>State - Bearing Acres =</i>	13,406			
Expenditures for:				
Bed Prep. & Marsh Const.				3,260,437
Planting				441,636
Planting Stock				1,908,673
Total Marsh Development				<u>5,610,747</u>
Office Equipment				176,714
Field Equipment				11,785,317
Total Other Investment				<u>11,962,031</u>
Total Investment				<u><u>17,572,778</u></u>

Table 8. Estimated Total Cash Expenditures and Receipts by *Northern* Wisconsin Cranberry Growers, 1995

Item	Expenditure or Receipt (\$)
Cash Operating Expenses:	
Custom Work Hired - Bed sanding	53,673
Harvesting	23,455
Other	156,784
Crop Insurance	696,331
General Business Expense	410,310
Fuel and Lubricants	404,609
Farm Supplies	259,152
Marketing Expenses	274,875
Wages and Salaries	6,822,363
Other Payroll Expenses	2,000,287
Fertilizer	462,834
Pollination	129,743
Pesticides - Materials and Application	554,139
Integrated Pest Management/Scouting	46,502
Total Cash Operating Costs	12,295,060
Cash Overhead Expenses:	
Cash Rent	558,458
Insurance (Non-Payroll)	771,115
Mortgage Interest	1,984,065
Other Interest	601,465
Vehicle Registration	25,412
Property Taxes	746,983
Other Taxes	658,728
Equipment and Building Repairs	689,762
Other Repairs	84,970
Utilities	315,301
Other Expenses, Not Elsewhere Specified	114,563
Total Cash Overhead Expenses	6,550,822
 Total Cash Expenses	 18,845,882
Investment Expenditures:	
Marsh Development	557,189
Other Investment	1,921,426
Total Investment	2,478,615
 Total Expenditures	 21,324,497
Receipts:	
Cranberry Sales	21,746,637
Vine Sales	558,122
Total Receipts	22,242,156

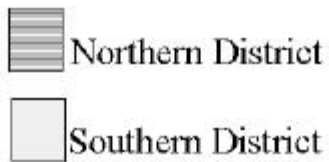
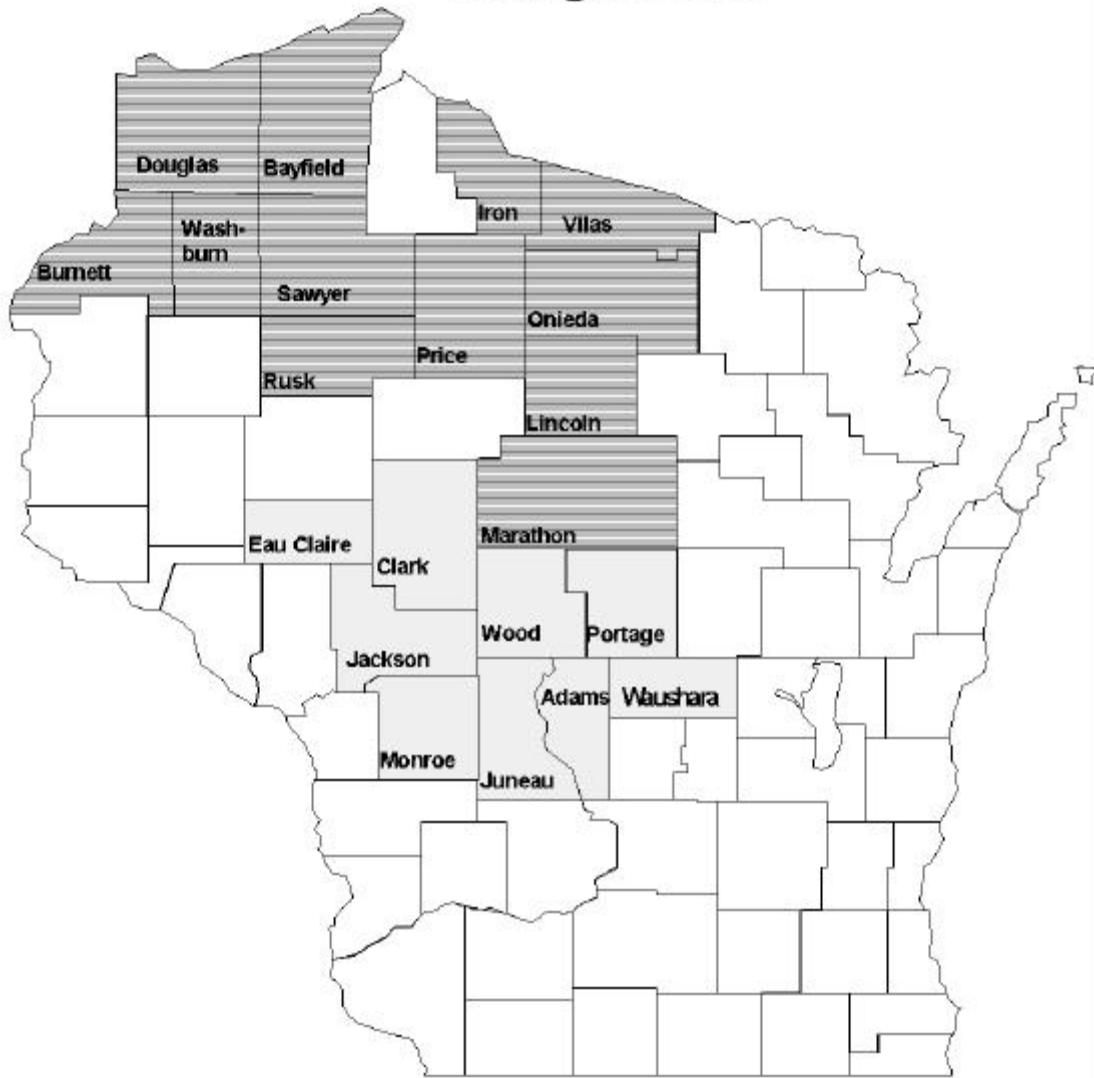
Table 9. Estimated Total Cash Expenditures and Receipts by *Southern* Wisconsin Cranberry Growers, 1995

Item	Expenditure or Receipt (\$)
Cash Operating Expenses:	
Custom Work Hired - Bed sanding	156,835
Harvesting	244,182
Other	443,528
Crop Insurance	2,142,488
General Business Expense	2,498,803
Fuel and Lubricants	1,505,324
Farm Supplies	966,023
Marketing Expenses	725,308
Wages and Salaries	25,301,392
Other Payroll Expenses	6,629,267
Fertilizer	2,265,619
Pollination	478,195
Pesticides - Materials and Application	1,728,403
Integrated Pest Management/Scouting	396,919
Total Cash Operating Costs	45,482,286
Cash Overhead Expenses:	
Cash Rent	1,098,403
Insurance (Non-Payroll)	2,301,620
Mortgage Interest	6,082,745
Other Interest	1,437,046
Vehicle Registration	106,101
Property Taxes	3,374,100
Other Taxes	1,343,753
Equipment and Building Repairs	2,660,363
Other Repairs	447,943
Utilities	1,101,921
Other Expenses, Not Elsewhere Specified	481,140
Total Cash Overhead Expenses	20,435,136
Total Cash Expenses	65,917,422
Investment Expenditures:	
Marsh Development	5,053,557
Other Investment	10,040,605
Total Investment	15,094,162
Total Expenditures	81,011,584
Receipts:	
Cranberry Sales	78,322,355
Vine Sales	2,272,557
Total Receipts	80,594,912

Table 10. Estimated Total Cash Expenditures and Receipts by *All* Wisconsin Cranberry Growers, 1995

Item	Expenditure or Receipt (\$)
Cash Operating Expenses:	
Custom Work Hired - Bed sanding	210,508
Harvesting	267,637
Other	600,312
Crop Insurance	2,838,819
General Business Expense	2,909,113
Fuel and Lubricants	1,909,933
Farm Supplies	1,225,175
Marketing Expenses	1,000,184
Wages and Salaries	32,123,755
Other Payroll Expenses	8,629,554
Fertilizer	2,728,453
Pollination	607,938
Pesticides - Materials and Application	2,282,543
Integrated Pest Management/Scouting	443,421
Total Cash Operating Costs	57,777,346
Cash Overhead Expenses:	
Cash Rent	1,656,861
Insurance (Non-Payroll)	3,072,735
Mortgage Interest	8,066,810
Other Interest	2,038,511
Vehicle Registration	131,513
Property Taxes	4,121,084
Other Taxes	2,002,482
Equipment and Building Repairs	3,350,125
Other Repairs	532,913
Utilities	1,417,222
Other Expenses, Not Elsewhere Specified	595,703
Total Cash Overhead Expenses	26,985,959
Total Cash Expenses	84,763,304
Investment Expenditures:	
Marsh Development	5,610,746
Other Investment	11,962,031
Total Investment	17,572,777
Total Expenditures	102,336,081
Receipts:	
Cranberry Sales	100,068,992
Vine Sales	2,830,679
Total Receipts	102,899,671

Wisconsin Counties with Cranberry Acreage in 1995



Economic Impact

Indirect and Induced Income and Employment Effects

As previously reported there was an estimated \$100 million in cranberry sales in 1995 and another \$2.8 million in vine sales. This production supports 3,341 jobs directly through on-farm operations paying nearly \$32 million in wages and salaries. Processing of these cranberries in Wisconsin supported approximately 1,000 jobs paying almost \$20 million in wages and salaries. Total industry sales for both production and processing was estimated to be about \$159 million.

These estimated impacts of the cranberry industry on the state's economy only capture part of the total economic impact question. Other industries are linked, directly and indirectly, to the cranberry industry. These industries represent additional sources of economic activity multiplying the effects of the direct activity associated with cranberry production and processing. The cranberry industry uses machinery, trucks, fuel, financial services and other inputs from local markets to conduct daily operations. These economic linkages create a network of interdependent industries, which, in turn, generate additional jobs and income in non-cranberry industries.

The income generated directly by cranberry production and processing also add to this interdependency; cranberry employees spend their income on groceries, housing, entertainment, and other consumer goods and services. In turn, employees in these industries spend their income on consumer goods and services. These additional, induced, linkages help to further form the complex intertwining of industries within Wisconsin. The relevant question to ask then is not what the cranberry industry contributes directly to the Wisconsin economy, but rather how much does the cranberry industry contribute to the Wisconsin economy through this complex networking of industries?

To answer this question it is necessary to develop an empirical representation of the Wisconsin economy. While there are numerous methods of regional analysis that can capture these linkages, the method adopted for this study is input-output analysis. An input-output model of a regional economy (in this case Wisconsin) can be described as a "snapshot" of the economy detailing the sales and purchases of goods and services between all sectors of the economy for a given period of time. Industry output (sales) can be purchased by other industries as inputs, households for final consumption, or exported outside of the region (again in this case, Wisconsin). Industry inputs (purchases) are either from other industries within the region, are purchased from households (labor), or imported from outside the region. The input-output model allows these linkages to be described empirically. By examining expenditures by and for the cranberry industry, an assessment of the importance of the industry to Wisconsin's economy can be gained.

For this study, Micro-IMPLAN (IMPact PLANning) is used to create the input-output model for the Wisconsin economy. Data for construction of the Wisconsin model are from 1994

reflecting the most current year available. For the cranberry industry analysis, three separate models are constructed: the state as a whole, the nine county region representing the northern cranberry production district, and the seven county region comprising the southern production district. Five separate analysis are provided: (1) cranberry production for the state; (2) cranberry processing for the state; (3) combined production and processing for the state; (4) production for the northern district; and (5) production for the southern district.²

There are at least two significant differences between the analysis reported here and the previous analysis provided to *The Cranberry Institute* in July of 1993. First, the base year of the model has been updated from 1991 to 1994. During this time significant changes have occurred in the Wisconsin economy. Despite national and regional trends to the contrary, manufacturing is becoming increasingly important to the state's economy. In addition, agriculture as an aggregate industry has become less important. These two factors coupled with many other changes have altered the structure of the Wisconsin economy. Second, as with any economic modeling approach, methods improve over time. With respect to the system used in this report, the methods of calculating induced impacts (the impacts associated with wages and salaries being re-spent in the economy) have been improved and made more conservative. ***Accordingly, it is important not to make direct comparisons between the analysis reported in this report and the 1993 report.***

Results of the Analysis

The direct, indirect, and induced impacts of the cranberry industry in Wisconsin are measured using four measures of economic activity: 1) employment; 2) personal income; 3) total value added; and 4) total industry output (sales). It is important to note that employment here does not distinguish between full- and part-time workers: a job is a job. This distinction is important when interpreting the results of the induced impacts in particular because the bulk of these impacts fall into the trade and services sectors where part-time employment is significant. Personal income represents all form of employment income including employee wages and salaries as well as proprietor income. Value added is a second measure of income and includes personal income, plus interest, profits and indirect business taxes. For the cranberry industry analysis, profits represents the largest difference between personal income and value added. Total industry output is akin to total sales within an industry.

The results of the five-layer analysis are reported in tables 11 through 15. Cranberry production and processing contribute \$334 million dollars to the state's total industrial output (Table 11), 68 percent of which (\$229 million) comes from on-farm operations (Table 12). For every dollar of production and processing sales, there is an additional \$1.09 worth of additional industrial sales for an aggregate multiplier effect of 2.094 (Table 11).

² For more detail on the methods and assumptions underlying input-output analysis and the Micro-IMPLAN modeling system please see Deller, Steven C., Sumathi, N.R., and Marcouiller, David. 1993. "Regional Economic Models for the State of Wisconsin: An Application of the Micro-IMPLAN Modeling System." Center for Community Economic Development, Department of Agricultural Economics, University of Wisconsin-Madison/Extension. Staff Paper No. 93.6, (November), 38p.

The cranberry production and processing industry also supports 7,163 jobs (Table 11), again with the majority, 76 percent or 5,470 jobs (Table 2), supported by on-farm production operations. For every job in cranberry production and processing, there are an additional 0.646 jobs supported through the multiplier effect. The employment multipliers for production (1.637) and processing (1.675) are comparable to the industry aggregate. Recall, however, that many of these jobs are part-time seasonal and must be appropriately discounted.

In addition to industry sales and employment two measures of income are analyzed and reported. Cranberry production and processing combined contributes a total of \$113 million in personal income and \$173 million in value added. Similar to industry output or sales, on-farm cranberry production accounts for about 70 percent of the total income contribution. The income multipliers for the cranberry industry are high at 2.179 for personal income and 2.415 for total value added income. The difference between the more typical, in terms of size, employment multipliers and the two income multipliers can be attributed to the high profitability of the cranberry industry. In other words, for the level of employment, income and industry output is strong, reflective of the income and profit generating potential of the industry.

This high income generating potential of the industry is partially captured by the induced nature of wages, salaries and profits being re-spent in the local economy. By examining distribution of the multiplier effect over various sectors of the economy, one can readily observe that the bulk of the multiplier effect falls into the Trade (retail and wholesale) and Services sectors. This is indicative of the income being created by the industry being recirculated through Trade and Service sector sales. In short, the real impact that the cranberry industry has on the state's economy is through the wages and salaries paid and the profits earned and re-spent. While the impact of non-wage expenditures (e.g., fuel, equipment, etc.) is not trivial, it pales in comparison to the income impacts.

From a regional perspective, production of cranberries in the southern district has nearly three times economic impact as does production in the northern district (Tables 4 and 5). For the southern district, cranberry production contributes 3,743 jobs, \$48 million in personal income, \$78 million in value added, and about \$147 million in industry output. For the northern district, cranberry production contributes 1,244 jobs, \$14 million in personal income, \$23 million in value added, and about \$44 million in industry output.

While the multiplier effects in the two districts appear to be smaller than the state-level analysis one must keep in mind that as one moves to smaller and smaller regions, the potential for dollar leakages increase, hence lowering the multiplier effect. But, the distribution of the multiplier effects across the various sectors of the economy again point to the importance of the induced economic impact, or the relative importance of wages and salaries paid and profits earned and re-spent in the local economy. A comparable regional analysis for cranberry processing is not provided due to confidentiality constraints on the major processors.

Table 11. Combined Production and Processing Impacts, State of Wisconsin

	Employment	Personal Income	Total Value Added	Total Industry Output
Initial	4,352	52,115,239	71,636,908	159,478,108
Agriculture	341	5,220,763	8,626,743	12,567,309
Mining	1	9,305	15,736	25,343
Construction	50	1,770,122	2,600,192	4,714,231
Manufacturing	162	5,483,540	8,995,414	23,278,308
TCPU	134	3,944,703	7,738,809	16,642,622
Trade	939	16,507,519	23,464,496	37,289,690
FIRE	186	4,429,525	20,863,451	34,058,529
Services	946	22,735,828	27,524,650	43,011,141
Government	25	1,167,311	1,358,582	2,761,547
Other	28	190,861	190,861	190,861
TOTAL	7,163	113,574,716	173,015,842	334,017,688
<i>Implicit Multiplier</i>	<i>1.646</i>	<i>2.179</i>	<i>2.415</i>	<i>2.094</i>

Table 12. Production Impact, State of Wisconsin

	Employment	Personal Income	Total Value Added	Total Industry Output
Initial	3341	32,123,755	51,645,424	102,284,973
Agriculture	250	3,840,549	4,852,755	7,749,566
Mining	1	6,685	11,395	18,290
Construction	37	1,300,186	1,910,654	3,462,914
Manufacturing	111	3,595,374	5,983,988	15,615,380
TCPU	69	2,152,882	4,472,843	9,389,170
Trade	722	12,056,285	17,055,790	26,929,604
FIRE	149	3,558,252	16,828,505	27,421,493
Services	748	18,005,276	21,733,654	33,971,353
Government	20	906,985	1,051,824	2,134,700
Other	23	155,487	155,487	155,487
TOTAL	5470	77,701,716	125,702,318	229,132,929
<i>Implicit Multiplier</i>	<i>1.637</i>	<i>2.419</i>	<i>2.434</i>	<i>2.240</i>

Table 13. Processing Impacts, State of Wisconsin

	Employment	Personal Income	Total Value Added	Total Industry Output
Initial	1,011	19,991,484	19,991,484	57,193,135
Agriculture	91	1,380,214	3,773,988	4,817,744
Mining	0	2,620	4,341	7,054
Construction	13	469,936	689,538	1,251,317
Manufacturing	51	1,888,166	3,011,426	7,662,928
TCPU	65	1,791,822	3,265,966	7,253,452
Trade	217	4,451,234	6,408,706	10,360,086
FIRE	37	871,273	4,034,947	6,637,036
Services	197	4,730,552	5,790,996	9,039,788
Government	6	260,326	306,759	626,848
Other	5	35,373	35,373	35,373
TOTAL	1,693	35,873,000	47,313,524	104,884,759
<i>Implicit Multiplier</i>	<i>1.675</i>	<i>1.794</i>	<i>2.367</i>	<i>1.834</i>

Table 14. Production Impacts, Northern District

	Employment	Personal Income	Total Value Added	Total Industry Output
Initial	827	6,822,363	10,218,637	22,242,156
Agriculture	60	613,846	791,702	1,358,203
Mining	0	652	1,098	1,754
Construction	8	237,040	346,286	655,239
Manufacturing	21	546,938	834,099	2,676,155
TCPU	16	400,327	754,596	1,751,697
Trade	146	2,290,056	3,292,538	5,261,588
FIRE	23	308,802	2,929,369	4,659,720
Services	135	2,975,117	3,607,569	5,711,418
Government	3	116,612	123,906	257,254
Other	5	30,570	30,570	30,570
TOTAL	1,244	14,342,323	22,930,370	44,605,753
<i>Implicit Multiplier</i>	<i>1.504</i>	<i>2.102</i>	<i>2.244</i>	<i>2.005</i>

Table 15. Production Impacts, Southern District

	Employment	Personal Income	Total Value Added	Total Industry Output
Initial	2,513	25,301,392	39,426,787	80,042,817
Agriculture	116	1,364,323	1,987,118	3,373,729
Mining	1	4,149	6,641	10,908
Construction	23	746,916	1,092,931	2,038,041
Manufacturing	41	1,107,940	1,710,590	5,100,953
TCPU	50	1,394,211	2,834,804	6,035,340
Trade	479	7,173,237	10,378,695	16,725,260
FIRE	77	1,268,608	8,660,641	13,963,183
Services	419	9,521,358	11,496,887	18,285,611
Government	10	423,886	494,489	1,024,683
Other	16	98,384	98,384	98,384
TOTAL	3,743	48,404,403	78,187,968	146,698,909
<i>Implicit Multiplier</i>	<i>1.490</i>	<i>1.913</i>	<i>1.983</i>	<i>1.833</i>