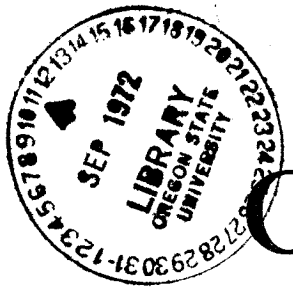
Some Economic and Marketing Aspects of the Northwest Prune Growing and Canning Industry



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SOME ECONOMIC AND MARKETING ASPECTS OF THE NORTHWEST PRUNE GROWING AND CANNING INDUSTRY

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FOREWORD

This publication is based upon a research paper prepared by Kenneth N. Brown in partial fulfillment of a Master of Agriculture degree in the Department of Agricultural Economics, Oregon State University, Corvallis, Oregon, 1971. This publication has been edited, condensed, and in some places revised by the three co-authors listed:

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INTRODUCTION

Purple plums are canned prunes that are packed commercially in Oregon, Washington, Idaho and Michigan. This report deals primarily with the Northwest purple plum industry; concerns itself with the Michigan industry; and to a lesser degree other fruit products that may compete with purple plums.

Canning of purple plums in the U. S. has increased since the early 1900's. However, a peak of some three million cases was reached in 1946, and the industry in more recent years has stabilized at around 1.5 million cases. See Table 1.

Table 1: Canned Purple Plums: Canners Carryin, Pack, Total Supply and Seasonal Shipments, United States 1960-71. (1,000 equivalent cases. 24 - 2½ basis.)

Year	Canners Carryin	Pack	Total Supply	Seasons Shipments
1960-61[1/]	276	374	650	612
61-62	38	1,637	1,675	1,293
62-63	382	2,060	2,442	1,706
63-64	736	1,170	1,906	1,338
64-65	568	1,497	2,065	1,503
65-66	562	1,729	2,291	1,558
66-67[2/]	733	1,488	2,221	1,759
67-68	462	1,858	2,320	1,802
68-69	518	731	1,249	998
69-70	251	2,209	2,460	1,543
70-71	917	840	1,757	--
1969-70 Ave.	494	1,417	1,912	--

[1/] Season beginning June 1. 1960 through 1970.
[2/] Season beginning January. 1966 through 1970.
Source: Northwest Food Processor Association and National Canners and Freezer Association.

Year to year variations occur due to uneven production of raw product as indicated in Table 2. Although there is a possibility of leveling out this production by planting new or different varieties, the industry has not been successful to date. However, changes in tree numbers are reflected in Table 3 showing that Michigan has been increasing tree plantings. Some of the variation as shown in Table 3 for the Northwest can be explained by

Table 2: Prunes and Plums: Production, By States and Northwest, 1940-70

Year	California			Pacific Northwest				
	Plums	Dried Prunes Fresh basis	Dried Prunes Dried basis 2/	Michigan	Idaho	Washington	Oregon	Total Northwest
	Tons	Tons	Tons	Tons	Tons	Tons	Tons	Tons
1940	69,000	460,000	184,000	5,000	21,500	18,900	42,700	83,100
1941	71,000	470,000	188,000	5,900	21,000	22,300	69,400	112,700
1942	72,000	430,000	172,000	4,200	18,200	23,500	70,500	112,200
1943	76,000	490,000	196,000	2,500	7,800	23,000	104,000	134,800
1944	92,000	397,500	159,000	4,500	23,300	25,800	60,400	109,500
1945	71,000	565,000	226,000	1,700	28,200	26,000	92,100	146,300
1946	100,000	535,000	214,000	6,000	22,400	29,100	101,100	152,600
1947	74,000	500,000	200,000	5,200	37,000	23,100	34,400	94,500
1948	67,000	455,000	182,000	4,800	20,800	19,000	48,800	88,600
1949	90,000	377,500	151,000	7,500	27,100	23,700	107,700	158,500
1950	77,000	372,500	149,000	6,500	10,000	13,600	22,300	45,900
1951	97,000	442,500	177,000	4,600	22,600	12,700	59,800	95,100
1952	53,000	337,500	135,000	7,500	24,800	17,100	45,100	87,000
1953	84,000	365,000	146,000	6,700	20,900	22,100	48,400	91,400
1954	71,000	447,500	179,000	6,300	12,700	15,100	42,500	70,300
1955	86,000	327,500	131,000	5,200	22,200	25,000	52,600	99,800
1956	100,000	482,500	193,000	4,900	25,500	17,500	59,000	102,000
1957	81,000	412,500	165,000	7,300	22,000	16,000	34,000	72,000
1958	61,000	240,000	96,000	7,800	19,100	13,500	19,700	52,300
1959	93,000	347,500	139,000	6,800	22,600	22,500	44,000	89,100
1960	82,000	347,500	139,000	8,000	10,600	10,100	4,000	24,700
1961	87,000	347,500	139,000	9,000	20,500	19,100	27,400	67,000
1962	84,000	370,000	148,000	8,000	16,700	21,400	46,000	84,100
1963	106,000	332,500	133,000	10,500	19,000	16,100	6,300	41,400
1964	113,000	450,000	180,000	14,500	23,500	23,300	23,000	69,800
1965	113,000	417,500	167,000	11,500	21,000	13,700	28,000	62,700
1966	95,000	330,000	132,000	13,000	11,000	17,200	25,000	53,200
1967	98,000	410,000	164,000	15,000	16,500	12,700	30,500	59,700
968	106,000	382,500	153,000	13,000	6,480	9,800	11,000	27,280
1969	67,000	325,000	130,000	14,500	17,500	27,200	30,300	75,000
1970	123,000	500,000	200,000	10,000	6,400	9,000	19,600	35,000

a change in census definitions and two major disasters ... the 1955 freeze and the 1962 windstorm. Each of these caused a noticeable change in tree numbers. Production in the Northwest since 1962 can and has varied from a low of 27,280 tons in 1968 to a high of 75,000 tons in 1969. Results of research indicate that cool temperatures, not freezing, is responsible for poor fruit set and wide fluctuations in production of Italian prunes.

Table 3: Plum Tree Numbers: Bearing, Non-Bearing, and Non-Bearing as Percent of Bearing Trees By States and Census Years 1954, '59, '64 and '69.

		Mich.	Oregon	Wash.	Idaho
		---------- Thousand Trees ----------			
Bearing Trees	1954	229	1290	435	299
	1959	237	1026	276	296
	1964	328	617	303	339
	1969	579	787	312	330
Non-Bearing Trees	1954	90	123	30	63
	1959	136	255	95	87
	1964	263	289	99	78
	1969	187	221	31	29
Non-Bearing Trees as Percentage of Bearing Trees					
	1954	39	10	7	21
	1959	57	25	34	29
	1964	80	47	33	23
	1969	32	28	10	9

Source: U. S. Census of Agriculture 1954, 1959, 1964 and 1969.

The Economics of Purple Plum Production

Comparative Costs of Production: The method used in determining a comparative cost of production for the three areas was as follows: a typical but hypothetical prune orchard operation was described to a group of six progressive prune growers in each area selected by County Extension Agents. The growers agreed upon a set of recommended cultural practices that would logically be used and the time and equipment necessary for the performance of each cultural practice. Each practice was then converted to a dollar value to result in a representative cost rather than an average cost of production.

In the Willamette Valley 40 acres of prunes with five tons per acre yield out of a total of 100 acres of orchard on a 200 acre farm was considered typical. In the Yakima area, 10 acres of prunes with a 12 ton per acre yield, out of a total 60 acre orchard was considered typical. In Michigan, 10 acres of prunes with 250 bushels (seven tons) per acre yield out of a total of 100 acres of orchard was considered typical.

The estimate that is most critical is yield per acre. Yields in the Oregon and Washington studies are not average yields, but are yields that may be expected from orchards on suitable sites and under good management. The possibility that assumed yields in the three areas are not comparable should be recognized.

The total cost of producing prunes found by these studies is $56.15 per ton in the Willamette Valley, $59.00 per ton in the Yakima area and $64.85 per ton in Western Michigan (see Table 4). In the Yakima area study the per-acre cost of production is over two and one-half times the Willamette Valley costs, but higher production in the Yakima study brings the costs per ton to within $3.00 of the Oregon study cost per ton. The Michigan study shows their cost per acre is between the Oregon and Washington costs, but that Michigan has the highest cost per ton.

It is interesting to compare some of the individual costs between the three areas. Spraying is always a big cost item in tree fruit production. The time required to put on a cover spray in the Oregon study is .5 hr/acre compared to .7 hr/acre in the Yakima study. The Willamette Valley uses primarily concentrate spraying and the Yakima area primarily dilute spraying. This could explain the difference between these two areas. Each area uses a cover spray and the cost of spraying excluding materials in each area is $7.15, Willamette Valley: $6.70, Yakima area.

Table 4: Prunes, Cost of Production Willamette Valley, Oregon; Yakima Valley, Washington; and Michigan 1970.

	Willamette Valley (a) 5 ton/Acre		Yakima Area (b) 12 tons/Acre		Michigan (c) 7 tons/Acre	
	Cost/Acre	Cost/ton	Cost/Acre	Cost/ton	Cost/Acre	Cost/ton
Total variable Costs*	192.25	39.50	526.90	43.90	297.18	42.45
Total fixed Cost	88.40	17.65	181.05	15.10	156.64	22.40
Total Costs	280.65	56.15	707.95	59.00	453.81	64.85

*includes operators labor

Pruning, including brush removal, is generally a high cost item in tree fruit production. Pruning costs were highest in the Yakima study at $73.80/acre; Michigan was next at $33.34/acre; Willamette Valley had the lowest cost of pruning at $19.80/acre. The relatively high cost in the Yakima study is probably associated with good tree growth, high yields and a desire on the part of growers to produce large clean fruit.

In the Yakima area the cost per acre for irrigation is calculated at $49.00 ($32.00 variable costs, $17.00 fixed costs) which is not incurred in Oregon and Michigan.

Property taxes are also of interest with the Yakima study having $15.00, Michigan $10.00 and Oregon $6.00. In Oregon property tax varies from less than the $6.00 used in the study to over $30.00 on land used to produce prunes. The same situation is probably true in the other areas as land used for prunes varies in quality, competitive use, and the varying tax rate.

One of the biggest costs is interest on investment in land. In the Oregon study the value of a prune orchard is placed at $800 per acre (including trees). The cost of buying land and bringing an orchard into production is at least $1,200/acre. The $800 value reflects the lack of confidence in prunes by buyers and producers. Seven percent was used for interest on investment to get $56.00 value in the Willamette Valley study. Growers used $1,250 for a value in the Yakima area and judged this was less than cost to bring an acre of prunes into production. Interest on investment at seven percent gives a cost of $87.00. If interest on investment from the Michigan study is computed the same way as in Oregon and Washington, the cost would be $70.00.

The relationship between fixed and variable costs is shown in Table 4. In Yakima the fixed cost per acre is highest at over $180, yet the fixed

cost per ton is lowest at about $15.00. This again demonstrates the effect of the high per-acre yields used in the Yakima study. Fixed cost as a percent of total cost is also interesting with the Yakima area again having the lowest at 25.6 percent with Oregon at 31.6 percent and Michigan at 34.6 percent.

After the investment has been made in orchard development and orchard equipment, these costs are considered sunk costs because they are no longer considered in future production decisions. A prune grower will tend to continue to grow prunes as long as he believes other crops on the same land would not return more than prunes. Sunk costs in orchard and in equipment (to some extent) are lost if the orchard is removed. This explains why some nearly abandoned orchards in the Willamette Valley are not removed. It must also be kept in mind that it costs money to remove trees and unless the land has an alternative use, trees may not be removed.

Table 5: Effects of Varying Yields on Variable, Fixed and Total Costs of Production

Oregon (a) Willamette Valley			Washington (b) Yakima area			Western (c) Michigan		
Tons/Acre		$/Tons	Tons/Acre		$/Tons	Tons/Acre		$/Tons
3	Var.	47.65	8	Var.	52.25	4.2	Var.	52.80
	Fix.	29.45		Fix.	22.65		Fix.	37.20
	Total	77.00		Total	74.90		Total	90.00
5	Var.	39.50	12	Var.	43.90	7	Var.	42.45
	Fix.	17.65		Fix.	15.10		Fix.	22.40
	Total	56.15		Total	59.00		Total	64.85
7	Var.	34.05	16	Var.	38.10	9.8	Var.	38.60
	Fix.	12.65		Fix.	15.10		Fix.	16.10
	Total	46.70		Total	49.40		Total	54.70

Source: (a) Appendix Table 6 Ken Brown's Research Paper.
(b) Appendix Table 7 Ken Brown's Research Paper.
(c) Agricultural Economics Report No. 162, Michigan State University, 1970.

The effect assumed yield might have on cost of production has already been mentioned. However, the average yield in Oregon is less than 3 tons per acre, and the average yield in Washington is around 8 tons per acre. Table 5 shows the variation in yield as shown on each of the cost studies. In the Oregon study, reducing yield from five to three tons per acre would increase cost per ton about $20.00. Increasing yield from five to seven tons per acre would reduce costs almost $11.00 per ton. Fixed costs do not change with changing yield, and most variable costs are on a per acre basis.

The exception is hand harvest costs, which are closely related to yield. The same general relationship exists in the studies in all three areas.

The difference between cost per ton in Oregon and Yakima comparing low yield in one area and high yield in another is about $28/ton (Table 5). The same general relationship will be true when comparing Michigan with other areas. This points out that from a competitive basis the prune grower who is able to get high production will probably have an advantage over growers with more average production, regardless of area.

Although average prices from Table 6 would seem to indicate growers in the Willamette Valley and Yakima area getting a good return from prunes for canning, this is not true, because the crop failure or extremely short crop in 1968 distort the average prices. If the 1968 price is dropped from the 1965-69 average, the average canning price received by Oregon growers drops from $66.42 to $56.52. It must also be kept in mind that yields in the Oregon and Yakima cost of production studies were above average. Cullage is another factor that must be considered. For instance, had cullage of 10 percent been used in the Oregon study, the cost of production figures would have advanced to $62.35 per ton. The result is that average cost of production is considerably above the price received for prunes for canning.

Table 6: Average Prune Prices Received by Growers
Oregon, Washington and Idaho
Annually 1965-69 and Average 1965-69

	Oregon			Washington		Idaho
	Fresh	Canned	Dried[2]	Fresh	Canned	Fresh
1965	$150.00	56.20	82.30	176.00	62.00	107.00
1966	119.00[1]	51.50	85.70	209.00	82.00	170.00
1967	165.00	64.70	79.10	181.00	76.00	146.00
1968	181.00	106.00	143.00	214.00	116.00	180.00
1969	153.00	53.70	86.00	186.00	54.00	130.00
Average 65-69	162.40	66.42	95.22	193.20	78.00	146.40

[1]Milton-Freewater area did not have a crop that year because of freeze damage.

[2]Drying costs of $25-$30/ton included in grower price

Source: Oregon Commodity Data Sheet (1970).

THE ECONOMICS OF PROCESSING PURPLE PLUMS

Introduction

Information for this section of the report is based on personal and written interviews with canners in Oregon and Washington who process purple plums. In many instances mailed questionnaires returned were not always complete and due to a lack of time in attempting to complete this study as a thesis project individual processor records were not reviewed nor were follow-up actions taken to complete the data. However, it is felt by the authors that the data as presented is representative of the industry and a more complete survey probably would not affect the conclusions presented.

Table 7 shows the Northwest Purple Plum pack, the United States pack, and the Northwest percentage of total pack for the years 1965-1969.

In 1970 the Northwest had 16 canneries canning purple plums on a regular basis. Nine are located in Oregon and two in Washington west of the Cascade Mountains and five are located east of the Cascade Mountains in Washington and Idaho.

Table 7: Pack of Canned Purple Plums; Northwest, U. S. and Northwest as a percent of U. S.
(100 cases 24/2½ basis)

	Northwest Pack	U. S. Pack	Northwest Percent of Total
1965	1,336	1,729	77
1966	1,027	1,488	69
1967	1,337	1,858	72
1968	255	731	35
1969	1,708	2,209	77

Source: National Canners and Freezers Assoc. and Northwest Food Processors Association

Five of the canneries are cooperatives, four are recognized as national brands and the others are a part of multiple product processing firms operated under local or family type management.

The importance of the purple plum pack to the total cannery operation has an effect on how management reacts to different situations involving purple plums. The persons interviewed when asked to estimate the percentage of total sales derived from purple plums, none of the 16 answered this question, and the percentage ranged from one to eight percent with an average

of 4.9 percent. This indicates that purple plums are a small part of the total product mix of the Northwest canning industry, and a minor part of the total dollar sales of those processors who handle them.

There has been a general trend in past years for wholesale food buyers (mainly chain stores) to use their own labels rather than the processor's labels. The procedure is for the buyer to supply the cannery with labels and these labels are placed on the can; then the cans are put in cases and shipped. The theory is that customers can be induced to develop a preference for a label, and the customer would have to come to a particular store or chain for a certain private label. Preference for a certain processor label would not benefit the chain store in the same way.

A question was asked the cannery personnel interviewed for an estimate of how much of the purple plum pack was processor label vs private label. The range on the retail size cans was from five percent processor label to 100 percent processor label, with an average of 38 percent processor label and 62 percent private label. The range was the same for the institutional size cans, but the average was 45 percent processor label and 55 percent private label. It is logical that institutional sizes would have less private labeling because the ultimate consuner does not see the label. It is evident that the same theory on developing preference for a certain label is in effect. This is the only way to explain why over 50 percent of the institutional business was estimated to be under private label.

There was clear indication from the people interviewed that they expected more private labeling of purple plums. About half the people expected labeling to stay about the same, but one person expected more processor labeling on purple plums. This processor's reasoning was that buyers were not going to want to maintain stocks of labels on an insignificant item like purple plums.

Canners were queried regarding the tonnage they have received the past five years, to determine the size relationship of purple plum packers. The tonnage each cannery received over the five years (1966-70) was averaged and compared to the average utilization by canning of the same five years. An indication of the size relationship is as follows:

Average utilization by canning	14,938
Average tonnage of four largest packers	5,736
Average tonnage of eight others	5,410
Average tonnage not accounted for	3,792

This information indicates that the four largest purple plum packers account for 38 percent of the Northwest pack.

Purple plums are canned in four different size cans. The eight-ounce can contains about one serving. There are 24 of these cans per case, but

they are generally reported in government and industry publications on the basis of 48 per case. The No. 303 and No. 2½ are the normal retail can sizes for purple plums, with 24 cans per case. The No. 10 can is used for the institutional outlets with six cans packed per case. Table 8 shows net weight and drained weight for plums in each can size.

Table 8: Purple Plum Can Size, Net Weight and Drained Weight

Can Designation	Net Content Weight	Drained Weight
8 oz.	8-3/4 oz.	4¼ oz.
No. 303	1 lb.	9 oz.
No. 2½	1 lb. 14 oz.	15½ oz.
No. 10	6 lb. 12 oz.	3 lb. 12 oz.

Source: Industry sales information

The purple plum pack is normally reported in actual cases or 24/2½ equivalent cases. Table 9 shows the conversion from actual case to 24/2½ equivalent cases and the percent of the 1969 Northwest purple plum pack in the various can sizes.

Table 9: Northwest 1969 Purple Plum Pack by Can Sizes, and Conversion to 24/2½ Basis

Designation	Percent Actual Cases 1969 Pack	Case Conversion to 24/2½ basis
48/8 oz.	4.2	.58
24/303	25.4	.57
24/2½	38.0	1.00
6/10	31.6	.92
Miscellaneous	.8	

Source: Northwest Food Processors Association

Costs of Processing

An accounting firm has done cost accounting for eight Northwest purple plum canners for several years. These canners had a combined pack of 966,216 cases in 1969. This combined pack represented over 40 percent of the total United States purple plum pack that year. The 1969 season is used to make cost comparisons because this was a full crop in the Northwest, and this is the latest year for which cost figures were available.

Table 10 shows a simplified breakdown of the 1969 average costs per case, and the percent of the total costs that each item represents. The high-cost group of items is cans, cases and labels, which represent 30.4 percent of the $5.26 total cost per case. Variable and fixed overhead combined to make up 21.8 percent of total processing costs per case. The raw prunes in 1969 accounted for $.88 per case, or 16.6 percent of the total costs of processing purple plums.

Table 10: Costs to Pack and Sell Purple Plums, Industry Average 24/2½ Fancy Unpitted

	Costs $/Case		Percent of Total
Direct Labor	$ .590		11.2
Variable Overhead	.185		3.5
Cans, cases and labels	1.596		30.4
Sugar	.753		14.3
Plums	.876		16.6
Manufacturing costs		4.000	
Selling costs	.298		5.7
Overhead	.961		18.3
Total costs		5.259	100.0

Source: Processing Industry records

Table 11 shows the total cost per case to pack and sell purple plums from 1962 through 1969, and the pre-season estimates of costs for 1970.

There is a distinct increase in total costs from 1962 to 1969, representing a general increase in costs of supplies, labor and overhead. There are also higher relative costs in 1963, 1968 and 1970. These higher costs represent short crop years and higher raw prune costs.

The effect of raw prune costs on total processing costs can be shown by comparing 1968 and 1969. The 1968 raw product cost was $1.94 per case, or 30 percent of total costs. This is compared to $.89 per case in 1969. The total cost per case in 1968 was $1.47 more than in 1969. Over 70 percent of this increase was due to increased raw product costs. The Oregon and Washington average packing house door price was about $111.00 per ton in 1968, compared to $54.00 per ton in 1969.

Another cost that deserves special attention is sugar. In 1969 sugar represented 14 percent of the total costs of producing purple plums in the fancy pack. Table 12 shows the relationship between extra heavy, heavy and light syrup and the amount and cost per case for the 1970 estimated costs.

Table 11: Purple Plum Average Costs Per Case, 24/2½ Fancy Unpitted 1962-70

Year	Total Cost of Processing	Raw Prune Costs $ Per Case	Raw Prune Costs % of Total	Total Costs Minus Raw Product
1962	$4.13	.62	15	3.51
1963	5.18	1.26	20	3.92
1964	4.36	.73	17	3.63
1965	4.51	.82	18	3.69
1966	4.72	.90	19	3.82
1967	5.23	1.12	20	4.11
1968	6.73	1.94	30	4.79
1969	5.26	.89	17	4.37
1970 1/	6.00	1.44	20	4.56

1/ Estimated

Source: Processing industry records

The sugar in the syrup is adjusted to just meet minimum requirements for the particular designation that is desired by the packer. Minimum sugar percentages allowed for extra heavy, heavy and light are 26, 21 and 18 percent respectively. The sugar content of the raw plums affects the amount of sugar needed to meet minimum requirements. One canner's spokesman with quality control background estimated that it would take over 30 percent more sugar for fancy grade purple plums from prunes with 18 percent soluble solids compared to prunes with 24 percent.

Table 12: Amount and Cost of Sugar for Purple Plums, 1970 Estimates

	Pounds Per Case	Estimated Cost Per Pound	Estimated Cost Per Case 24/2½
Extra Heavy	7.462	$.105	$.784
Heavy	5.462	.105	.574
Light	3.653	.105	.384

Source: Industry records

Although the above cost estimates are based on fancy pack with extra heavy syrup, in the 1969 cost study the bulk of the prunes were choice grade, packed in heavy syrup. The percentage of the 1969 pack in the various grades and type of syrup was as follows:

Fancy (Extra Heavy)	17.5%
Choice (Heavy)	71.6
Standard (Light)	9.6
Water	1.3

Price information f.o.b. the cannery was secured for 24/2½ choice purple plums. Choice purple plums cost $.21 per case less to pack because of reduced sugar. Using the $.21 per case adjustment, canners obtained a profit five years, but suffered a loss four years in the 1962-70 period. The four years with losses occurred in the five year period 1966-70. Canners did consistently recover variable cost of processing based on 1969 cost breakdown so purple plums contributed something to general overhead every year. If a canner has capability not needed for more profitable packs, a contribution to general overhead from purple plums will improve the total profits for the operation, even though purple plums show a loss.

FACTORS INFLUENCING PURPLE PLUM GROWER PRICES AND REVENUES

Several variables interact in the market-place to form the actual prices received by Northwest purple plum growers. These factors are discussed under three classifications: utilization, consumption (demand) and production (supply). Relations between quantities marketed and prices received are then considered.

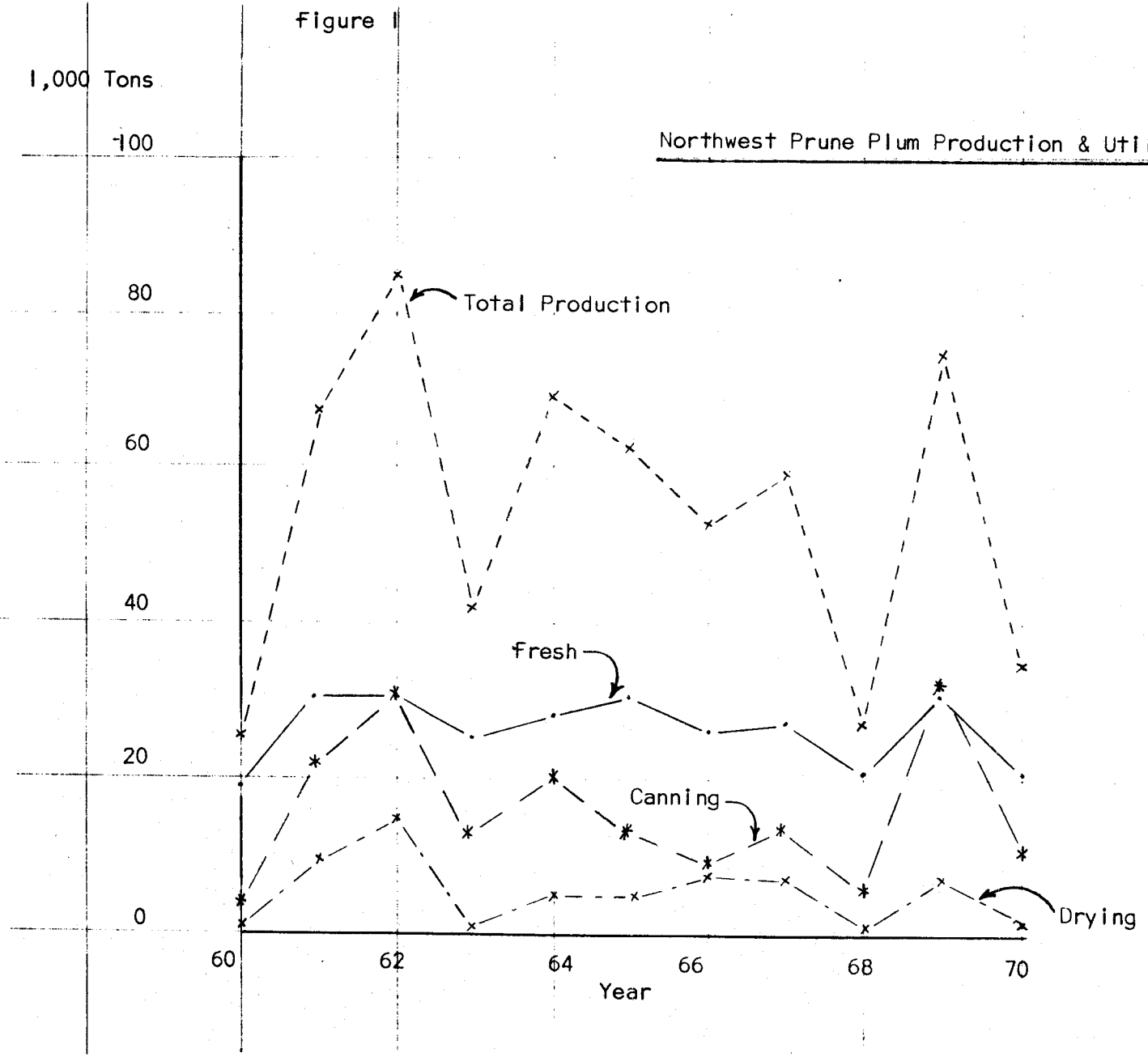
Utilization

Italian-type purple plums are utilized by consumers in three forms: fresh, canned and dried. Figure 1 breaks total Northwest purple plum production in these three uses during the 1960-70 period. It shows that the tonnages of fresh sales have remained fairly constant, in spite of some substantial fluctuations in total production. Tonnages of purple plums canned tend to vary directly with production. Drying volumes followed a pattern similar to those of canned, but the smaller volumes dried resulted in low tonnage fluctuation than that handled by canners.

The Northwest's purple plum drying and canning industries are concentrated west of the Cascade Mountains (most in the Willamette Valley of Oregon). The production areas east of the Cascades concentrate on fresh shipments; very little fresh tonnage is shipped from the western production region. At the same time, Western Oregon is the main influence in Northwest production variations. These relationships explain the similar pattern between fluctuation in total production and canning.

The few canneries located east of the Cascades process purple plums only when tonnage produced in those areas exceed fresh market requirements. Eastern Washington's canning volume were 50 percent of fresh utilization in 1969 and 25 percent of fresh shipments in 1970. Growers located in the Milton-Freewater, Oregon; Yakima, Washington; and Idaho production areas have strong price incentives to sell as much volume as possible through fresh channels. For example, grower prices were 2-4 times greater for fresh than canned sales in Oregon and 2-5 times greater for fresh shipments in Washington during the 1965-69 period (see Appendix Table 1 for a comparison of yearly prices). Heavy cullage and weight loss associated with picking at earlier maturity for the fresh market offset (but not all) of this price advantage. Later maturity and brown rot disease prevented Western Oregon from becoming a major fresh shipping area.

Figure 1



Northwest Prune Plum Production & Utilization

Consumption

The U. S. per capita consumption of canned prunes and plums (primarily counting of purple plums) has declined from an annual average of 0.4 pounds in 1935-49 to about 0.3 pounds in 1965-70. Other prune and plum products have experienced a similar decline in consumption, with the exception of frozen prunes and prune juice. An insignificant volume of prunes are frozen, and prune juice is mostly made from dried prunes in California. While a method for making clear, concentrated juice from Italian prunes has been developed, it has not been utilized in the Northwest on a commercial scale. Per capita consumption of all prune and plum products has dropped from over 8 pounds to less than 4 pounds (fresh weight basis) from 1935 to 1969. Consumption of fresh prunes has declined from over 2.5 pounds per person to about one pound during the same time period (see Appendix Table 2).

Per capita consumption defines the total quantity of a product that is offered for sale and purchased by consumers, divided by U. S. population to place it on a per-person basis. It defines that quantity where supply and demand meet. The supply of purple plums is not highly responsive to price, but varies from year to year due to weather variations and is fixed for the year once harvest is completed. Thus, per capita consumption provides a rough estimate of the "demand" for purple plum.

Retail Demand

A product's retail demand curve shows the quantities consumers will purchase at various prices in a given time period (per year in this study). Two characteristics of canned purple plum demand are of interest to the industry: (1) The "shape" of the demand curve, showing what impact a change in quantity sold (and bought) will have on prices at various levels; and (2) Demand "shifters", i.e., those factors which are expected to increase or decrease demand (and price) in the absence of a shift in supply. Demand shifters are discussed in this section; the shapes of the demand curve for purple plums at the wholesale and grower levels are discussed later.

Three factors (in addition to the price of the product) are important in explaining the quantities of a product purchased by consumers. They are (1) consumers' tastes and preferences, (2) consumers' incomes, and (3) availability and prices of substitute products. Let us consider the impact of these factors on canned purple plum consumption.

Tastes and preferences define the image of a product from the consumers' viewpoint. This image varies by historical time period and among specific consumers as a result of differences in age, ethnic background, social influences on eating patterns, etc. Most product advertising and promotion

is designed to alter consumers' tastes and preferences. For example, promotion of prunes as "the funny fruit" by the California prune industry is designed to alter consumers' attitudes toward that product. The ultimate objective of this campaign is to shift the demand "upward", resulting in larger quantities of prunes sold at higher prices.

Consumption of specific food products responds to increases in consumers' disposable incomes in one of three ways: it increases, decreases, or remains constant. Per capita disposable income has increased steadily in the U. S. during the past thirty years; during the same period canned (and total) plum and prune consumption has steadily declined. This relationship can be interpreted two ways: (1) consumers are substituting other (perhaps higher-priced) products for purple plums in their diets as their incomes increase; or (2) purple plum consumption is income-neutral, and other factors are responsible for the consumption decline. Whichever situation actually exists, the industry cannot expect future increases in per capita incomes (to the extent that they occur) to bolster consumption of purple plums.

Purple plums compete with other (canned, fresh, frozen and dried) fruits for a portion of the consumer's food dollar. Per capita consumption of all fruits has been fairly stable over the past 30 years; total consumption has increased at about the same rate as U. S. population growth. Canned fruits have declined slightly, being displaced by frozen fruits, especially citrus products. Dried fruit consumption has also declined steadily since 1940. Within the canned fruits, total per capita consumption has been very stable since 1950. Applesauce, fruit cocktail and pears have experienced moderate increases in per capita consumption, while most other canned items (including plums and prunes) have declined slightly. Canned peaches had the same per capita consumption in 1950 and in 1970.

Prices and availabilities of competing fruits will undoubtedly continue to place strong limitations on consumption markets for canned purple plums. For example, a large pack of canned cling peaches offered at relatively low prices and heavily promoted would probably displace some of the purple plum market. The growth of institutional food outlets, with an accompanying shift toward frozen food products, is expected to exert downward pressures on total canned fruit (and vegetable) demand.

Wholesale and Producer Demand

There are three levels of demand for purple plums: retail, wholesale and producer or grower. Retail demand translates consumers' purchasing patterns into market prices and quantitites. Processor-seller of canned purple plum in turn face a demand for their products from retail and wholesale buyer. The difference between retail prices and wholesale prices

includes the costs involved in selling the finished product to consumers and the retailer's profit margin.

The processor desires to purchase (receive) purple plums from growers for processing. This producer-level demand translates into the price received by growers for the quantity of purple plums they produce. The difference between (wholesale) prices received by processors and prices paid growers for their purple plums covers all processing costs and the processor's profit (if any exist). Thus, prices at the processor and grower levels are a function of "derived demand"; they are based upon the retail price, with adjustments for costs and profits at each off-farm level.

Demand relationships at the canner and grower levels are plotted for each year during 1960-70 in Figure 2. Two facts are evident from studying these price-quantity relations. First, a consistent pattern existed between quantities available for sale in the U. S. in a given year and prices received by Northwest growers. Secondly, the two demand curves plotted in Figure 1 demonstrate a parallel relationship, indicating that there has been no drastic change in the "marketing margin" between canner sales prices and prices received by growers during the 1960's.

Appendix Figure 1 plots Northwest prune and plum production against average Oregon-Washington prices received for canning fruit each year during the 1960-70 period. These regional price-production relations are consistent with those depicted in Figure 2. These diagrams demonstrate the inverse relationship between quantity produced and prices received at both the grower and processor levels.

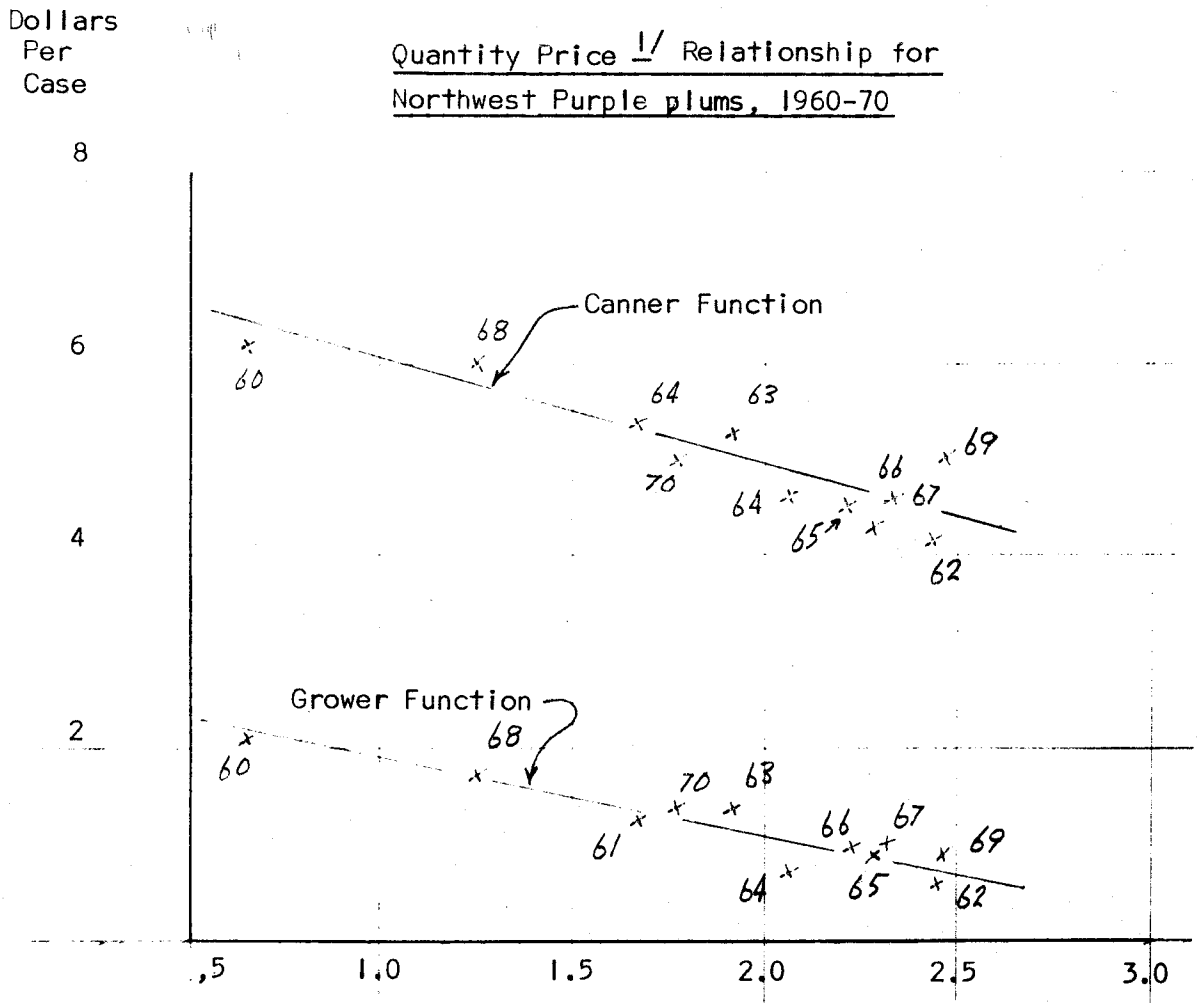
Impact of Production Variations on Prices and Revenues

Substantial year-to-year variations occurred in Northwest purple plum production during the 1960's (Figure 1). At the same time, stability of total demand resulted in consistent relations between prices and canned purple plum supplies during the same time period (Figure 2). Producers and processors are interested in an estimate of how much prices will drop (increase) as production increases (falls). Whether the price change or the quantity change is proportionately more determines whether total revenues will increase or decrease as production varies. These relationships are sometimes referred to as the "price flexibility of demand" for a product.

Grower Level

The grower demand function in Figure 2 was enlarged to facilitate comparisons of quantities and prices (see Appendix Figure 2). Prices and

Figure 2



Pack plus carry-in, million cases
24/2-1/2 basis. U. S. total

1/ Grower price Oregon Washington Average p.h.d. converted to dollars per case.
Northwest Canner price f.o.b. 24/2-1/2 choice

Source: Appendix A Table 3

total revenues received by growers at four supply levels are calculated below. Total revenue equals number of cases supplied times prices at each quantity.

Quantity (million cases)	Grower Price (dollars per case)	Total Revenue (dollars)
1.0	$1.90	$1.90 million
1.5	1.52	2.24 million
2.0	1.15	2.30 million
2.5	.77	1.93 million

As quantities supplied increase from 1.0 million to 2.0 million cases grower prices fall, but the percentage decrease in prices is not as great as the percentage increase in quantities marketed. Therefore, total revenues paid growers for their prunes increase up to this volume. However, as supplies grow from 2.0 to 2.5 million cases, price declines are proportionately greater than quantities marketed, leading to a decrease in total returns paid industry growers. In fact, total revenue was about the same at a production of 2.5 million cases as it was at 1.0 million cases.

It is interesting to note that industry supplies exceeded 2.0 million cases six out of eleven years of the period studied. The individual grower can compare his production and returns over this time period to see how he fared on prices and production relative to these industry averages. At any rate, if an industry objective is to maximize total revenues received by growers, annual supplies in excess of 2 million cases should be discouraged.

Canner Level

A similar analysis was conducted for prices and quantities of purple plums sold at the wholesale (processor) level during the 1960-1970 period (see Appendix Figure 3). Canner prices and total revenues received for the same for volume levels are listed below.

Quantity (million cases)	Canner Price (dollars per case)	Total Revenue (dollars)
1.0	$6.04	$6.04 million
1.5	5.50	8.25 million
2.0	4.95	9.80 million
2.5	4.42	11.02 million

While prices and quantities vary inversely (as they did at the grower level), every increase in quantity leads to an increase in total revenue to the canning industry. This happens because price falls proportionately less than quantity increases between each supply level. Combined with the cost economies associated with processing larger packs, the processor has a double incentive to receive, process and sell as large a volume as possible. This difference between total revenue relations at the grower and canner levels could lead to conflicting interests in and support of supply control programs. Of course, where the canner is a grower-owned cooperative, this may be a matter of transferring money "from one of the grower's pockets to the other." The net effect on returns to cooperative growers depends on several factors (including types of product pools, cost allocations and per unit costs of processing) which are beyond the scope of this report.

Summary

The 1969 census showed Michigan had 32 percent non-bearing trees, Oregon 28 percent, Washington 10 percent and Idaho 9 percent. All areas except Idaho possess the potential to increase production in the next 10 years. In spite of this potential for increased production the Northwest has not solved the set failure problem on Italian type prunes that resulted in short crops in 1960, 1963, 1968 and 1970. The total Northwest production in 1968 was just over 27,000 tons compared to 75,000 tons in 1969.

Cost of production information secured from prune growers indicates efficient growers on suitable prune sites can produce canning prunes for $56.15 per ton in the Willamette Valley of Oregon and $59.00 in the Yakima area in Washington. Average cost per ton is higher because average yields are lower than assumed yields in the two studies.

There are 16 canneries in the Northwest that can purple plums. Eleven of these canneries are located west of the Cascade Mountains and the other five are located east of the Cascade Mountains in the predominantly fresh shipping area. Cost of processing 24/2½ fancy purple plums 1962-70 ranges from $4.13 per case to $6.73 and averaged $5.10 per case. Prune costs range from 15 percent to 30 percent of total cost of processing.

Northwest prune utilization by canning has fluctuated widely in the past 11 years. In 1968 utilization by canning was just over 6,000 tons compared to 32,000 tons in 1969. The canning industry absorbs a relatively high percentage of the large crops and a low percentage of the small crops in the Northwest. Price to growers from fresh shipping prunes in the five years 1965-69 has averaged $96.00 per ton above canning price in Oregon and $115.00 per ton above canning price in Washington.

Per capita consumption of canned purple plums has dropped from 0.4 pound in 1935-44 to 0.2 pound in 1960-69. Prunes sold for canning have an inelastic demand at quantities between 2.5 million and 1.5 million cases. The processor demand is elastic. A drop from 2.5 million cases available to 1.5 million cases brings about an increase in total revenue to growers, but a decrease in total revenue to processors.

Some Possible Approaches to Industry Problems

In the previous sections of this paper a number of potential problems facing the purple plum industry have been presented. All of these problems are a part of one basic problem, relatively low returns to both growers and canners. One way to increase returns is to increase efficiency and reduce costs of production and processing. In the competitive system in this

country, forces are continually at work which encourage the efficient and discourage the inefficient. The purple plum industry needs to retain this competitiveness and continue to increase in efficiency if the product is to retain its place in the food industry along with other canned fruit.

Part of the inefficiency in the purple plum industry is because of the low production in certain years associated with the Italian type prunes in the Northwest. A research effort sponsored by the Oregon Prune Commission has been instituted to find out what is causing set failure and a means for correcting or overcoming this problem.

If this breakthrough does not develop, another suitable canning variety might be a possibility. The Stanley cultivar is being considered for the Northwest, in spite of its many weaknesses, because Stanley does produce fruit under the adverse weather conditions that cause Italian type prunes to fail to set fruit. There is a possibility that a new cultivar will appear from previous selections or from a breeding program that will have desirable canning characteristics, along with better fruit-setting characteristics than Italian.

Reducing the cause of crop failure or reduced production is important to the existence of the purple plum industry, and it should be given top priority for long-range prune industry production programs. The short crop not only causes inefficiencies in production and processing, it causes inefficiency in wholesaling and retailing of purple plums which contribute directly to low returns.

Another way to increase returns to growers and processors is to increase the price consumers pay for purple plums. The section on demand indicates the effect quantity offered by the canning industry has on the Northwest f.o.b. price received for 24/2½ choice purple plums.

Promotion, along with consistent quality that encourages consumers to come back for more purple plums, could increase the use of this fruit. Promotion and quality control may result in switch buying that could benefit the prune industry in the short run.

Many non-agricultural industries figure out what it costs to produce and market its product and then produce only the quantity that can be sold at a price high enough to return a profit. It might be interesting to make some assumptions as shown below to see how the prune industry might operate to insure a profit.

The cost of production information indicates efficient growers in Oregon and Washington can produce prunes for canning at $60.00 per ton. This would be about $.95 per case 24/2½. Using 1969 processing costs (taking out cost of prunes and adjusting from fancy to choice) the cost of processing is about

$4.15. This would give cost of producing and processing of $5.10 for 24/2½ choice purple plums. Assuming the demand function is correct in Appendix Figure 2, pack plus carry-in could be almost 1.8 million cases, 24/2½ basis. A smaller quantity would increase the price buyers would pay above $5.10, and this increase could be returned to growers and processors.

Promotion and quality control, which might cost $.15 per case, could be used to change consumer's preferences from other fruit to prunes thus shifting the demand curve to the right. The promotion and quality control would need to shift the demand curve so there could be a return on the investment in promotion and quality control, or so a larger quantity could be sold for the cost of producing and processing, plus promotion and quality control.

The above situation could be set up for the total purple plum pack and all market areas, or just for part of the pack in certain market areas. Perhaps what is needed is some market testing whereby the over all market could be segmented and in certain areas supply and quality control supported by a promotional program could be tested.

With an elastic demand (as in the higher quantities at the grower level) the increase in total revenue associated with reduced quantities available makes increased returns from reduced quantities obvious. Even with an inelastic demand situation lower quantities can increase profit even though total revenue may be less. It is the return above cost of production or processing that results in profit. Marketing orders are a possible method to control quantity, but state or federal legislation would have to be enacted to make marketing orders applicable to canned purple plums.

Promotion has come into disfavor with many people because in some cases promotion has not accomplished what was expected. If promotion is utilized for purple plums, extreme care needs to be used in setting up the promotion so it does result in a return above that of the money invested in promotion. This return could be an increased price received, increased quantities at the same price or just maintaining demand where it is when other factors are adversely affecting purple plums.

Hopefully this paper will stimulate thinking within the industry which may contribute to an improvement in the economic position of both the prune grower and the purple plum canner.

Appendix Table 1:

Prune Prices Received by Growers, 1965-69

	Oregon			Washington		Idaho
	Fresh	Canned	Dried[2]	Fresh	Canned	Fresh
1965	$150.00	56.20	82.30	176.00	62.00	107.00
1966	119.00[1]	51.50	85.70	209.00	82.00	170.00
1967	165.00	64.70	79.10	181.00	76.00	146.00
1968	181.00	106.00	143.00	214.00	116.00	180.00
1969	153.00	53.70	86.00	186.00	54.00	130.00
Average 65-69	162.40	66.42	95.22	193.20	78.00	146.60

[1]Milton-Freewater area did not have a crop that year because of freeze damage.

[2]Drying costs of $25-30/ton included in grower price.

Source: Oregon Commodity Data Sheet (1970).

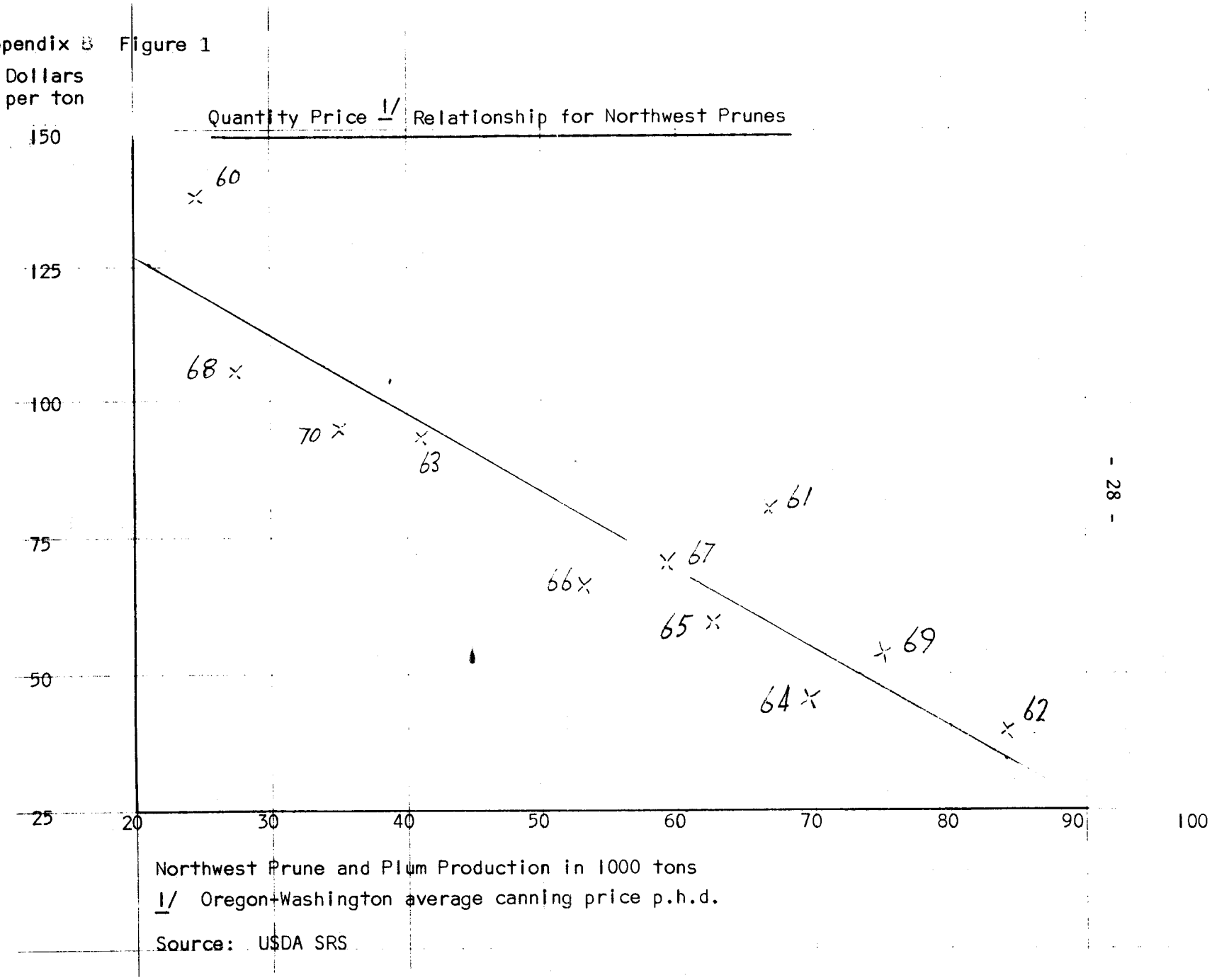
Appendix Table 2:

Plums and prunes, fresh-weight equivalent:
Per Capita Consumption, United States, 1935-69

Year	Fresh	Processed					Total fresh and processed
		Canned	Frozen	Dried[1/]	Juice[1/]	Total processed	
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1935	2.50	0.33	----	5.40	0.02	5.75	8.25
1936	2.68	.46	----	4.59	.04	5.09	7.77
1937	2.66	.50	----	5.44	.18	6.12	8.78
1938	2.67	.40	----	3.95	.20	4.55	7.22
1939	2.74	.39	----	5.29	.07	5.75	8.49
1940	2.50	.43	----	5.04	.06	5.53	8.03
1941	2.40	.42	3/	4.02	.06	4.50	6.90
1942	2.41	.45	3/	3.35	.43	4.23	6.64
1943	2.18	.41	3/	5.38	.46	6.25	8.43
1944	2.74	.33	3/	4.57	.58	5.48	8.22
1945	2.35	.48	0.11	4.99	.90	6.48	8.83
1946	2.73	.55	.08	3.45	.91	4.99	7.72
1947	2.26	.47	.12	2.18	.76	3.53	5.79
1948	2.15	.40	.06	2.02	.75	3.23	5.38
1949	2.40	.39	.02	2.43	.80	3.64	6.04
1950	1.75	.32	.03	2.67	.97	3.96	5.71
1951	2.25	.21	.03	2.05	.78	3.07	5.32
1952	1.72	.30	.04	2.42	.88	3.64	5.36
1953	2.01	.35	.04	2.10	.95	3.44	5.45
1954	1.48	.29	.02	2.39	.98	3.68	5.16
1955	1.77	.34	.03	1.82	1.02	3.21	4.98
1956	1.84	.36	.03	2.11	1.27	3.77	5.61
1957	1.53	.35	.01	2.24	1.22	3.82	5.35
1958	1.15	.28	.01	1.71	1.06	3.06	4.21
1959	1.60	.24	.08	1.82	.88	3.02	4.62
1960	1.17	.20	.02	1.58	1.07	2.87	4.04
1961	1.35	.15	.01	1.61	1.06	2.83	4.18
1962	1.32	.25	.01	1.75	1.07	3.08	4.40
1963	1.41	.22	.05	1.50	1.12	2.89	4.30
1964	1.51	.23	.06	1.76	1.12	3.17	4.68
1965	1.41	.21	.05	1.55	1.17	2.98	4.39
1966	1.19	.25	.04	1.42	1.11	2.82	4.01
1967	1.25	.26	.06	1.46	1.10	2.88	4.13
1968	1.24	.19	.05	1.72	.75	2.71	3.95
1969[4/]	1.03	.19	.04	1.89	.73	2.85	3.88

[1/] All forms of dried prunes except those used for juice; season beginning year shown.
[2/] Made from dried prunes.
[3/] Separate data not available
[4/] Preliminary.
Source: ESAD-ERS-USDA

Appendix B Figure 1



Northwest Prune and Plum Production in 1000 tons

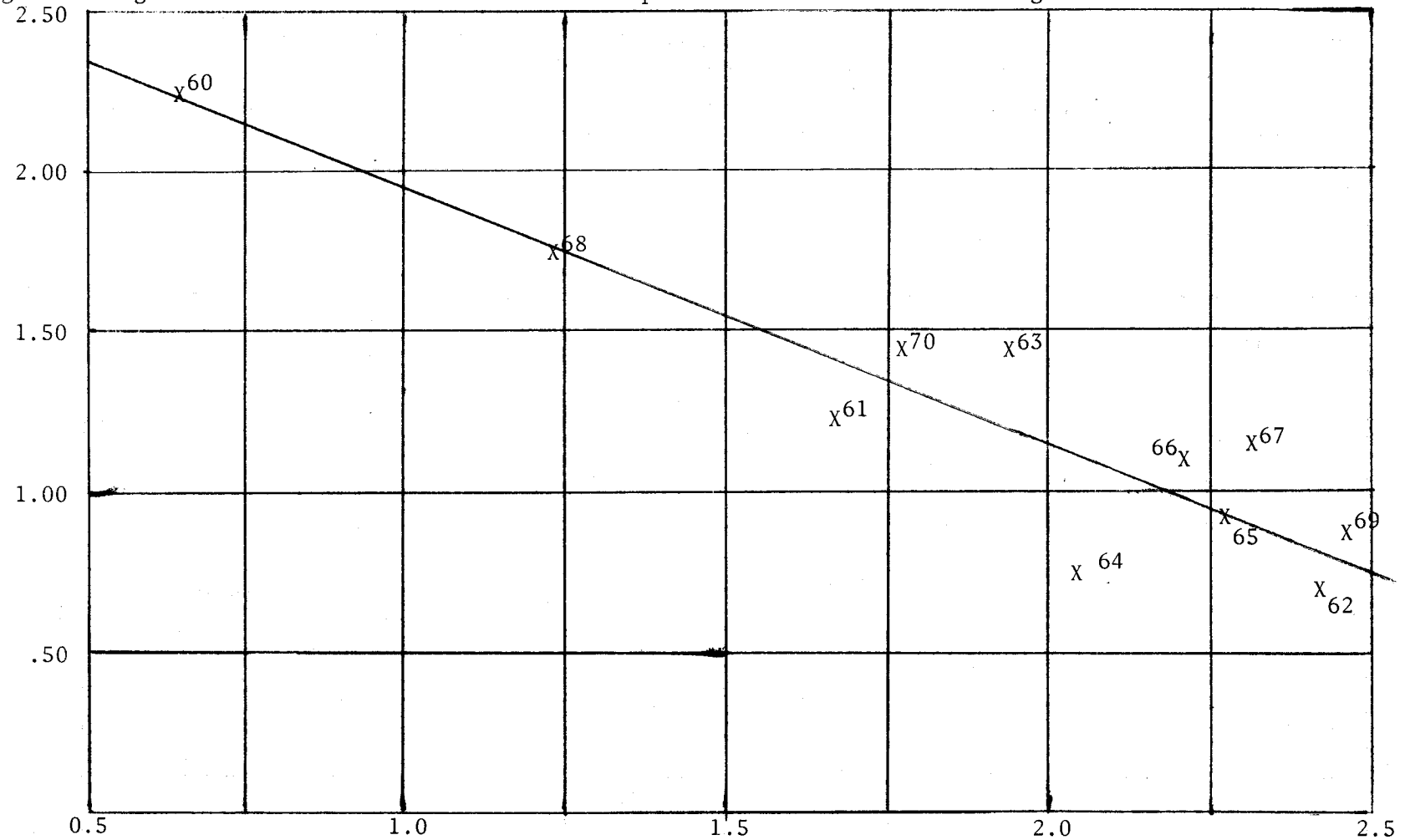
1/ Oregon+Washington average canning price p.h.d.

Source: USDA SRS

APPENDIX FIGURE 2:

Dollars per Case Received by Oregon-Washington Growers

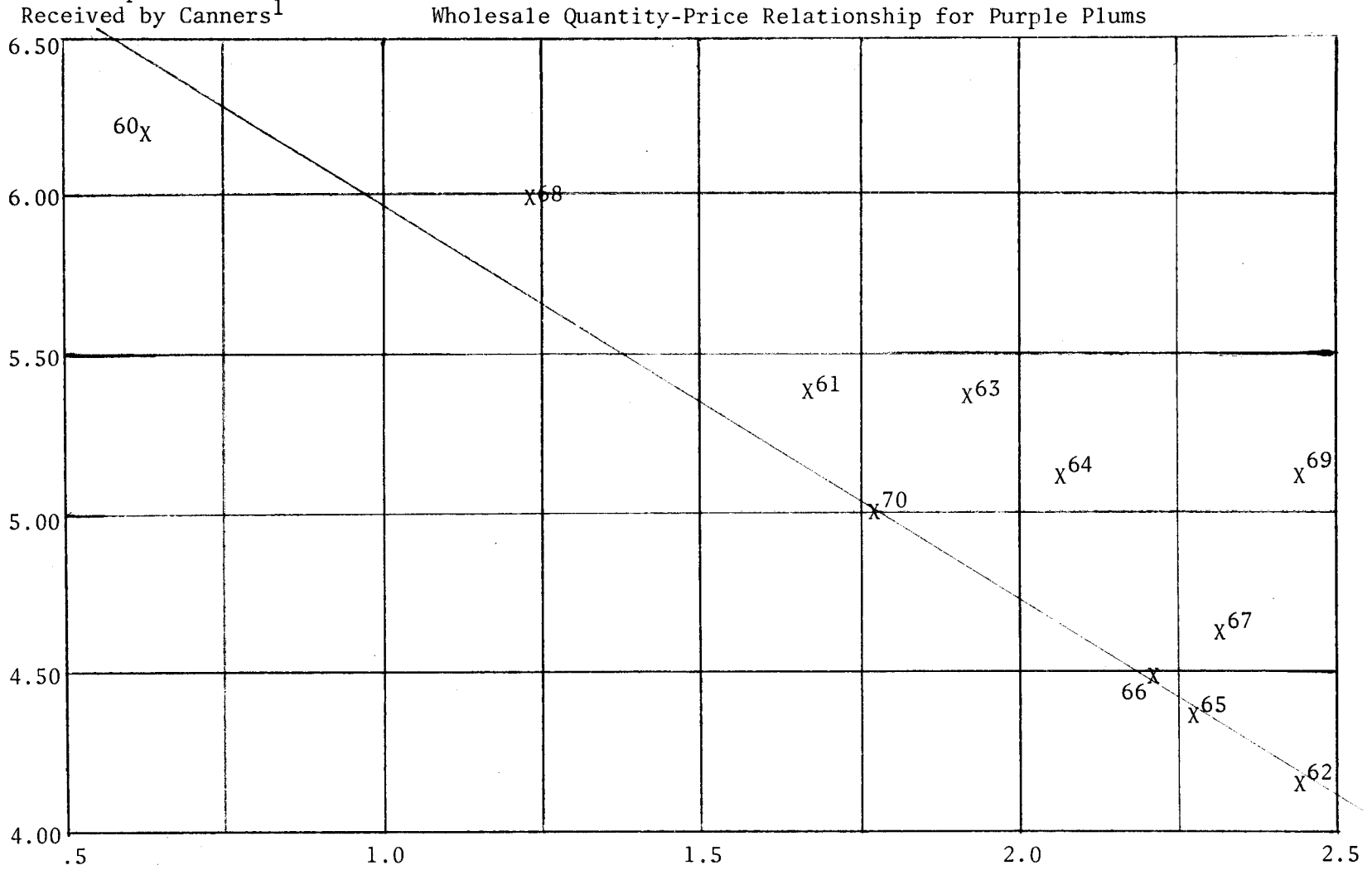
Grower Quantity Price [1/] Relationships for Prunes Sold for Canning



U. S. Pack plus carry-in, million cases, 24/2-½ basis.

[1/] Oregon-Washington average canning price p.h.d. converted from $/ton to $/case (63.66 cases/ton)
Source: USDA SRS

APPENDIX FIGURE 3:



Pack plus carry-in, million cases 24/2½ basis. U. S. total

[1]F.O.B. prices received for choice purple plums by Northwest canners, 24/2½ case basis.
Source: USDA SRS
Prices compiled by R. W. Anderson to be used in his Ph.D. thesis, Michigan State University

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Canner Personnel Contacted in Purple Plum Study

Salem Area

Richard Barger, Agripac
John Stone, Dole Corp.
Dan Potter, Kolstad Canning Co.
Farmer Smith, Stayton Canning Co.
Al Randall, United Flav-R-Pac
Bob House, U. S. P. Corp.
Mark Gehlar, Oregon Fruit Products

Portland Area

Howard Blackley, Diamond Fruit Co.
Don Berryhill, Del Monte
Allen McDonald, Northwest Packing Co.
Paul Zeger, Portland Canning Co.
Ted Bell, Hudson House Inc.*
E. M. Paupack, Sales, Nor-Pac Canners
Dave Pahl, Northwest Food Processors Association

Yakima Area

Jim Edeler, Sales, Sno-Kist Growers
E. I. Holme, Del Monte*
E. M. Carter, Libby McNeill and Libby*

Idaho

Roy Wenig, Stokely-Van Camp
Marvin Ahrens, Top Canning, Inc.*

*Telephone Interview

Northwest Purple Plum Canners

Canners who have and intend to continue to pack purple plums

Agripac Inc. (Merger of Blue Lake Packers and Eugene Fruit Growers)
Del Monte, Vancouver and Yakima
Diamond Fruit Growers, Vancouver
Dole Co.
Hudson House, Inc.,
Libby, McNeill and Libby, Yakima
Northwest Packing Co.
Oregon Fruit Products
Portland Canning Co.
Sno-Kist Growers
Stayton Canning Co.
Stokely-Van Camp
Top Canning
USP Corp.
United Flav-R-Pac

Others who have packed in recent past years

Kolstad Canning Co.
Fruitland Canning Association
Starr Foods