Contribution of the Oregon Wheat Industry to Oregon's Economy

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CONTRIBUTION OF THE OREGON WHEAT INDUSTRY TO OREGON'S ECONOMY

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Executive Summary

Wheat is important to Oregon's economy for several reasons:

- Wheat sales comprised about 13 percent of Oregon's agricultural sales in 1984.

- At 1984 levels, wheat production in Oregon created an estimated $205.5 million in personal income for the state.

- Handling, transportation and marketing of Oregon's wheat produced $48.1 million in personal income.

- Thus, wheat production, marketing handling, and exporting created an estimated $325.3 million in personal income, or roughly 20,000 full--time equivalent jobs in Oregon in 1984.

- Wheat is important to the state's economy in a non-quantifiable way as well, such as:

  * leading commodity through the Port of Portland (nearly 60 percent of tonnage), wheat creates a transportation "critical mass."

  * wheat production provides surplus labor for other industries in certain Oregon subregions.

  * wheat production complements other types of agricultural enterprises.

  * wheat traffic on Columbia River results in low cost transport service for other users.

  * wheat export promotion programs have helped "wedge" other products into new markets.

  * wheat and other agricultural, natural resource-based industries reflect the state and region's true comparative advantage.

I. WHEAT PRODUCTION IN OREGON

Introduction

Wheat is the most important field crop produced in Oregon. In 1984, the total farm value of wheat was $234,413,000, accounting for 12.8 percent of the total farm value of agricultural products (Figure 1). About 90 percent of the wheat in the Pacific Northwest and also in Oregon is white winter wheat,[1] that is exported to foreign markets. Further, approximately 90 percent of all white winter wheat grown in the United States comes from the Pacific Northwest (PNW).[2] Almost all wheat produced in Oregon is exported to markets on the Asian Pacific Rim and in the Middle East; a small segment is shipped to domestic markets outside Oregon. This heavy reliance on exports is a distinguishing characteristic of the Oregon wheat industry. For Oregon's economy, the production, as well as the transporting and marketing, of wheat for export provides a substantial contribution to the state's economy.

The purpose of this report is to estimate this contribution. The first two sections discuss production and export trends for Oregon wheat in general terms. The third section describes the use of economic models used to assess the economic contribution of basic industries. The final section estimates the economic contribution to Oregon's economy of wheat production, marketing, and shipping for export.

Wheat Production Trends in Oregon

Oregon wheat production increased dramatically in the 1970s and 1980s (Figure 2 and Appendix I). Total production in Oregon increased from 27

Figure 1.

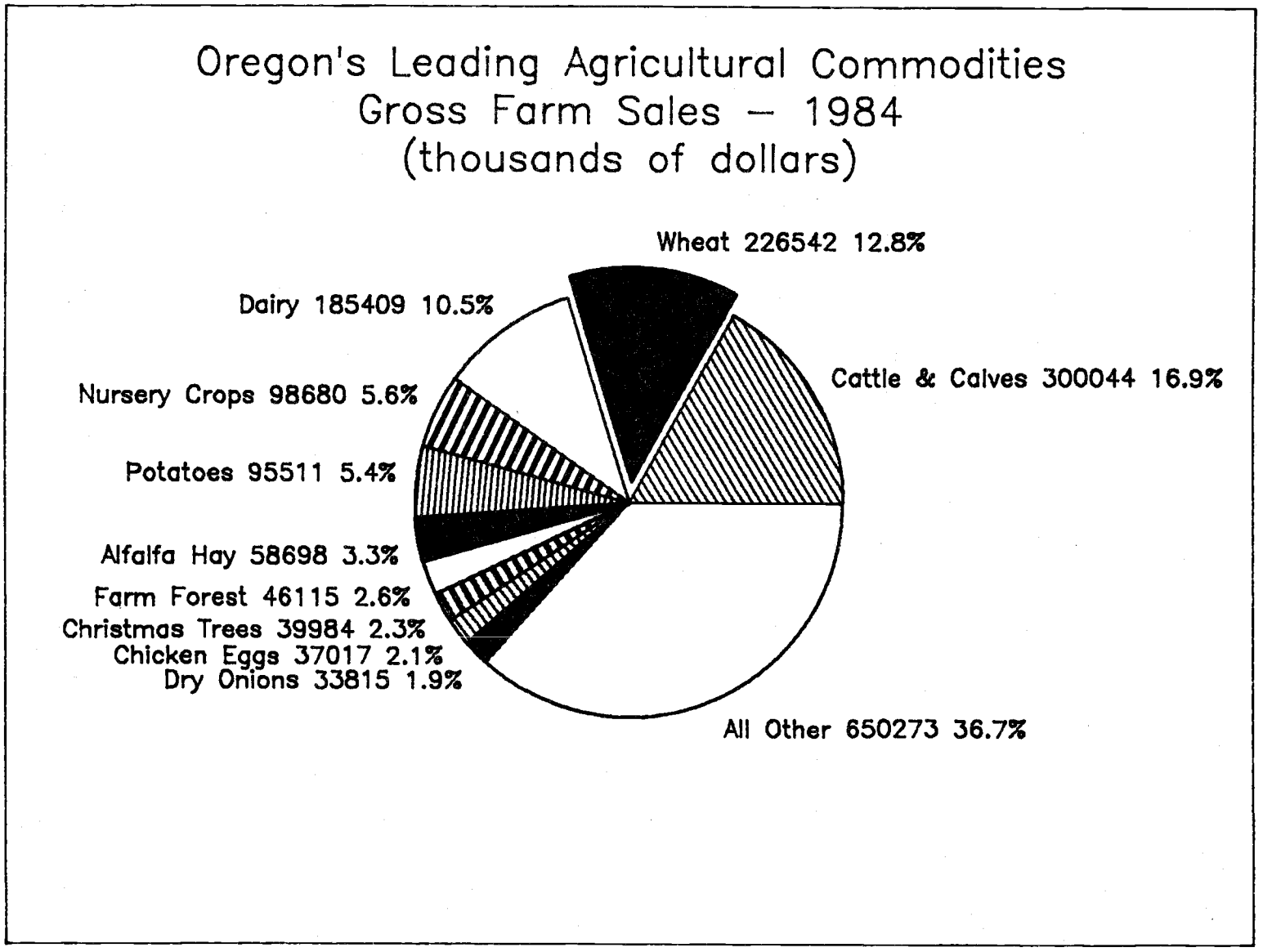
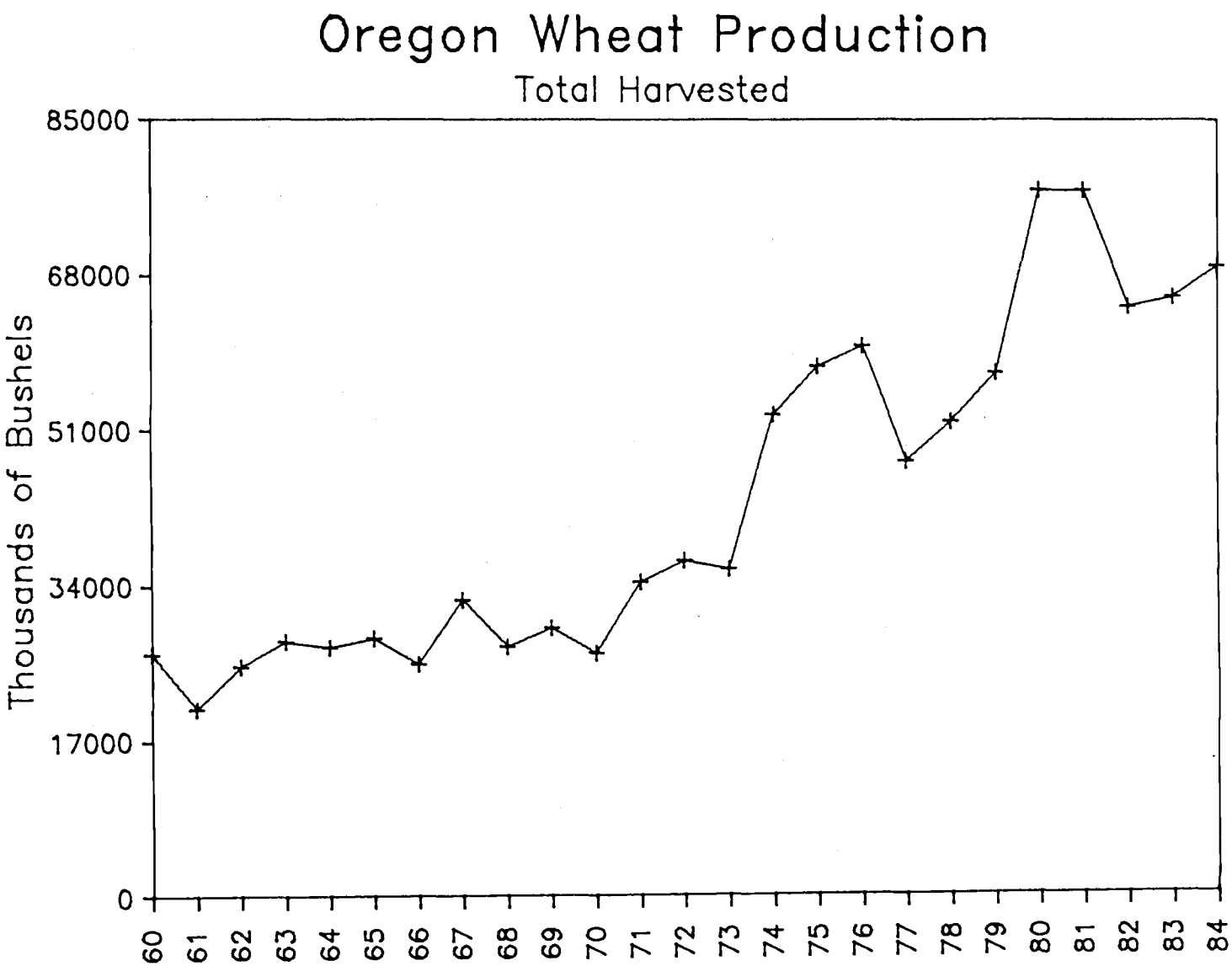

Oregon's Leading Agricultural Commodities
Gross Farm Sales — 1984
(thousands of dollars)
Wheat 226542 12.8%
Dairy 185409 10.5%
Cattle & Calves 300044 16.9%
Nursery Crops 98680 5.6%
Potatoes 95511 5.4%
Alfalfa Hay 58698 3.3%
Farm Forest 46115 2.6%
Christmas Trees 39984 2.3%
Chicken Eggs 37017 2.1%
Dry Onions 33815 1.9%
All Other 650273 36.7%

Figure 2.


Oregon Wheat Production
Total Harvested
Thousands of Bushels
85000
68000
51000
34000
17000
0
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

million bushels in 1970 to more than 77 million bushels in 1981. Since 1981, this increasing trend has reversed; production between 1982 and 1984 has stabilized at about 68 million bushels.

The growth in production was a result of increased wheat acreage, as well as increased yields (Figure 3a-b). Increased yields are a result of changes in technology, such as changes in cropping patterns and increased uses of chemicals and machinery, increased use of irrigated land for wheat production as well as improved management (Figure 4).

In terms of regional growth, Oregon Agricultural District 4, which contains Gilliam, Hood River, Morrow, Sherman, Umatilla, Wasco, and Wheeler counties, experienced the greatest total growth. However, the counties in District 1 (Willamette Valley) have shown a dramatic proportional growth, as well as total growth. Their production has increased from 5 million bushels in 1971 to 17 million in 1984 (Figure 5, and Appendix 2).

Wheat Prices

The increase in price per bushel received by Oregon farmers during the early 1970s was most likely the main reason for the increased total wheat production (Figure 6-7). Between the early 1960s and the early 1980s, world wheat trade more than doubled, from an average of 1.74 billion bushels in 1960-1964 to an average of 3.63 billion bushels for 1980-1983.[3] American farmers have generally supplied about 40 percent of the wheat in world trade.

Several factors contributed to this doubling of world wheat trade. Importing nations, particularly developing countries, experienced strong population growth, and some nations had rapid growth in income. Income growth was most pronounced in oil-exporting and other middle-income developing nations. This growth, with massive population movement from

Figure 3a.

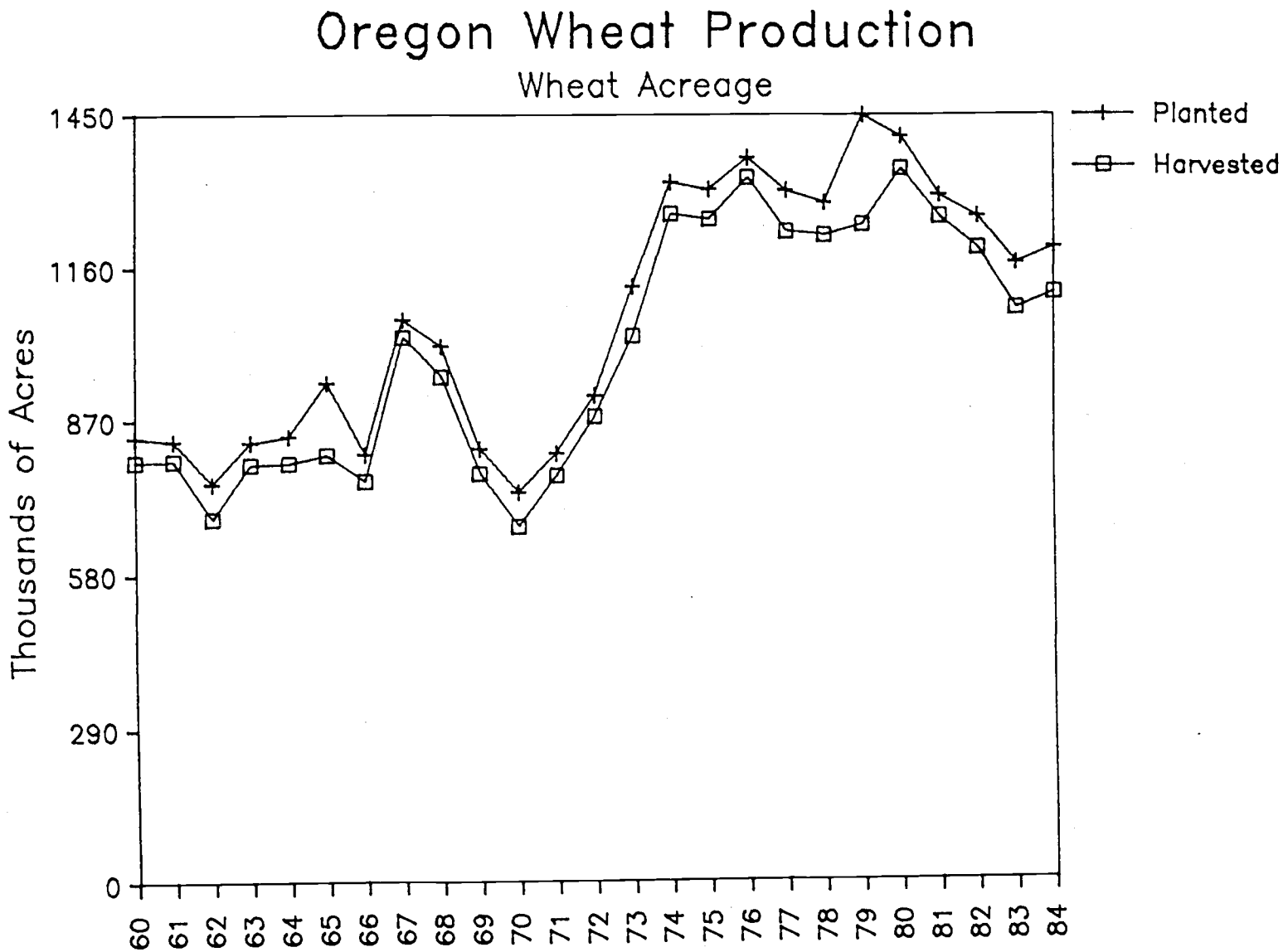

Oregon Wheat Production
Wheat Acreage
Planted
Harvested
Thousands of Acres
1450
1160
870
580
290
0
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

Figure 3b.

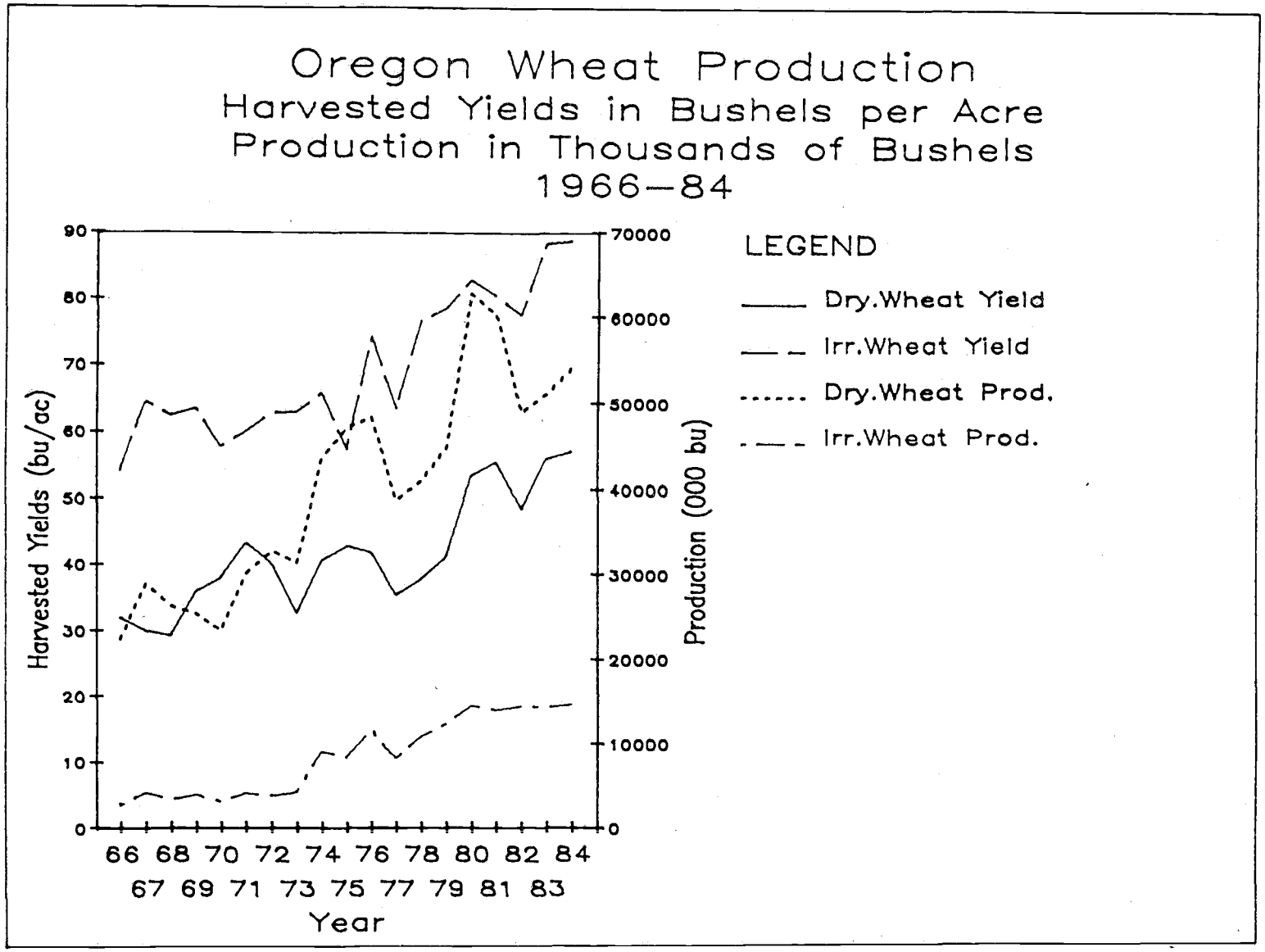

Oregon Wheat Production
Harvested Yields in Bushels per Acre
Production in Thousands of Bushels
1966—84
Harvested Yields (bu/ac)
Production (000 bu)
0
10
20
30
40
50
60
70
80
90
0
10000
20000
30000
40000
50000
60000
70000
66 68 70 72 74 76 78 80 82 84
67 69 71 73 75 77 79 81 83
Year
LEGEND
Dry.Wheat Yield
Irr.Wheat Yield
Dry.Wheat Prod.
Irr.Wheat Prod.

Figure 4.

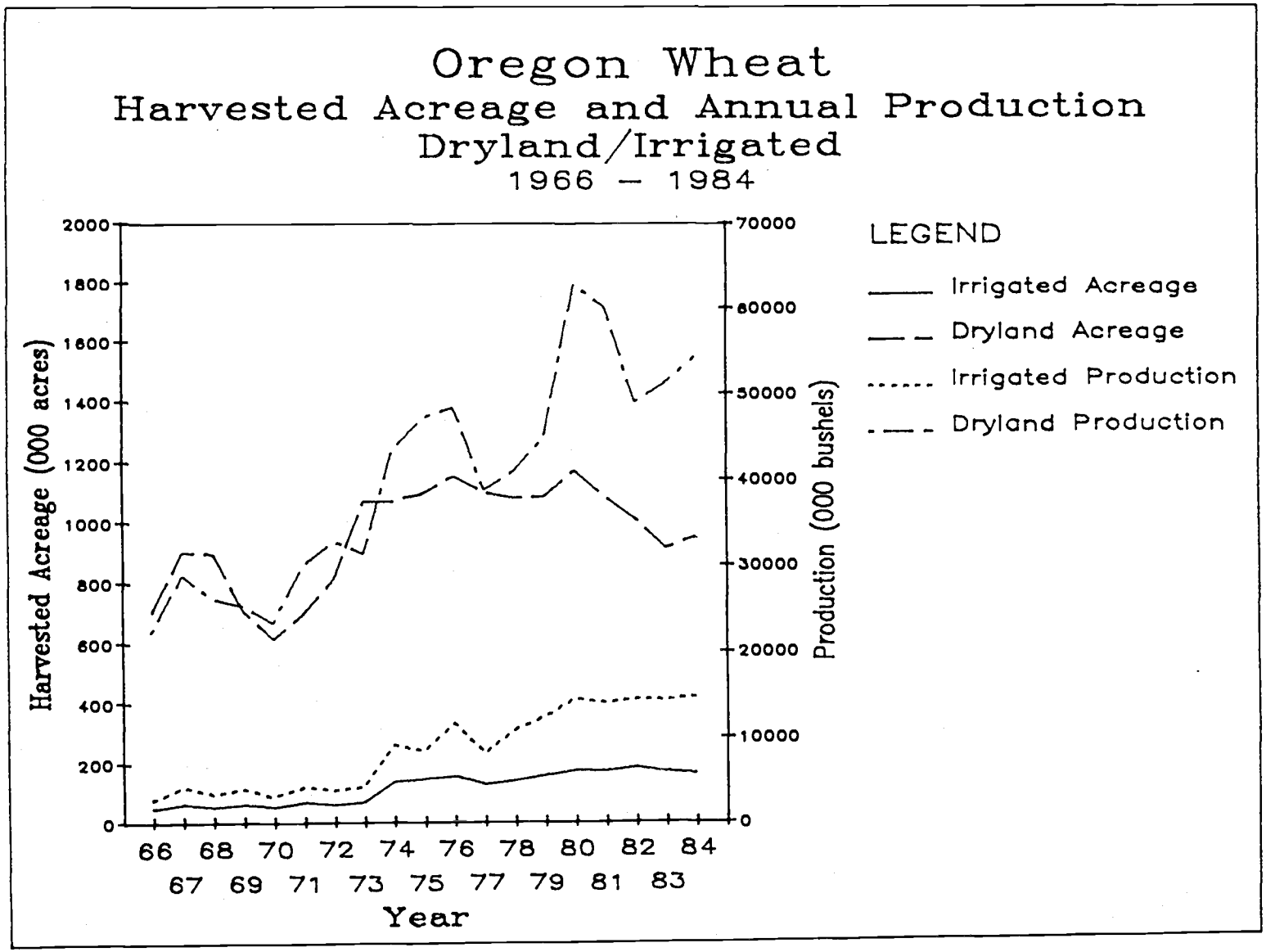
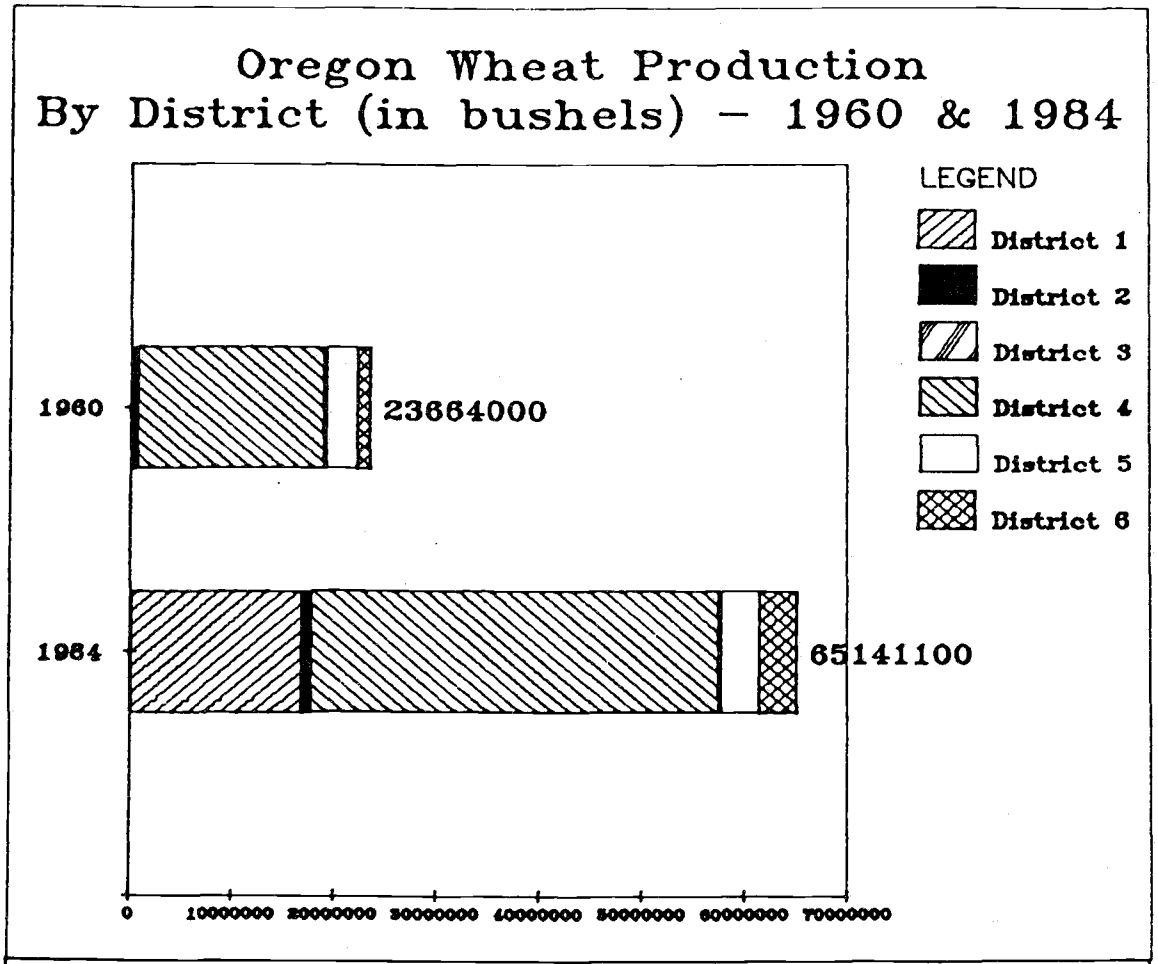

Oregon Wheat
Harvested Acreage and Annual Production
Dryland/Irrigated
1966 – 1984
Harvested Acreage (000 acres)
Production (000 bushels)
Year
LEGEND
Irrigated Acreage
Dryland Acreage
Irrigated Production
Dryland Production
2000
1800
1600
1400
1200
1000
800
600
400
200
0
70000
60000
50000
40000
30000
20000
10000
0
66 68 70 72 74 76 78 80 82 84
67 69 71 73 75 77 79 81 83

Figure 5.



Oregon Agricultural Districts
County Composition

District 1: Benton, Clackamas, Lane, Linn, Marion, Multnomah, Polk, Washington, Yamhill

District 2: Clatsop, Coos, Curry, Lincoln, Tillamook

District 3: Douglas, Jackson, Josephine

District 4: Gilliam, Hood River, Morrow, Sherman, Umatilla, Wasco, Wheeler

District 5: Baker, Malheur, Union, Wallowa

District 6: Crook, Deschutes, Grant, Harney, Jefferson, Klamath, Lake

Figure 6.

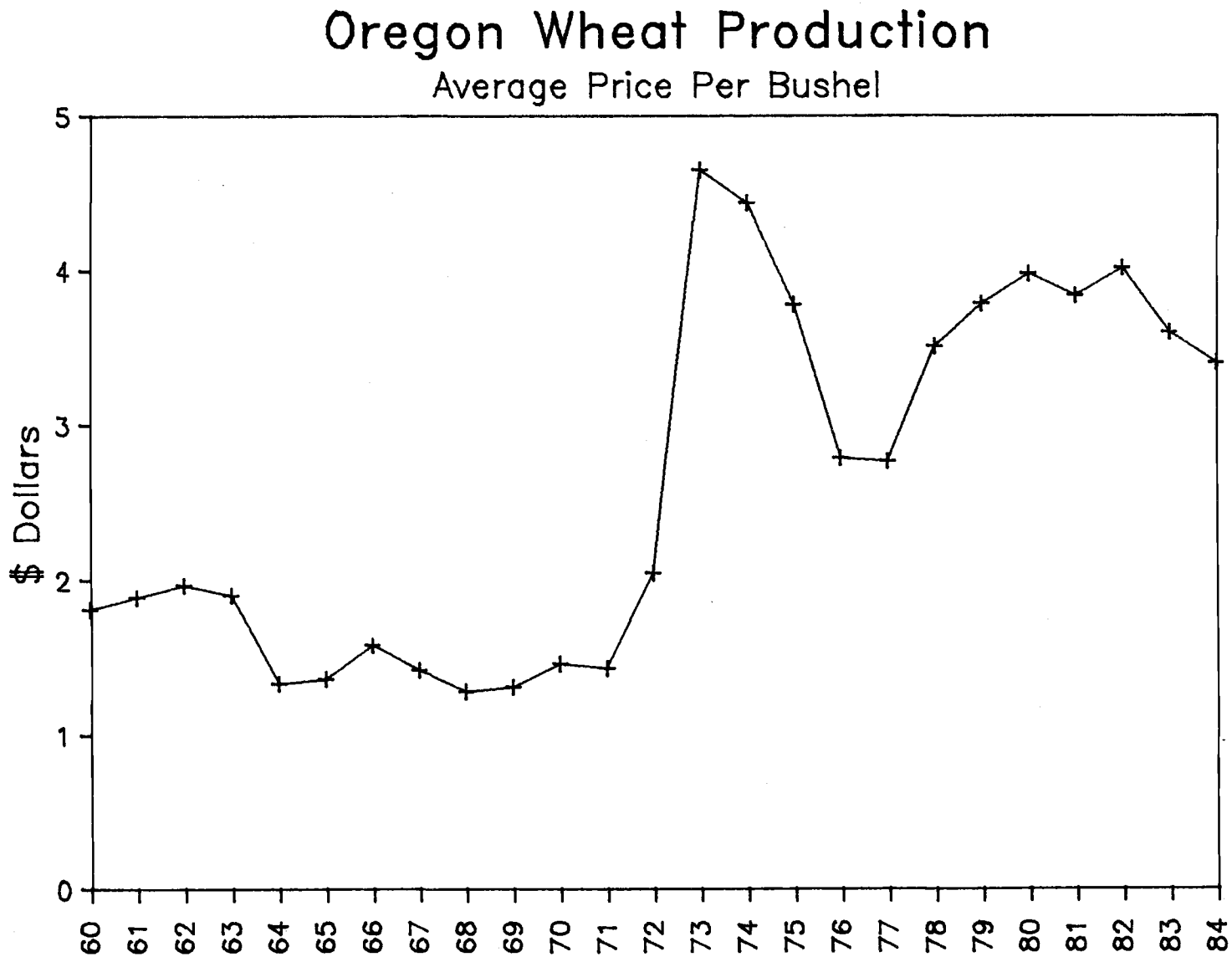
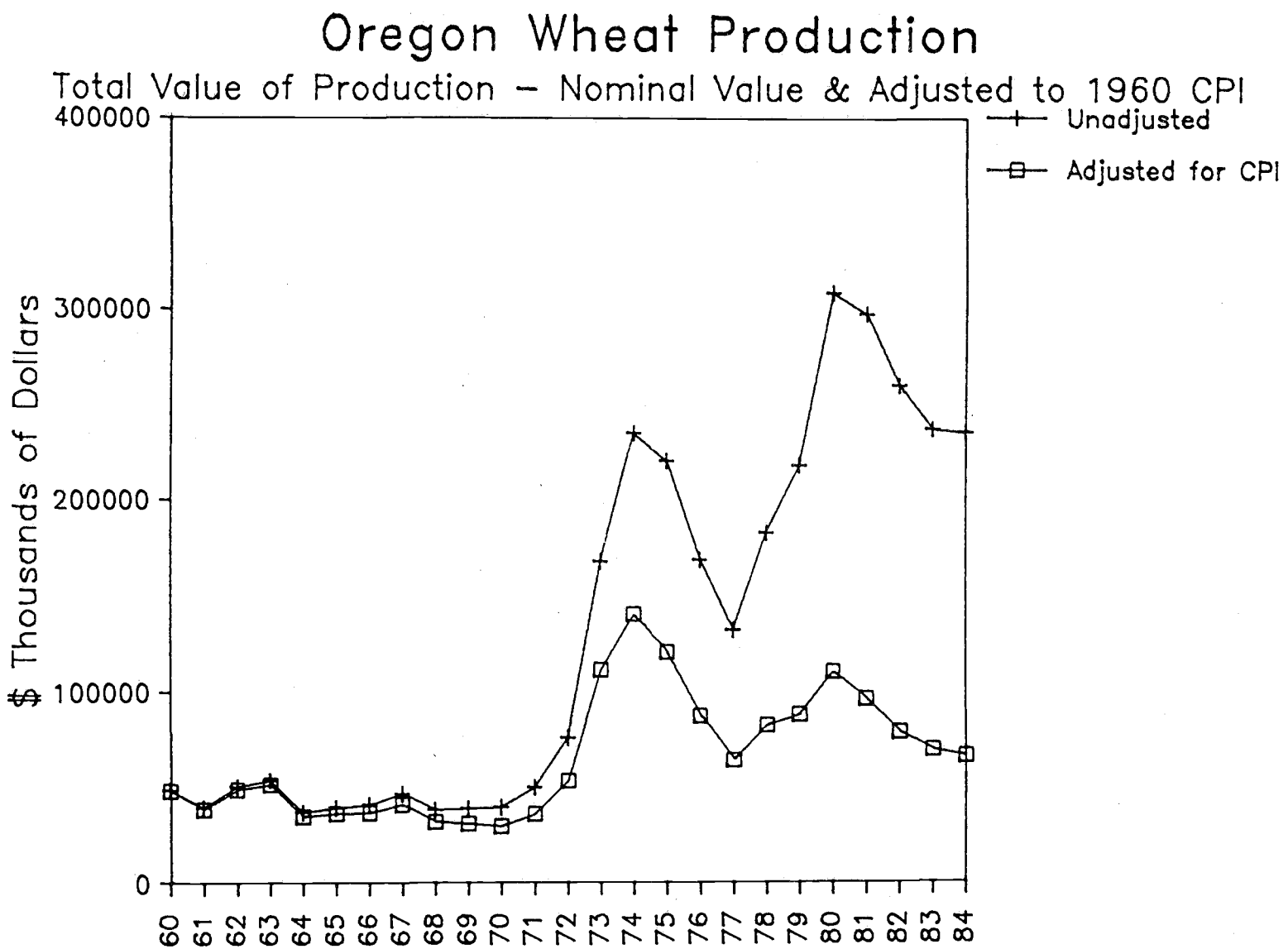

Oregon Wheat Production
Average Price Per Bushel
$ Dollars
0
1
2
3
4
5
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

Figure 7.


Oregon Wheat Production
Total Value of Production – Nominal Value & Adjusted to 1960 CPI
Unadjusted
Adjusted for CPI
$ Thousands of Dollars
400000
300000
200000
100000
0
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84

rural areas to cities, caused a shift in demand toward staple foods such as bread that required imported grain. Some nations, such as those in Central Africa, increased grain imports because per capita food production declined. Government policies subsidized wheat for consumers in Pakistan, Brazil, and Egypt, encouraging imports. Finally, industrial nations provided free or low cost food aid.

Since the early 1970s, instability in the world wheat market has been a major issue facing exporters, importers, and policymakers. Price volatility, as measured by the coefficient of variation, increased threefold in the 1970s as compared to the 1960s. There has been debate over the relative importance of the various factors contributing to price instability. Certainly, the events of the early 1970s led to increased price sensitivity: reduction in stocks by major exporters through the use of production controls in the United States and stock disposal in Canada, the decision by the Soviet Union to import grain rather than to adjust domestic use in response to crop failure, and imposition of controls by both importing and exporting countries to reduce the domestic impact of fluctuating prices.

Grain price variability has also been associated with changes in the world monetary system. The devaluation of the dollar in 1972 and the shift from a fixed to a floating exchange rate system have led to variation in the value of the dollar in relation to other currencies. The boom in U.S. wheat exports in the 1970s was based in large part on the dollar's depreciation against foreign currencies. In turn, the dollar's appreciation against foreign currencies in the early 1980s in effect has raised the price of U.S. wheat and reduced our competitiveness.

Importing countries practice various types of domestic market insulating

policies which, in effect, serve to shift their own price instability to their export suppliers.

Over the last two decades, wheat imports of developing and centrally planned countries have grown rapidly while those of developed countries have declined--from about 30 percent in 1960-1964 to about 15 percent in 1982. Most of the decline occurred in the European Economic Community (EC). The EC shifted from being a net importer to being a net exporter during the late 1970s when policies setting high farm prices stimulated wheat production and dampened consumption. Until 1974, feeding wheat to livestock was subsidized. Thereafter, excess supplies were exported at subsidized prices.

The wheat market share of developing nations peaked during 1975-1979. The recession and the rise in interest rates in the early 1980s caused debt servicing problems for many of these nations and a decline in imports. Further, the cost of subsidizing consumers proved burdensome, causing some nations to shift towards self-sufficiency.

Table 1. World Wheat Imports, Selected Countries, 1979/80 - 1983/84 a/

Country	1979/80	1980/81	1981/82	1982/83	1983/84 b/
	Million Metric Tons				
EC	5.3	4.5	4.7	3.8	3.1
USSR	12.1	16.0	19.5	20.2	20.5
Japan	5.6	5.8	5.6	5.8	5.6
East Europe	6.1	5.9	6.3	4.3	3.9
China	8.9	13.8	13.2	13.0	10.0
Others	48.1	48.1	52.0	51.2	59.1
Total	86.1	94.1	101.3	98.3	102.1

a/ July-June year.

b/ Preliminary.

The Japanese share of the world wheat market increased during the early 1970s with income growth and a change in food habits favoring bread and noodles. Although domestic wheat prices were fixed by the Japan Food Agency above world market prices, wheat prices at the consumer level still fell relative to rice. After 1974, Japan's share of world imports fell because rising incomes no longer improved wheat demand. Also, Japanese consumers failed to benefit from the fall in world wheat prices.

In 1972/1973, the Soviet Union decided to import grain rather than absorb crop shortfalls internally. Large, but erratic, Soviet grain imports finally led to the U.S.-USSR grains agreement in 1976. Soviet wheat imports have remained large during the 1980s; one reason is that the 1980 U.S. grain embargo limited Soviet access to U.S. corn. Limited supplies of foreign exchange have reduced the importance of the Soviet bloc in Eastern Europe as a wheat market.

The emergence of China as a major buyer of U.S. wheat was a result of the normalization of U.S.-Chinese relations. As recently as 1976/1977 there were no exports of U.S. wheat to China. However, in recent years, China has remained a large importer and has signed a trade agreement with the United States.

The growing importance of centrally planned and developing countries in world wheat trade in the last decade has led to an increasing reliance on long-term agreements. The state trading agencies, which control grain trade for many of these countries, frequently prefer arrangements which assure long-term supplies. In addition, the growing debt problems experienced by many less developed countries and Eastern European countries in the last three years have exacerbated shortages of foreign exchange and triggered interest in barter arrangements, which were once almost exclusively confined to trade among centrally planned countries. Future U.S. wheat exports will

not be affected by these developments as long as these agreements comprise a small proportion of trade or merely formalize a trade flow which would have occurred anyway.

The Oregon wheat farmer exporter rely heavily on the international market, since about 90 percent of Oregon wheat production is exported. For example, domestic shifts in oil prices may reduce production costs at the farm level, but such a shift can also reduce effective demand for wheat in some of the importing nations.

II. EXPORT OF WHEAT FROM OREGON AND THE PACIFIC NORTHWEST THROUGH PORTLAND

Most of the wheat exported from Oregon flows through the Port of Portland. (As used in this report the Port of Portland includes all export facilities in the Portland area.) Wheat produced in Oregon is only part of the total wheat exported through the Port of Portland. In 1984, Oregon wheat exports were estimated to be 68,945,000 bushels.[4] Exports from other states (about 130 million bushels) are approximately double the Oregon total (Figure 8).

Wheat has historically been the leading commodity handled through the Port of Portland. Other ports on the Columbia River originally were developed to serve wheat trade from the Pacific Northwest region.

Wheat served, and continues to serve, as the "traffic critical mass" which attracts international shipping services. These shipping services in turn serve a number of other industries and sectors. In 1984, wheat accounted for about 60 percent of the total tonnage exported through Portland via water (Figure 9). Most of the other products exported out of the Port of Portland via water are also resource based goods produced in Oregon and the Pacific Northwest.

Figure 8.

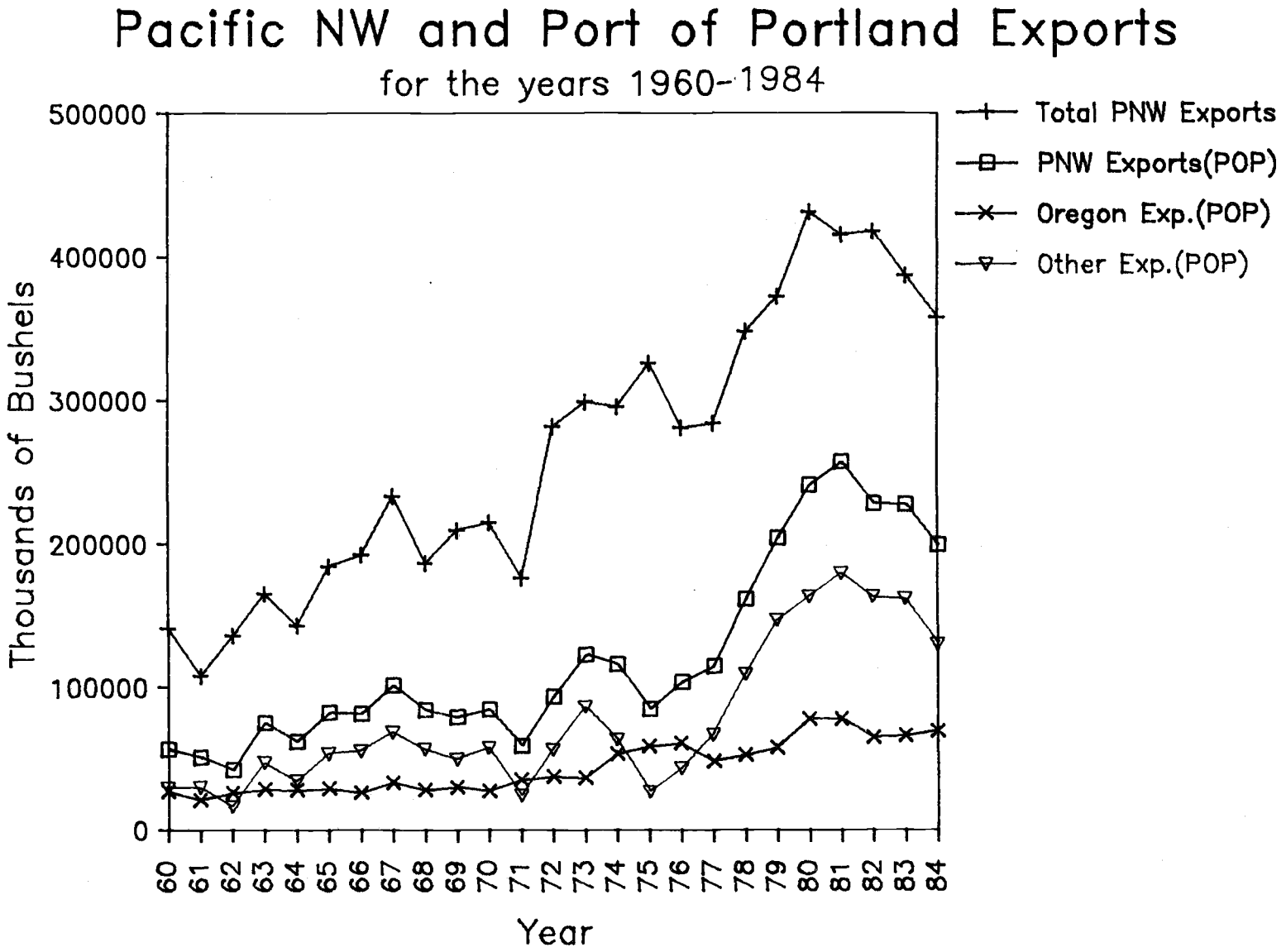
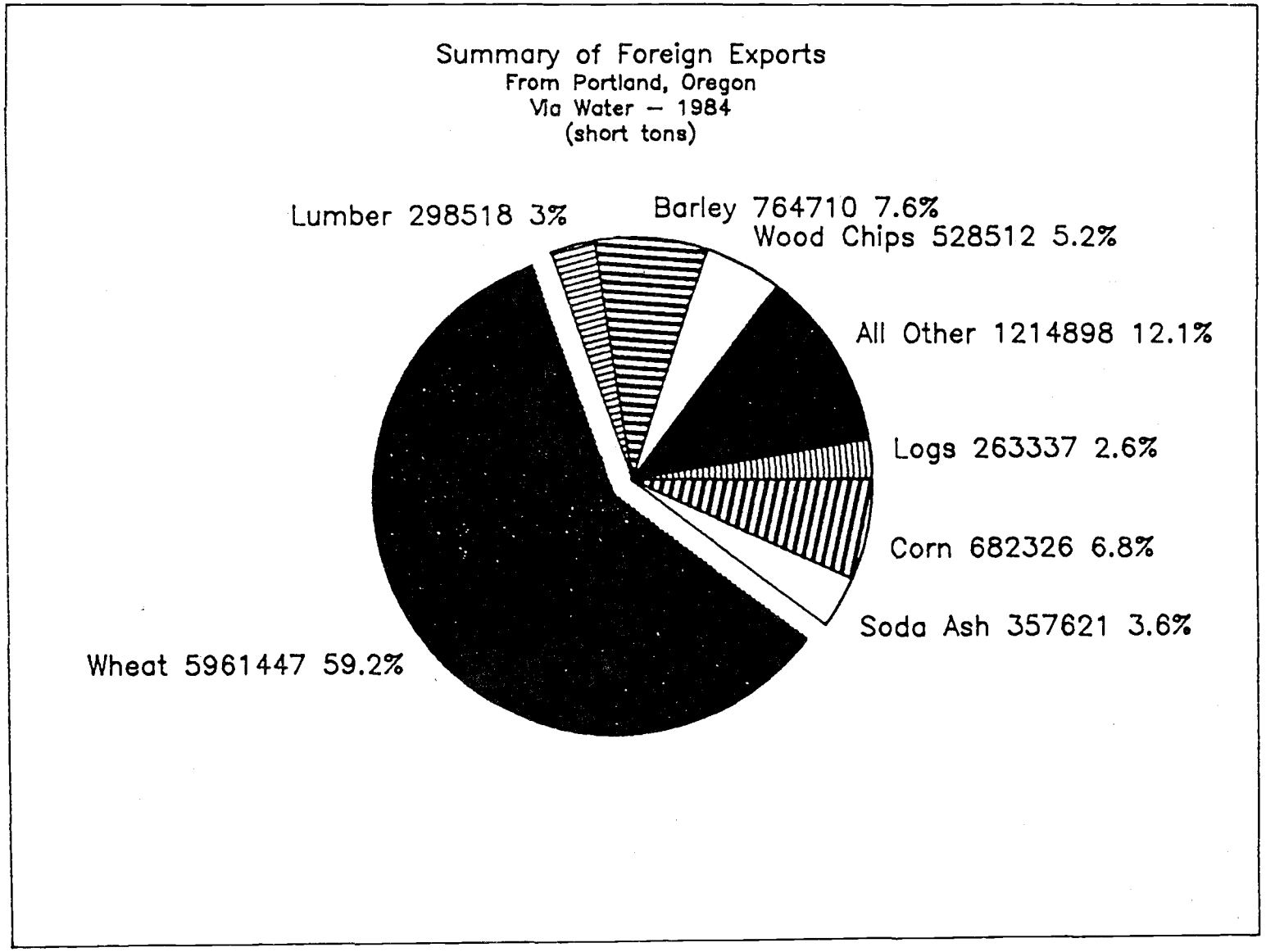

Pacific NW and Port of Portland Exports
for the years 1960-1984
Thousands of Bushels
500000
400000
300000
200000
100000
0
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
Year
Total PNW Exports
PNW Exports(POP)
Oregon Exp.(POP)
Other Exp.(POP)

Figure 9.


Summary of Foreign Exports
From Portland, Oregon
Via Water – 1984
(short tons)
Lumber 298518 3%
Barley 764710 7.6%
Wood Chips 528512 5.2%
All Other 1214898 12.1%
Logs 263337 2.6%
Corn 682326 6.8%
Soda Ash 357621 3.6%
Wheat 5961447 59.2%

III. ECONOMIC CONTRIBUTION OF WHEAT PRODUCTION AND EXPORT IN OREGON

Wheat production and marketing are an extremely important sector in Oregon's economy. The process of farming reaches back through a chain of farm supply stores, tractor dealers, and fertilizer distributors to farm input manufacturing plants and phosphate mines. Extending forward through the chain are all the activities that move wheat from the farm to the local elevators, to the centralized export terminals, and to the export markets created in the local, state, and regional economy.

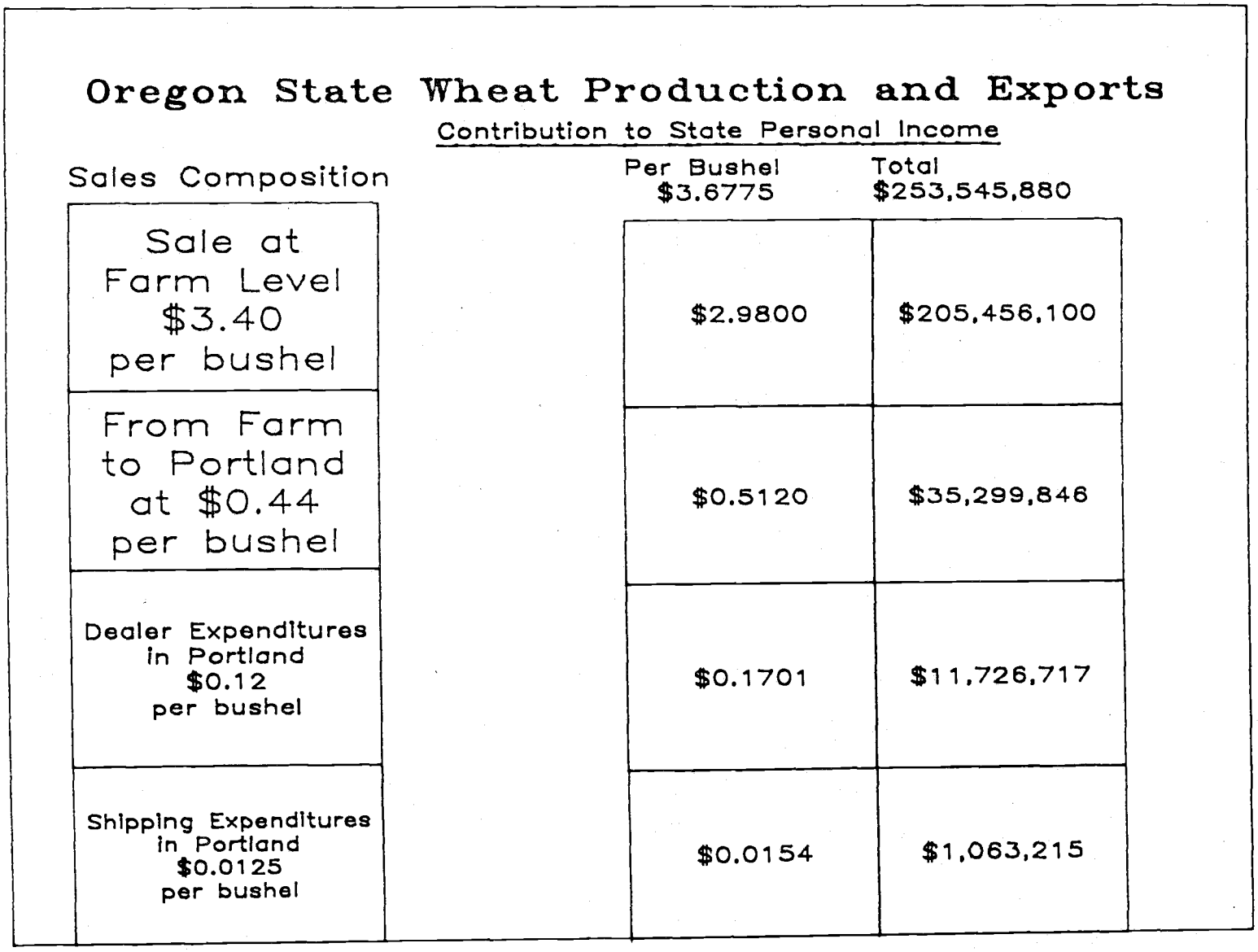
Oregon Wheat Production and Marketing

The expenditures of operating a wheat producing farm are the elements that are part of the input/output model used to estimate the economic contribution of the wheat industry to Oregon's economy. A detailed explanation of the design and appropriate use of input-output analysis is provided in Appendix 3. Using the IMPLAN model for Oregon, it is estimated that for every one dollar of revenue received by farmers delivering wheat bound for export to a country elevator a total of $.8777 of personal income accrues in the state.[5]

In 1984, the season average "farm price" was $3.40.[6] Multiplying the personal income coefficient of .8777 times $3.40 yields $2.98 of personal income generated in Oregon for every bushel of wheat produced per export. Contribution to state personal income per bushel, therefore, is $2.98 (Figure 10). Total production in Oregon in 1984 was 68,945,000 bushels. This farm production contributed $205,456,100 of personal income to the state economy.

An average margin between the country elevator and the export elevator is estimated at $.44 per bushel.[7] About five cents of this margin goes to

Figure 10.


Oregon State Wheat Production and Exports
Contribution to State Personal Income
Sales Composition
Per Bushel $3.6775
Total $253,545,880
Sale at Farm Level $3.40 per bushel
$2.9800
$205,456,100
From Farm to Portland at $0.44 per bushel
$0.5120
$35,299,846
Dealer Expenditures in Portland $0.12 per bushel
$0.1701
$11,726,717
Shipping Expenditures in Portland $0.0125 per bushel
$0.0154
$1,063,215

the elevator for handling; the rest (39 cents) goes to the transportation system, either truck-barge combinations or rail and truck. The IMPLAN model estimates that for every bushel that is handled-transported to Portland, $.5120 of state personal income is generated. The total Oregon wheat production created $35,299,846 of state personal income through local handling and transportation.

The margin for export grain dealers may vary from $.05 to $.25 per bushel depending on the age of the loading facility. An estimate of .12 is used in this analysis. Representatives of interocean shipping businesses estimated that a ship with a capacity of 30,000 metric tons spends between $13,000 and $14,000 in Oregon for every load of wheat shipped out of Portland.

By multiplying the personal income coefficients of these activities by the total bushels exported, it is estimated that these Portland area transporting and marketing activities generate another total of $11,726,717 and $1,063,215 of personal income to the Oregon economy.

Thus, the contribution to Oregon's income of Oregon wheat production and marketing activities totals $253,545,880 (Figure 10).

Out-of-State Wheat Transported and Marketed Through Portland

Wheat produced in other states and shipped through Oregon was almost twice the amount that was produced in Oregon alone. Oregon produced and marketed 68,945,000 bushels in 1984 and marketed an additional 130 million bushels of other states' production through Portland.

Grain grown in other regions of the country and transported through Oregon for export travels mostly by rail. The IMPLAN model estimated that

shipping by rail, the dealer margins and resulting expenditures, and the shipping expenditures of out of state wheat contributed about $.55 of personal income to the state for every bushel of wheat moving through Portland (Figure 11).

The total 129,770,000 bushels exported through Portland contributed an estimated $71,736,856 of personal income to the state.

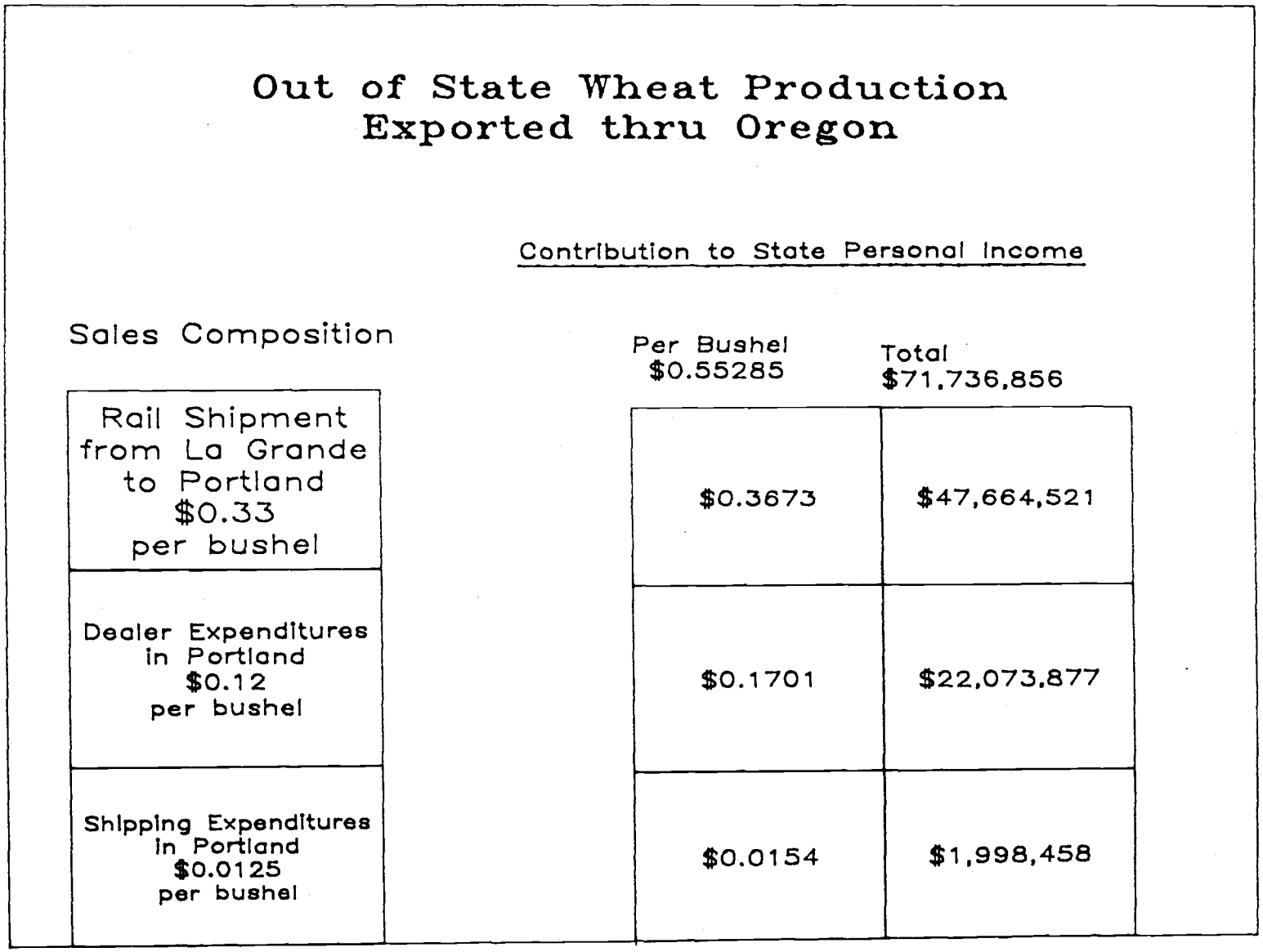
SUMMARY

Wheat production, marketing, and trade play an important role in Oregon's agricultural economy. In 1984, Oregon's wheat sales totaled $234 million (and exceeded $300 million in 1980). This represents about 13 percent of the State's total agricultural sales. Wheat sales resulted in about $253.5 million in personal income. Of this, about $205.5 million was generated at the farm level, about $35.3 million was generated by the farm-to-export marketing system, about $11.7 million by the grain dealers in the Portland area, and about $1.1 million by the shipping activities at the port.

Grain marketers in Oregon also handled wheat produced outside the state. The economic activity associated with transportation and export of non-Oregon wheat produced about $71.1 million in personal income to Oregonians. Transportation generated about $47.7 million in income, grain dealers about $22.1 million, and export shippers nearly $2.0 million.

Thus, the state realized a total of approximately $325.3 million in personal income from wheat. This translates into roughly 20,000 full-time equivalent jobs for the state or about two percent of all jobs in Oregon.

Figure 11.


Out of State Wheat Production
Exported thru Oregon
Contribution to State Personal Income
Sales Composition
Per Bushel
$0.55285
Total
$71,736,856
Rail Shipment from La Grande to Portland $0.33 per bushel
$0.3673
$47,664,521
Dealer Expenditures in Portland $0.12 per bushel
$0.1701
$22,073,877
Shipping Expenditures in Portland $0.0125 per bushel
$0.0154
$1,998,458

Beyond the quantifiable impact on the Oregon economy, wheat contributes in a number of other important, but nonquantifiable, ways. First, wheat has historically been the leading commodity handled through the Port of Portland (and the other Columbia River ports). The ports on the Columbia River originally were developed to serve wheat trade from the Pacific Northwest region.

Wheat served, and continues to serve, as the "traffic critical mass" which attracts international shipping services. These shipping services in turn serve a number of other industries.

Second, Oregon agriculture, including wheat, provides considerable surplus labor to other industries. A large number of farmers and farm spouses work off the farm on either a full- or part-time basis. This labor serves a number of both agricultural and nonagricultural enterprises.

Third, wheat production complements a number of other farming activities. In sales terms, wheat comprises about 13 percent of total agricultural sales in Oregon. However, relatively few farmers produce wheat exclusively. Rather, wheat is produced in concert with other crops such as cattle, or grass seed, or potatoes. As a consequence, wheat farming complements other agricultural production in making the farm a viable economic unit.

Fourth, wheat traffic dominates commercial use of the Columbia River. Downriver wheat shipments create substantial empty back-haul transport capacity. This back-haul capacity provides very inexpensive transport service movement of traffic to upriver industries and communities.

Fifth, wheat was among the first major agricultural exports from the Pacific Northwest. The wheat industry was innovative in developing export marketing and promotion programs in Asia. Western Wheat Associates, now

U.S. Wheat Associates, made significant inroads into the markets in Japan and South Korea and elsewhere in Asia and the Middle East. The trade linkages created by wheat exports now serve to enhance exports of other commodities and products.

Finally, Oregon's long-term ability to participate in international markets rests, to a substantial degree, on its comparative advantage in resource-based products. The state's agriculture, including wheat, has a strong, natural, comparative advantage which can be overcome by competitors only at considerable cost. Oregon's endowment of land, water, climate, etc., are permanent assets in the state economy. As a consequence, agriculture in general, and wheat production in particular, will almost certainly remain cornerstone industries in Oregon's economy well into the foreseeable future.

ENDNOTES

1. U.S. Department of Agriculture. Pacific Northwest Wheat Reports. Economic Statistics and Cooperative Service, Portland, Oregon, various issues.

2. U.S. Department of Agriculture. Wheat Situation. Economic Statistics and Cooperative Service, various issues.

3. "Wheat-Background for 1985 Farm Legislation." Economic Research Service, Agriculture Information Bulletin, No 467. U.S. Department of Agriculture, Washington, D.C. 1984. (Most of the section on wheat prices is taken from this publication.)

4. Since almost all of Oregon's wheat production is either exported to foreign markets or shipped to domestic markets outside of Oregon the Assumption for the purposes of this paper is that all Oregon wheat production is shipped out of Portland. Port of Portland is used to include all Oregon export facilities in the Portland area.

5. The U.S. Forest Service IMPLAN model does not contain a sector called "Wheat Export". Therefore, the separate functions of producing and marketing wheat are identified. The expenditures of these functions are entered into the IMPLAN; the resulting personal income coefficients are needed to derive the $3.68 of total personal income generated per bushel of wheat exported. For the production of wheat the IMPLAN system lists the following coefficients:

Direct	Indirect	Induced	Total
.2242	.1347	.5188	.8777

This means that out of the $.8777 of state personal income generated from wheat production, $.2242 is retained by wheat farmers as income. Another $.1347 contributes to the income of suppliers of the wheat industry, and $.5188 of income is generated for the general public. The income generated by the other functions are served in a similar manner.

6. "Farm price" = prices paid to farmers for wheat delivered to a country elevator.

7. Townsend, Terry P. "An Economic Analysis of the White Wheat Marketing System Between the Pacific Northwest and Japan." Unpublished Masters Thesis, Department of Agricultural and Resource Economics, Oregon State University, Corvallis. 1980.

APPENDICES

Appendix A1.1

Oregon Wheat Production Statistics

Year	Planted (000 acres)	Harvested (000 acres)	Yield (bushels)	Production (000 bushels)	Ave. Price ($)	Total Value (000 $)	Consumer Price Index	Value Adjusted to CPI (3)
1960	838	793	34	26626	1.81	48193	100	48193
1961	832	796	26	20602	1.89	38938	101	38552
1962	751	687	37	25264	1.97	49770	102.1	48746
1963	829	789	36	27998	1.90	53196	103.4	51447
1964	840	791	35	27385	1.33	36422	104.7	34787
1965	942	806	35	28399	1.36	38751	106.5	36386
1966	806	757	34	25558	1.58	40382	109.6	36845
1967	1063	1030	32	32575	1.42	46257	112.7	41044
1968	1012	954	31	27434	1.28	37669	117.5	32059
1969	817	772	38	29502	1.31	38647	123.8	31217
1970	735	673	40	26717	1.46	39007	131.1	29754
1071	809	768	45	34500	1.43	49335	136.8	36064
1972	918	879	42	36848	2.05	75539	141.3	53460
1973	1125	1032	35	35976	4.65	167288	150.1	111451
1974	1324	1265	42	52745	4.44	234188	166.5	140653
1975	1310	1255	46	58040	3.78	219391	181.7	120744
1976	1370	1333	45	60301	2.79	168240	192.2	87534
1977	1308	1230	39	47620	2.77	131908	204.6	64471
1978	1285	1225	42	51925	3.51	182257	220.3	82731
1979	1450	1245	46	57310	3.79	217205	245.1	88619
1980	1410	1350	57	77400	3.98	308052	278.2	110730
1981	1300	1260	59	77380	3.84	297139	307.1	96756
1982	1260	1200	53	64500	4.02	259290	325.9	79561
1983	1170	1085	60	65570	3.60	236052	336.4	70170
1984	1200	1115	62	68945	3.40	234413	350.7	66841

Total Pacific Northwest and Port of Portland Exports for the years 1960 thru 1984

Year	Pac.NW Expts. Total (000 bushels)	Pac.NW Expts. Pt.of Portland (000 bushels)	Oregon Exports Pt.of Portland (000 bushels)	Other Exports Pt.of Portland (000 bushels)
1960	140765	56059	26626	29433
1961	107400	50298	20602	29697
1962	135054	41528	25264	16264
1963	164660	74927	27998	46929
1964	142561	61513	27385	34128
1965	183607	81829	28399	53430
1966	191662	80856	25558	55271
1967	232533	101143	32575	68568
1968	186002	83834	27434	56400
1969	208776	78935	29502	49433
1970	214390	84080	26717	57363
1071	175542	58409	34500	23909
1972	281271	92938	36848	56090
1973	298616	122369	35976	86393
1974	294867	115908	52745	63163
1975	325292	84298	58040	26258
1976	280596	103254	60301	42953
1977	283463	114321	47620	66701
1978	347600	160869	51925	108944
1979	371989	203696	57310	146386
1980	431125	240553	77400	163153
1981	415062	256850	77380	179470
1982	417200	227432	64500	162932
1983	386731	227141	65570	161571
1984	357333	198715	68945	129770

Export Source Notes:

(1) Grain Market News
U.S. Dept. of Agriculture

(2) Foreign Import and Export
Statistics for Portland,
Oregon, via Water
Merchants Exchange,
Portland, Oregon.

(3) Total production values are in current values. Buying power of these dollars changes with inflation. In order to adjust current dollar values to real 1960 dollars, the CPI can be used. This means in terms of 1960 buying power that the $234,413,000 total value of production in 1984 is worth $66,841,000 in 1960 dollars.

Appendix 2.1. Wheat Production by District in Oregon

DISTRICT 1
Counties: Benton, Clackamas, Lane, Linn, Marion, Multnomah, Polk, Washington, Yamhill

Year	Harvested Acres	Production Bushels	Value of Production $1,000
1960	88,500	3,291,000	6,036
1961	93,400	2,866,000	
1962	73,600	3,613,900	7,111
1963	95,100	4,467,900	8,470
1964	115,500	5,411,500	7,184
1965	106,450	5,190,500	7,222
1966	109,150	5,453,500	8,764
1967	148,000	6,579,500	9,502
1968	113,700	5,647,000	6,348
1969	814,000	4,411,500	5,759
1970	73,600	3,755,700	5,607
1971	19,800	5,317,000	7,659
1972	110,700	6,752,900	13,896
1973	165,700	12,319,900	56,243
1974	229,800	14,078,700	63,326
1975	225,500	14,495,000	53,401
1976	261,000	17,862,500	50,141
1977	259,200	18,079,600	50,249
1978	243,500	10,631,700	36,281
1979	236,100	18,641,500	71,674
1980	254,300	17,915,300	72,932
1981	270,600	17,915,300	72,932
1982	229,200	17,125,800	69,510
1983	202,100	14,888,400	55,723
1984	216,100	16,876,600	59,234

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 2.2. Wheat Production by District in Oregon

DISTRICT 2
Counties: Columbia, Clatsop, Coos, Curry, Lincoln, Tillamook

Year	Harvested Acres	Production Bushel	Value of Production $1,000
1960	400	13,000	24
1961	400	12,000	23
1962	200	8,000	16
1963	200	8,000	15
1964	300	12,000	15
1965	200	7,500	10
1966	450	17,500	27
1967	600	30,000	42
1968	300	15,000	18
1969	200	10,000	10
1970	200	11,500	17
1971	200	12,000	18
1972	200	13,000	30
1973	400	26,000	133
1974	1,100	66,000	311
1975	700	49,000	185
1976	1,000	68,000	194
1977	500	32,500	91
1978	1,250	62,500	209
1979	1,600	104,000	401
1980	2,500	162,500	689
1981	3,500	157,500	621
1982	2,000	160,000	676
1983	1,500	105,000	419
1984	1,200	96,000	345

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 2.3. Wheat Production by District in Oregon

DISTRICT 3
Counties: Douglas, Jackson, Josephine

Year	Harvested Acres	Production Bushels	Value of Production $1,000
1960	1,650	42,000	71
1961	1,200	31,000	59
1962	850	23,000	43
1963	750	21,000	34
1965	850	25,000	32
1966	1,300	54,000	79
1967	1,900	71,000	94
1968	3,800	151,000	198
1969	3,400	152,300	190
1970	2,400	90,200	116
1971	2,100	112,500	188
1972	1,300	63,000	122
1973	1,050	61,400	261
1974	1,900	78,200	332
1975	3,800	186,000	697
1976	5,200	305,500	901
1977	6,550	468,700	1,287
1978	7,950	350,100	1,248
1979	9,400	570,000	2,105
1980	10,950	714,500	2,670
1981	11,700	478,800	1,766
1982	11,700	680,900	2,632
1983	10,600	684,000	2,462
1984	8,500	554,900	1,882

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 2.4. Wheat Production by District in Oregon

DISTRICT 4
Counties: Gilliam, Hood River, Morrow, Sherman, Umatilla, Wasco, Wheeler

Year	Harvested Acres	Production Bushels	Value of Production $1,000
1960	567,450	18,575,000	33,834
1961	570,800	13,279,000	25,097
1962	507,300	17,404,300	34,507
1963	573,300	18,795,300	35,944
1964	550,500	16,665,000	22,419
1965	574,000	17,631,000	24,231
1966	533,800	15,660,500	24,877
1967	730,900	19,812,500	28,408
1968	700,000	17,684,200	23,492
1969	568,900	19,270,000	25,681
1970	494,000	18,370,500	27,090
1971	544,400	22,756,500	32,947
1972	650,500	24,434,400	50,490
1973	736,700	18,201,800	85,148
1974	580,600	29,735,300	132,622
1975	857,100	34,397,000	131,999
1976	882,500	34,399,000	97,649
1977	825,700	22,624,000	63,428
1978	829,600	32,752,300	118,262
1979	840,800	29,399,000	112,111
1980	904,100	46,671,400	187,405
1981	843,300	50,894,200	197,607
1982	797,000	36,165,100	146,277
1983	722,400	38,779,500	144,105
1984	732,300	39,838,400	135,399

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 2.5. Wheat Production by District in Oregon

DISTRICT 5
Counties: Baker, Malheur, Union Wallowa

Year	Harvested Acres	Production Bushels	Value of Production $1,000
1960	83,800	3,215,000	5,506
1961	82,300	2,658,000	5,024
1962	64,800	2,644,900	4,990
1963	75,000	2,897,900	5,281
1964	76,000	3,432,000	4,312
1965	79,000	3,628,000	4,643
1966	71,500	2,778,000	4,114
1967	95,300	4,126,500	5,419
1968	90,400	4,099,400	5,146
1969	77,400	4,061,500	5,007
1970	73,000	3,454,300	4,705
1971	86,000	4,465,000	5,957
1972	80,200	4,227,100	8,292
1973	82,850	3,782,900	18,121
1974	119,100	6,116,000	25,576
1975	111,500	6,202,000	22,882
1976	123,500	5,173,000	12,784
1977	95,750	4,575,500	11,956
1978	102,800	6,290,300	20,195
1979	109,700	6,263,000	22,411
1980	126,700	8,897,500	32,236
1981	119,800	8,065,100	29,243
1982	107,500	7,066,800	27,114
1983	100,100	7,462,100	25,713
1984	50,400	3,887,900	13,307

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 2.6. Wheat Production by District in Oregon

DISTRICT 6

Counties: Crook, Dischutes, Grant, Harney, Jefferson, Klamath, Lake

Year	Harvested Acres	Production Bushels	Value of Production $1,000
1960	51,200	1,490,000	2,722
1961	47,900	1,358,000	2,567
1962	40,250	1,569,000	3,103
1963	44,650	1,807,900	3,452
1964	47,800	1,839,000	2,463
1965	45,500	1,917,000	2,613
1966	40,800	1,594,500	2,521
1967	53,300	1,955,500	2,792
1968	45,800	1,837,400	2,467
1969	40,700	1,596,700	2,000
1970	29,800	1,034,800	1,472
1971	43,500	1,837,000	2,566
1972	36,100	1,357,600	2,709
1973	45,300	1,584,000	7,382
1974	62,500	2,670,800	12,021
1975	56,400	2,711,000	10,227
1976	59,800	2,493,000	6,571
1977	42,300	1,839,700	4,897
1978	39,900	1,838,100	6,062
1979	47,400	2,332,500	8,503
1980	51,450	3,038,800	12,120
1981	51,100	3,156,800	12,082
1982	52,600	3,301,400	13,081
1983	48,300	3,651,400	13,531
1984	50,400	3,887,900	13,307

SOURCE: Oregon Commodity Data Sheet
Cooperation Extension Service
Oregon State University
Corvallis, Oregon

Appendix 3

ECONOMIC ASSESSMENT MODEL OF EXPORTS AND ECONOMIC CONTRIBUTION

One way of measuring the importance of a particular economic activity is to look at the amount of goods and services it sells and buys outside the local economy. A state economy has exports and imports just as the United States has exports and imports. Raising and transporting wheat to Japan, or to Minneapolis is an export; trees which are grown, harvested and/or processed in the state and shipped to Los Angeles, or elsewhere in the United States or to Japan are also an export; so are lodging and recreation services purchased by tourists. Although a tourist comes into the state, the goods and services he purchases are paid for with dollars he earned somewhere outside the state. All exports bring outside dollars into the economy, thereby stimulating local economic growth.

An economic multiplier is an approximate gauge of the effect that a change in exports from a specific sector would have on the total economy. Multipliers are based on one fundamental idea about how economies work. State economies, such as Oregon, are not completely self-sufficient. Many of the products and services needed or wanted by residents and businesses must be imported. When goods and services are purchased outside Oregon, the dollars used to buy these goods are lost from the Oregon economy. To offset this outflow of dollars, Oregon farms and businesses must produce goods and services to sell to businesses or people in other markets, thereby bringing in dollars which will circulate throughout the economy. The business sectors which sell to markets outside the state are called basic sectors.

The dollars brought in by basic or exporting sectors begin the multiplier process. The basic sector stimulate a local economy by originating the multiplier effect. The following are examples of basic sectors in Oregon (not necessarily in any order of importance).

1. Logging and timber processing.
2. Agricultural production and processing.
3. Fish harvesting and processing.
4. Tourism and recreation.
5. Manufacturing.
6. Services.
7. Transfer payments.

How is the effect of a dollar of export sales multiplied in the state economy? Suppose Oregon's wheat industry increases export sales by $1,000. If the economy has an output multiplier of 2.49, total business sales throughout the state are expected to increase by a total of $2,490 as a result of the $1,000 increase in exports (Figure A3-1). (The 2.49 is used as an example only. The actual output multiplier may be different.)

Figure A3-1 demonstrates how state respending of the export payment by businesses and households creates this multiplier effect. The process begins when a dollar enters the state economy, in this case as the result of an export sale (Column a). The dollar will be respent by the exporting firm to purchase inputs to meet the increased export demand (Column b). Sixty cents of the dollar will be received by state businesses and households, but 40 cents will leak out in the form of nonstate purchases, savings and taxes. Thus, in addition to the initial dollar, business respending has generated an additional 60 cents of business activity within the state economy.

Of the 60 cents that is received, 38 cents will be respent within the state, and the rest will leak out (Column c). This process continues until the amount remaining in the state economy is negligible (Columns d,e,f). Thus, greater leakage at any round of respending leads to a smaller multiplier.

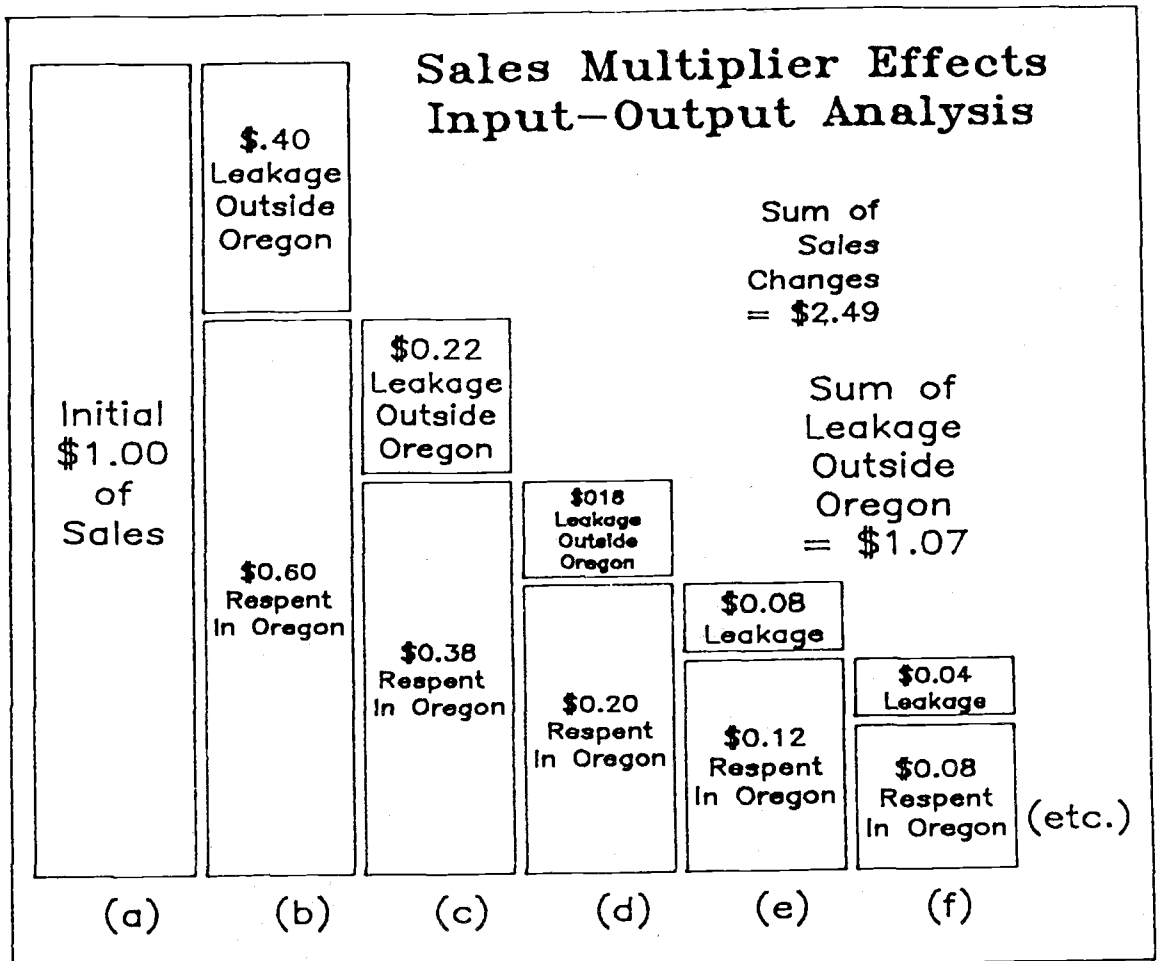
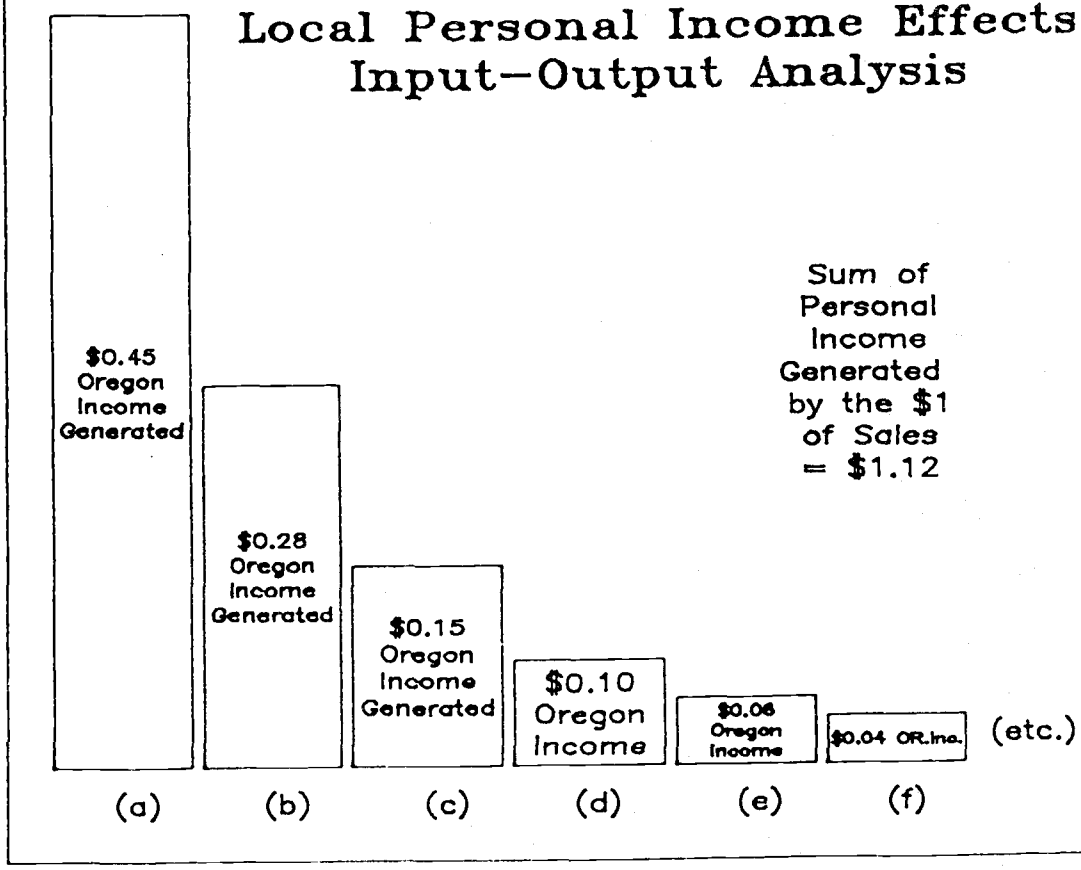

Sales Multiplier Effects
Input–Output Analysis
Initial $1.00 of Sales
$.40 Leakage Outside Oregon
$0.60 Respent In Oregon
$0.22 Leakage Outside Oregon
$0.38 Respent In Oregon
$018 Leakage Outside Oregon
$0.20 Respent In Oregon
$0.08 Leakage
$0.12 Respent In Oregon
$0.04 Leakage
$0.08 Respent In Oregon
(etc.)
Sum of Sales Changes = $2.49
Sum of Leakage Outside Oregon = $1.07
(a)
(b)
(c)
(d)
(e)
(f)

Figure A3.2


Local Personal Income Effects
Input–Output Analysis
$0.45 Oregon Income Generated
$0.28 Oregon Income Generated
$0.15 Oregon Income Generated
$0.10 Oregon Income
$0.06 Oregon Income
$0.04 OR.Inc.
(etc.)
Sum of Personal Income Generated by the $1 of Sales = $1.12
(a)
(b)
(c)
(d)
(e)
(f)

To determine the total sales multiplier value, the initial dollar is added to the sum of state respending. In this example, the multiplier equals 2.49 ($1.00 + .60 + .38 + .20 + .12 + .08, etc.). Thus, $2.49 of state business activity will be generated for each dollar that enters the state economy.

The multiplier presented in this example is a business output sales multiplier, which measures the total change in state sales generated by a one-dollar increase in export sales. While output multipliers are useful in describing the interrelationships between business sectors they do not adequately describe the amount of income or employment generated in the state by specific business activities. A more useful measurement of the contribution of a sector's activity is the amount of personal income that is directly and indirectly generated by that sector's activities. The dissemination of the amount of state personal income generated by an increase in economic activity is shown in Figure A3-2. In the first round of export sales, $.45 of state personal income is generated. As these sales work through the economy, a total of $1.12 of personal income is generated for every one dollar of increase in sales.

To make the analysis meaningful, the effects estimated in this report are effects on total personal income, the amount that is retained as household income (salaries, wages, and proprietary income). Because many jobs in the resource based industries are not full-time, an employment figure could be misleading. A full-time equivalent employment figure can be calculated by dividing the estimated total personal income figure by a representative annual personal income average.

The income coefficient is different from output multipliers which are generally higher. The income coefficient is straight forward: for every

initial dollar of export sales, a certain amount ($1.12 in Figure 9b) in personal income is generated. An output multiplier of 2.49 would mean that for every initial dollar of export sales there are $2.49 of total sales as the initial and related expenditures pass through various sectors of the economy. It does not mean, however, that $2.49 of new money is produced and that it ends up in people's pockets. The output multiplier calculates how much money is "stirred up" in the economy, but it doesn't mean that someone in the local area is making a wage or profit from this money. A word of caution on the usage of output multipliers is given by the economists Bourque and Conway[1] who constructed the State of Washington I/O model:

> Note that here we have not specified aggregate output multipliers. Although the output multipliers given by the elements of the inverse matrix are at the root of the multipliers specified in the previous paragraphs, it is not very meaningful to sum these elements into an aggregate output multiplier for each industry. In other words, it does not make much sense, economically speaking, to combine, say, the shipments of pulp mills with the margins of the insurance industry into an aggregate transactions measure. Furthermore, users of the Washington tables in the past have sometimes employed aggregate output multipliers inappropriately, in at least one case confusing them with income multipliers [Bourque and Conway].

More Myths About Multipliers[2]

To make matters even more confusing, laymen and (unfortunately) poorly trained economists have used value-added or turnover concepts loosely to represent output (sales) multipliers. This is why we sometimes hear claims that the total multiplied impact of a direct change in economic activity is five, ten or fifteen times the direct effect.

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[1] Bourque, Philip J. and Richard S. Conway, Jr. The 1972 Washington Input/Output Study. Graduate School of Business Administration, University of Washington, 1977.

[2] This section summarizes material in "Income Multipliers in Economic Impact Analysis-Myths and Truths," by Robert O. Coppedge and Russell C. Youmans. Special Report 294, Cooperative Extension Service, Oregon State University, Corvallis, June 1970.

The "value-added" concept refers to the increase in value of a particular product at successive levels in production and distribution. For example, suppose a food product was brought in from the farm, transported to town, washed, inspected, graded, cooked, packaged, frozen, and delivered to storage points and supermarkets before reaching the final consumer. As the product moved through the market chain, money and effort have been spent to improve and convert the raw product into a finished product. Suppose the final consumer pays $8 for the finished product which cost $1 in raw form. Does this mean the gross sales (output) multiplier is eight (8)? No!

Value-added information may still be useful because, in a sense, it measures an industry's contribution to the gross product of the economy. However, value-added does not measure the gross sales impact on the local economy.

The "turnover" concept refers to the number of times a dollar changes hands as it is spent. Suppose a dollar is spent to buy some product or service in a local community. The seller uses some of the dollar to pay for such things as utilities, rent, wages, and raw materials. He also uses the rest of the dollar as disposable income. The original dollar is thus broken into parts and distributed. Some parts of the dollar will have "escaped" the local community and some will have remained within. The firms and people receiving this second round impact use it to help pay their bills. The money is then further divided and scattered within and outside the community. This process continues until it is impossible to measure the impact of the $1 sale in the local community.

Suppose it took six (6) rounds of bill payments to "lose" the original dollar to leakages outside the community. Does this mean the gross sales (output) multiplier for the community was six (6)? No! Using this figure as a sales multiplier ignores the fact that <u>each time</u> money turns over, the

amount retained in the local community (and in part contributing to income in the local community) diminishes.

Economic INPUT/OUTPUT Models

Economic input/output models are often used to estimate the impact of resource changes or to calculate the contributions of an industry to the local economy. The basic premise of the input/ output framework is that each industry sells its output to other industries and final consumers and in turn purchases goods and services from other industries and primary factors of production. Therefore, the economic performance of each industry can be determined by changes in both final demand and the specific interindustry relationships.

Input/output (I/O) models can be constructed using surveys of a regional economy. The disadvantages of the survey model approach are its complexity and high cost. Construction of a survey data I/O model involves obtaining data on the sectoral distribution of local purchases and sales to final demand of every sector of the economy, and on the imports purchased and exports sold by each sector. Another approach uses secondary data to construct estimates of local economic activity.

The model developed for this report utilizes one of the best known secondary input/output models available. The U.S. Forest Service has developed a computer program called IMPLAN which can be used to construct county or multi-county I/O models for any region in the United States. The regional I/O models used by the Forest Service are derived from technical coefficients of a national I/O model and localized estimates of total gross outputs by sectors. The computer program (IMPLAN) adjusts the national level data to fit the economic composition and estimated trade balance of a chosen region.

The IMPLAN data base consists of two major parts: 1) county estimates of final demand, final payments, gross output, and employment for 466 industrial sectors; and 2) a national-level technology matrix. The data represent 1977 county-level activity of 466 economic sectors. Details are presented in the Forest Service IMPLAN manual.[3]

[3] Siverts, Eric, Charles Palmer, and Ken Walters. IMPLAN Users' Guide. U.S. Forest Service, Fort Collins, CO, September 1983.