Pear Cultivars of North America[4]

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Origin

All of the major pear cultivars of North America originated as chance seedlings rather than from breeding programs. All are more than 100 years old and some are nearly 200 years old. Bartlett (Williams), Anjou, Bosc, Hardy, Comice, and Winter Nelis, originated in Europe between about 1795 and 1850. Seckel, Kieffer, and Clapp Favorite originated in the United States between about 1800 and 1860. All are *Pyrus communis* L. except Keiffer which is a hybrid of the oriental pear, *Pyrus pyrifolia* (Burm.) Nak. Limited acreages of oriental cultivars have been planted recently in the Pacific Coast states.

The object of most of the pear breeding programs in North America has been the selection and development of hardy, high quality cultivars that are resistant to fireblight (*Erwinia amylovora* (Burr.) Winsl. et. al.). Blight resistance is not required for cultivars grown in the Pacific Slope states and British Columbia but is sorely needed for most of the fruit growing areas east of the continental divide. It is hoped that some of the new blight resistant cultivars released in recent years will be of the same high quality as are the blight susceptible cultivars currently being grown.

Climate

Most of the commercial cultivars have winter chilling requirements of 1000 to 1500 hours, but Kieffer and a number of other oriental hybrids appear to acquire less than 800 hours to break rest.

Domestic pears are generally more hardy than peaches but less hardy than apples. A few cultivars derived from *Pyrus ussuriensis* Max. however, are as hardy as most apples. Thus the southern limits are set by warm winters with insufficient chilling and the northern limits are set by temperatures low enough to cause winter killing.

The best climate for growing quality pears is one that is warm to hot during the summer and has enough frost-free days to mature the fruit. The length of growing season required varies from 100 to 200 days, depending upon cultivar. Where irrigation is not available, 35 or more inches of annual rainfall are needed. Wet and humid conditions during spring and early summer are undesirable because they cause fruit russetting and also permit diseases to infect the trees.

Geographic Distribution

Besides the obvious constraints of climate, pear orchards are primarily limited to areas where fireblight can be controlled, namely the arid regions of the Pacific Slope and areas near oceans and large lakes that are too cool in spring for the disease to get started.

The dominant pear areas of the west are in California, Washington, Oregon, Chihuahua (Mexico), and British Columbia. Of the U.S. annual production of about 750,000 tons, more than 90% is produced in the three coastal states. Primary production in the East occurs near the lakes in Ontario, New York, and Michigan.

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Pear Production in Western North America

The major production areas for pears in the western United States and Canada are listed in Table 1. Four cultivars make up 99% of the production with 2 of these, Bartlett and Anjou accounting for 95% of the total (Table 2). The remaining production mostly involves the following cultivars: Bosc, Comice, Hardy, Winter Nelis, Seckel, Forelle and Packham's Triumph.

Approximately 60% of the west's production is processed. The main cultivar for this is Bartlett. Only 23% of the production of this cultivar is marketed fresh. The other cultivars are marketed fresh except for Hardy and Winter Nelis, which are used in fruit cocktail processing. Only recently, has cullage of these cultivars been utilized for puree products or by juicing the unripe fruit for concentrate juice or fermented juice used in 'pop' wines.

Fresh marketed pears are packed in paper wraps or tight fill in 20 or 43.5 pound cardboard containers. Pears are either packed and cold stored in the southern districts, or stored loose in bins and packed before shipment in the northern regions. Cold storage or "Controlled Atmosphere" storage of the late keeping cultivars; Anjou, Winter Nelis, Eldorado, or Packham's Triumph seldom last more than 9 months when marketing ends in May or June. Therefore, there is usually a marketing gap of one to two months before early harvest of Bartletts from the Sacramento River Delta area reach marketing channels in mid-July. Only 20% of the fresh marketed pears are sold in the West while 31% are shipped to New England and Mid Atlantic States, 17% are sent to the midwest, 15% to the south and 17% exported, mostly to Canada, Sweden, Brazil, Norway and Germany.

Table 1. Pear Production in Western United States and Canada.

Regions	Pear[1] Production (Tonnes)	Percent of Total Western U.S.A.
California	286,500	43.5
Sacramento River Valley	128,000	19.4
North Coastal	100,000	15.2
Sierra Foothills	22,000	3.3
Bay Area	20,500	3.1
So. Calif. & Other	16,000	2.4
Oregon	160,000	24.3
Mid Columbia & S.W. Wash.	100,000	15.2
Southern Oregon	60,000	9.3
Washington	180,000	27.3
Yakima River Valley	105,000	16.0
North Central Wash.	75,000	11.4
British Columbia		
Okanogan Valley	20,250	3.1
Colorado	5,500	0.8
Utah	4,500	0.6
Idaho	1,500	0.2
Western States & B.C.	658,250	100.0

[1]Average pear production during the years 1973-78. (Tonnes = 1.1 short ton)

Western Pear Cultivars and Their Characteristics (Tables 3, 4, 5 and 6)

Bartlett is the main cultivar from the standpoint of production, fruit quality, and utilization in the U.S. Bartlett trees are productive under a wide range of latitude and conditions, but pollen tube growth in the flower style is very temperature dependent and fruit set can be low when bloom is followed by mean temperatures below 8° C. Late or "rattail" bloom of Bartlett increases its infection to fireblight when it develops during a warm period favoring bacteria inoculum.

Pre-mature ripening of the cultivar is a common and devastating occurrence in cooler climates such as in the northwest Oregon and central Wash-

Table 2. Cultivars in Relation to Pear Production in the Western United States and Canada.

Cultivar	Pear[1] Production (Tonnes)	Percent Total Production	Principal Regions Grown	Production Level 1973-78
Bartlett (Williams)	507,000	77.0	All	inc. 1%
Anjou (Beurre d')	121,800	18.5	Ore., Wash., B.C.	inc. 50%
Bosc (Kaiser)	21,200	3.2	Ore., Wash., Cal.	inc. 44%
Comice (Doyenne du)	5,000	0.8	S. Ore., Cal.	inc. 12%
Hardy (Beurre)	1,500	0.2	Bay Area	dec.
W. Nelis (Nelis d'Hiver)	1,400	0.2	Cal.	dec.
Seckel	1,200	0.2	Ore., Wash.	same
Forelle	200	<0.1	Ore., Wash.	same
Nijisseiki	200	<0.1	Sac. R. Va.	inc.
Packham's (Triumph)	100	<0.1	S. Ore.	dec.
Other	450	<0.1		
Total	658,250	100.0		

[1]Average pear production during the years of 1973-78. (Tonnes = 1.1 short ton)

ington areas making processors nervous about cool periods previous to harvest.

Acreage of Bartlett has been stable during the past 10 years where it is widely distributed in the west.

Anjou is grown exclusively in the northwest and British Columbia because of its adaptation and long storage life. Lack of fruit set is a common weakness of this cultivar and the tree requires heavy head pruning, sunlight, and high N applications (more than that of the Bartlett) besides good cross pollination for adequate set. Anjou is compatible on quince rootstock but is seldom used on it. Fruit finish and production of Anjou are very susceptible to insect damage and pests must be carefully monitored.

A ripe Anjou for eating is not related with a color change as in Bartlett (from green to yellow). This makes it necessary to educate the consumer. Waxing of the Anjou pear is more prevalent in the packing house of the northwest, but the process may reduce ripening if not carefully controlled.

Anjou acreage and production in the northwest has increased in the last 10 years. The major reason for this is success in extended storage and marketing.

Bosc is a widely grown dessert pear throughout southern Europe and the southern hemisphere besides the United States. The trees are very productive and can set frequently seedless fruit, but they still require pollinizers. However, the trees are difficult to train because of their long growth habit without branching. Bosc is not compatible on quince without support or Old Home interstock. Fruit is heavily russetted and remains firm even when ripe. It is highly prized for baking or drying. Consumer publicity by the industry during the last four decades has increased sales and encouraged new plantings of the cultivar.

Comice is considered the best eating pear because of its juicy buttery texture and well balanced flavor. It is widely grown throughout the world but in the United States it has been

Table 3. Source and Production of Principal Pear Cultivars of Western States and Canada.

Cultivar	Source Country	Age Approx. Years	Production Bearing age[1] (years) Q	Fr.	Crop level[2] (Tonnes/ha)	Fruit Set[3] (per 100 cl.)	Nutritional Status (Levels)
Bartlett	England	1790	6	7	35-90	50-60	Low K High N
Anjou	Belgium	1819	8	9	22-70	30-40	Low B, Ca, N High K
Bosc	France	1830	6	6	40-90	80-90	Low K, N
Comice	France	1849	7	9	22-70	20-30	Low N, Fe, Zn
W. Nelis	Belgium	1814	6	7	35-90	70-90	
Seckel	USA-Penn.	1790	6	6	22-45	100-120	Low N, K
Forelle	Germany	1800	–	7	30-75	60-80	
Packham	Australia	1896	6	7	22-70	30-40	Low N
Eldorado	USA-Calif.	1950	6	7	35-90	50-60	Low K, Zn
Hardy	France	1840	6	7	35-90	60-80	

[1]Age of trees with full bearing surface producing 22 Tonnes/ha (10 tons/acre) on Quince (Q) and French (Fr.) rootstocks.
[2]Production of mature trees with full bearing surface, lower figure is average and high figure is reported high yields on a commercial orchard.
[3]Fruit set usually occurring under proper pollenation for a productive crop. Fruit thinning of several cultivars is necessary for best fruit size, particularly Bartlett and Seckel.

Table 4. Pollination Characteristics and Tolerance Levels of Principal Pear Cultivars in Western States and Canada.

Cultivar	Bloom Period	Pollenizers	Cold Tolerance: Winter Kill[1] (1-5)	Cold Tolerance: Frost Inj.[2] (1-5)	Pest Tolerance To—: Fire-Blight (1-5)	Pest Tolerance To—: Blossom Blast.[3] (1-5)	Insect[4] Pressure (1-5)
Bartlett	mid.	Anjou, Bosc	3	5	2	3	5
Anjou	early	Bartlett, Seckel	4	2	4	1	1
Bosc	v. late	Bartlett, Comice	2	fl-1 fr-5	2	3	2
Comice	late	Bartlett, Bosc	5	fl-5 fr-1	3	4	3
Hardy	mid.	Bartlett, Bosc	3	5	3	4	3
W. Nelis	mid.	Bartlett, Anjou	4	5	3	1	4
Seckel	mid.	Anjou, Eldorado	3	fl-2 fr-4	3	2	4
Forelle	early	Anjou, Eldorado	4	4	1	4	4
Packham's Triumph	mid.	Bartlett, Comice	2	4	3	1	4
Eldorado	early	Anjou, Bartlett	3	1	2	4	4

[1]Cold tolerance of the whole tree.
[2]Cold tolerance to frost injury to flower buds, flowers, and fruit.
[3]Tolerance to Pseudomonas syringae blossom infection.
[4]Tolerance to spider mites and pear psylla infestation.

Table 5. Utilization, Harvest and Storage Characteristics of Principal Pear Cultivars in Western U.S. and Canada.

Cultivar	Utilization	Growing Season Days	Harvest Period	Storage Periods Cold (0°C.)	CA	Storage Disorders	Comments.
Bartlett	Process, fresh	120	Jul-Aug	3	4	Pre-mature ripening	Low solids
Anjou	Fresh, juice	140	Aug-Sep	7	9	Corkspot, surface, scald	CA fruit good qual.
Bosc	Fresh, juice	150	Sep-Oct	6	8	Rot, dry fr.	Good handler and shipper
Comice	Fresh, gift	150	mid-Sep	5	6	Scald	Prime eating poor handler
Hardy	Process, fresh	130	Aug-Sep	3	–		Processing only
W. Nelis	Fresh, process	160	Sep-Oct	6	8	Rot	Used as pollenizer
Seckel	Fresh	145	e-Sep	4	–	Breakdown, dry	High s. sol. small fruit
Forelle	Fresh	165	late-Sep	6	–		Basket pear excell. qual.
Packham's Triumph	Fresh	160	Sep-Oct	7	9	Scald	Excell. qual. rough surface
Eldorado	Fresh	160	Sep-Oct	8	10	Scald	Low s. sol. but juicy

grown principally in southern Oregon and California. The trees are late bearers and unproductive unless grown directly on quince or other precocious rootstock.

Comice is highly prized for gift packaging where half of the crop is usually sold. However, recently a greater proportion of the crop is sold to supermarkets making better handling techniques necessary to keep it attractive on the market. New plantings have been restricted primarily to southern Oregon.

Hardy is grown principally in the Santa Clara Valley of California. Originally it was for export markets. Recently it has been used for cocktail fruit mixes only. Processors prefer Bartletts and therefore Hardy production is declining rapidly. The cultivar has been used for an interstock on quince in the past because of its compatibility with quince. However, Old Home has been preferred for this usage because of its blight resistance.

Winter Nelis was the principal pollinizer for Bartlett, particularly in California. The fruit is used for processing and fresh market, but Nelis has not commanded the same return as Bartlett and Bosc and has been replaced by Bosc as a pollinizer.

Table 6. Source and Some Characteristics of Minor and New Pear Cultivars Planted in the Western U.S. and Canada.

Minor and New Cultivars	Source Country	Year Released	Region	Planted (ha)	Bloom Period	Harvest Period	Storage (mos)	Comments.
Red Pears								
Red Clapp Favorite (Starkrimson)	USA-Mich	1956	Ore.	20	mid	July	1	Early market Solid red.
Red Bartlett (Max Red, Sensation)	US-Aust	1950-60	Wash, Ore.	200 100	mid	Aug	4	Bartlett qual. Stripe red.
Red Anjou	USA-Ore	1957	Wash, Ore.	5 20	mid	Sep	7	Anjou qual. Solid red.
Red Angelo	USA-Ore	1977	S. Ore.	10	mid	Oct	10	Forelle qual. Solid red.
Red Comice	USA-Ore	1975	Ore.	75	late	Sep	5	Comice qual. Stripe red.
Rogue Red	USA-Ore	1968	S. Ore.	10	mid	Sep	8	Seckel qual. Blush red.
Green Pears								
B. Prococe Morettini	Italy	1956	Cent. Val.	30	mid	July-Aug	2	Excell. early qual.
California	USA	1972	Ore.	10	mid	Aug	4	Comice qual. non-uniform.
Sierra	Canada (BC)	1965	B.C.	10	mid	Aug	1	Home-use high solids.
Asian Pears								
Nijisseiki (20th Cent.)	Japan	1890	Cal, Wash.	100	early	Aug-Sep	4	Crisp, low solids.
Shinseiki (New Cent.)	Japan	1950	Cal.	10	early	Aug	4	Crisp, low solids
Chojuro	Japan	1935	Cal.	20	early	Aug-Sep	4	Russetted, crisp.

Seckel is very productive but the small fruit size requires hand thinning to produce marketable sizes. The cultivar which was widely grown at one time in New York and the New England states is now limited to a few orchards in the west. The fruit is primarily used for pickling because of its size and high solids. This specialty fruit can bring top fruit prices.

Forelle is another specialty fruit and is primarily used for basket displays because of its beauty and excellent shelf life. The production of Forelle is limited because of its susceptibility to fireblight. The fruit commands top fruit prices.

Nijisseiki (or Twentieth Century) has been produced for the Asian Americans located in the west. The Twentieth Century pear like other pear apple fruit is crisp when ready to eat. Asians use it in their cooking such as in the wok. New Asian immi-

grants have produced increasing demands for greater production.

Eldorado is a United States cultivar from a Bartlett × Winter Nelis chance seedling. Chief interest in this cultivar was the long storage life extending the marketing season while it retains the Bartlett appearance. However, low solids and small fruit sizes plus low tolerance to frost, freezes, and fireblight made it a difficult cultivar to sell to the consumer and grower. Some interest still remains because of its keeping quality and juiciness.

Red mutations of several pear cultivars have been planted recently because of consumer interest in red pears. These are: Clapp Favorite; Bartlett (two mutations); Max Red and Red Sensation; Anjou; and Comice. These mutations are essentially similar in production and fruit quality to the equivalent green fruited cultivars. Other red fruited cultivars which have been developed from various breeding programs and which are planted on a minor scale are Reimer Red; Canal; Red Angelo; and Rogue Red. The last two have long storage capabilities which extend their marketing period. Red fruited cultivars such as Max Red Bartlett are often weak in tree growth and have poor productivity because of virus infected scion wood. Red pears have commanded higher prices during the past few years but how long this market advantage will occur depends on production quality and consumer preference. Sale of Red Bartletts in 1950 to 1970 decreased markedly because of poor fruit quality.

Few green fruited cultivars have been planted recently except for the principal cultivars. Butirra Precoce Morettini (Coscia × Bartlett) was planted in California for the very early market. Although the fruit has high eating quality, it is usually harvested too early to be attractive. California (Red Bartlett × Comice) is supposed to have the quality of Comice without the production problems associated with it. However, early reports indicate the fruit is rough and not uniform in shape and color. Sierra (Bartlett × Marguerite Marilate) is a recent release from British Columbia which is used for home and fruit stand production in the Okanagan Valley.

Asian pear cultivars (besides Twentieth Century) in very limited production are Shinseiki (New Century) and Chojuro. There has been renewed interest in California and Oregon because of the good market demand for these. The production of Asian pears requires careful thinning to discourage alternate bearing which increases fruit sizes. Asian pear cultivars maintain tree vigor and production best when grown on Oriental rootstocks, i.e. *Pyrus calleryana* or *P. betulaefolia.* These cultivars are more susceptible to pear psylla insect pressures, to blossom blast (*Pseudomonas*), and to spring frost at bloom than the French cultivars. Several Chinese cultivars that have been available for production are: Tsu Li and Ya Li. "Asian pears" by William Griggs is an excellent review of their description and production in California.

The future of the western pear industry depends on its competitive strength with other fruits, particularly apple. Increased pear production has taken advantage of the "back to eating fresh fruit" movement. But, pear production has several deficiencies and problems that must be solved such as: (1) low yields, (2) fireblight susceptibility, (3) cost and lack of controlling pear psylla, (4) frost and pollination problems in some regions and in some major cultivars, (5) lack of a range of clonal rootstocks for growth control and cropping, and (6) a long storage and extended marketing season for available fresh fruit year round now found for apples. New cultivars developed from an active breeding pro-

gram could solve many if not all of these difficulties. However, at present, there is no active breeding program in the west except for pear rootstocks in Oregon. Effects of gamma radiation on growth control and self fertility of Comice is presently being studied in Oregon. However, the breeding program for new cultivars in California and Oregon have been terminated because of the lack of industry interest in resistance or in production. For now, production of pears in the west will favor fresh marketed pears but still rely heavily on the processing industry and the juice manufacturer to maintain high cullage prices.

Pear Production in Eastern North America

Pear production in eastern North America occurs primarily in Michigan, New York, Pennsylvania, Connecticut and Ontario. The four eastern states produce about 32,000 tons or less than five percent of the U.S. pear crop (Table 7), while Ontario produces about 19,000 tons or 50 percent of Canada's pear production.

Bartlett is the principal variety (9, 10, 11). Nearly 90 percent of the pear trees in Michigan and about two-thirds of the trees in New York and Ontario are Bartlett (Table 8). Bosc is second in tree numbers in each of these areas followed by Kieffer in Michigan and Ontario. Clapp Favorite is another variety of some importance in all these production areas. Bosc and Clapp Favorite are planted as pollinizer varieties for Bartlett.

The majority of pears produced in these three areas is processed as puree for baby foods or canned pear halves. Kieffer is grown only for processing

Table 7. Pear Production in Eastern States and percent of U.S. Crop*

Location	1964-68	1969-73	1974-78
		Tons	
Michigan	28,440	18,100	11,315
New York	16,580	16,120	15,300
Pennsylvania	2,980	3,090	3.700
Connecticut	1,806	1,786	1,500
Total	49,826	38,896	31,815
U.S. Production	658,060	657,164	765,305
% of U.S.	7.6	5.9	4.2

*Commercial pear production as reported by the U.S. Statistical Reporting Service.

Table 8. Pear Varieties of the Eastern U.S. and Canadian Production Areas

Variety	Michigan[1] %	New York[2] %	Ontario[3] %
Bartlett	87.3	66.9	61.5
Bosc	7.6	19.8	14.4
Kieffer	2.8		12.0
Clapp Favorite	1.1	6.9	5.2
Seckel		2.3	
Anjou			2.3
Other	1.1	4.1	4.7

[1]1978 tree census (9).
[2]1975 Orchard and Vineyard Survey (10).
[3]1977 research committee survey (11).

while Bosc and Clapp Favorite are usually marketed fresh.

Pear production is declining in the eastern production areas. Pear decline in the West Coast production areas in the early 1960's encouraged expansion in eastern plantings. These orchardists did not anticipate the rapid recovery of the level of production by the West Coast pear industry. New high density plantings in the western areas and higher yields per acre subsequently placed eastern producers at a disadvantage. Consequently, eastern pear acreage has declined from the mid-1960's.

A 1969 report by Harsh, et. al indicated future unfavorable pear prices for Michigan orchardists, reflecting higher production costs and low fruit prices (2). The 1978 Michigan tree census revealed a 71 percent decline from 1973 survey data for pear acreage and tree numbers (Table 9) (8,9).

Cost evaluation figures for Michigan fruit production in 1979 were projected from small group discussions with orchardists for pear (6), tart cherry (5), apple (4) and peach (7). Utilizing these grower current production costs, their production levels (which exceed the state average) and fruit prices received for 1974-78, extension farm management specialists compute per acre production and harvest costs and gross returns. Multiplying the reported grower yields by the 1974-78 average fruit prices minus these production costs indicate pear to have the lowest return per acre (Table 10). Such calculations indicate a grower loss for his pear enterprise.

Table 9. Changes in Michigan Pear Acreage and Tree Numbers, 1973 vs. 1978

Year	Acres	Trees
1973[1]	10,906	1,048,562
1978[2]	3,198	295,738

[1]1973 Michigan Fruit Tree Survey (8).
[2]1978 Michigan Fruit Tree Survey (9).

Michigan orchardists experience extremely low pear yields per acre. Average yields in Michigan are less than the 200 bushels per acre assumed by orchardists participating in production cost studies reported in Table 4. Michigan Agricultural Statistics for the 1977 season indicate the return per acre for pear was less than half of any of the other fruit crops (Table 11).

Fire blight, pear psylla, small fruit size and low per acre yields are serious problems limiting the scope of pear production in the east. These production limitations must be resolved if eastern producers are to effectively compete with Western growers.

An effective, economical and reliable control for fireblight or development of acceptable fire blight resistant varieties is essential if the pear industry is to stabilize or expand in the eastern United States. Psylla is a difficult insect problem for which effective control must be obtained, to which the pest does not readily develop tolerance. Improved fruit size and increased yields per acre are necessary for orchardists and processors to compete with the West Coast industry. Large fruit is essential for fresh market competition.

Bartlett is the standard by which other pear varieties are judged. Present "blight-resistant" varieties do not equal Bartlett in quality. Flowers and shoots of the Magness variety are resistant to fire blight but trunk tissue is susceptible (1). An Old Home frame might minimize this weakness. Fruit quality is good but size is small. Flowers lack pollen, are small and do not appear to readily attract bees. This may explain why it has been a shy bearing variety.

Dawn lacks sufficient blight resistance and quality to become a commercial variety (1). Fruit has dull color and short shelf life following harvest.

Table 10. Michigan Fruit Production and Harvest Costs, 1979

Cost/Acre	Tart Cherry 3 Ton	Dwarf Apple 400 Bu	Standard Apple 400 Bu	Peach 175 Bu	Pear 200 Bu
Cash Growing	$ 292.23	$ 439.32	$ 437.43	$ 397.39	$ 630.44
Cash Harvest	471.88	291.61	291.61	125.67	208.85
Overhead	328.41	308.22	308.22	361.35	331.98
Total	$1092.52	$1039.15	$1037.26	$ 884.41	$1171.27
Gross Return	$1530.00	$1210.00	$1210.00	$1189.00	$ 917.00

Table 11. Average return per acre for 1977 Michigan fruit crops.*

Pear	$249.64
Peach	588.50
Apple	756.00
Cherry	941.19

*Source: Michigan Agricultural Statistics.

Moonglow has blight resistance but is lacking in quality and attractiveness.

The Agriculture Canada Research Station, Harrow, Ontario, has a promising blight-resistant variety—HW602. It is reported to have Bartlett-like characteristics.

Orchardists tend to maintain their pear orchards in a relatively low nutritional status. They believe minimum vegetative growth reduces the incidence of fire blight infection. However, these orchards in low nitrogen status tend to have low fruit set as well as reduced flower bud initiation and small fruit size. These factors result in low yields.

Fruit size is unsatisfactory when an excessive fruit crop sets. Chemical fruit thinning reduces fruit numbers resulting in larger fruit size, but total yields per acre are reduced. Often there is not sufficient variation in processor prices for large versus small pears to compensate growers for the reduced yields resulting from thinning even though fruit are larger. Trees must be in good vigor to produce satisfactory fruit size when chemical thinning is practiced.

The comparative advantages of the West Coast areas in regard to production cost per ton, yields per acre, fruit size and finish are significant. The expanded national production in the 1970's resulted in lower average prices. Cultural limitations have made it difficult for some eastern pear growers to profitably raise pears on a competitive basis.

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