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THE U.S. WATERMELON INDUSTRY

Amy J. Allred
Gary Lucier

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Abstract

[Watermelon production and utilization declined from 1960 to 1980. However, recent evidence indicates that since 1980 both aggregate production and domestic utilization have expanded. This study reviews supply and utilization trends, prices, transportation, packaging, marketing, cash receipts, and costs of producing watermelons. It also documents historical industry changes, and reviews the research and promotion program, enacted by the industry in April 1989.]

Keywords: Watermelon, supply, utilization, trade, prices, marketing

Reference to commercial firms or brand names in this publication is for identification only and does not imply endorsement by the U.S. Department of Agriculture.

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Summary

Until the early 1980's, the U.S. watermelon industry appeared locked in an inexorable state of decline. U.S. production was trending downward and domestic utilization was in a tailspin. Domestic watermelon production gradually fell from 29.3 million hundredweight in 1960 to 26.1 in 1981 - the last year the U.S. Department of Agriculture estimated official U.S. watermelon production. With output falling and population growing, per capita utilization declined by a third - from 16.1 pounds in 1960 to a record-low 10.7 pounds in 1980. Industry efforts in dealing with these problems were not well coordinated.

Unlike many other fresh fruits and melons, watermelon utilization had been on the decline for many years. A private survey of 2,000 households in 1988 indicated consumer concerns about convenience and quality as possible explanations for this decline.

Changes during the 1980's may have given renewed vigor to the industry. Changes include a modification in the consumption patterns of health conscious consumers, the introduction of new varieties, and the passage of a watermelon research and promotion program. Statistics from various States representing about 70 percent of U.S. production in 1981 indicate that production and utilization have been increasing. Utilization is estimated to have increased roughly 3 percent per year between 1980 and 1988. Recent expansion in watermelon production has largely been the result of relatively favorable grower prices. Rising utilization has been due to a general trend toward more fresh produce in the diet, increased off-season availability of watermelons through rising imports, the convenience offered by new "icebox" and seedless melons, and the emphasis on value-added produce marketing in retail stores.

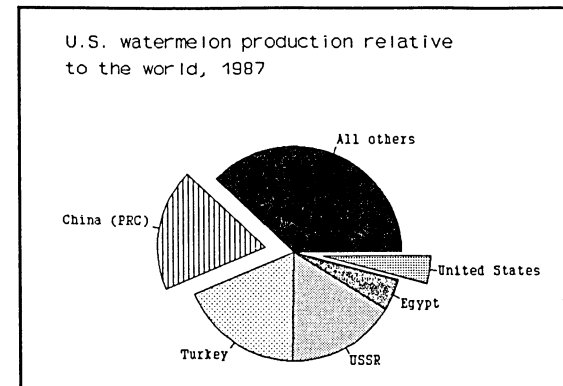
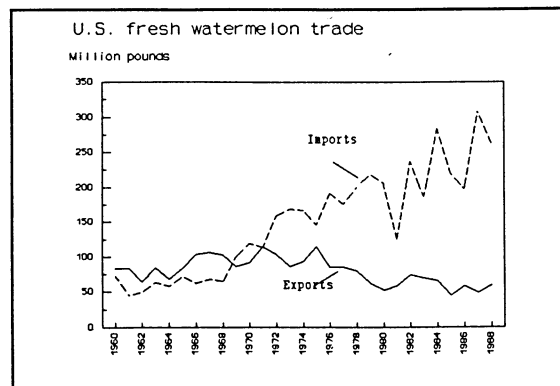
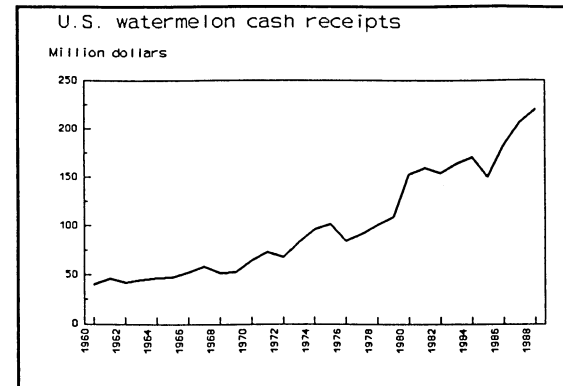
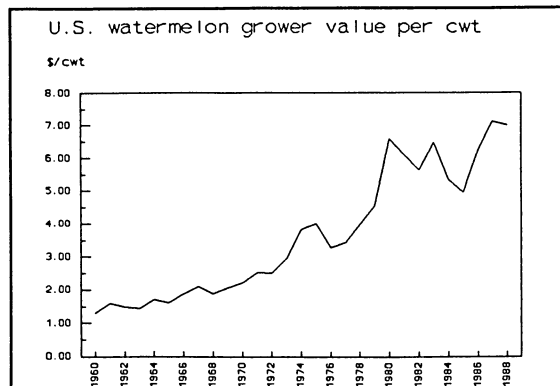
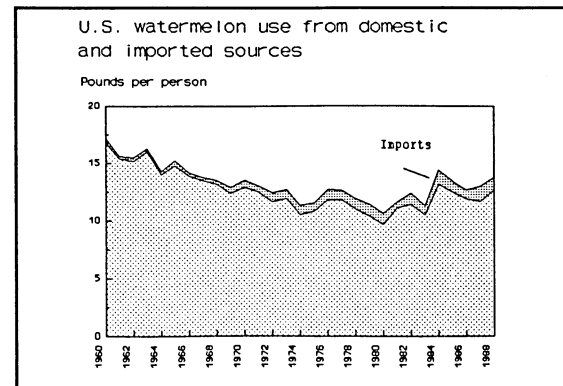
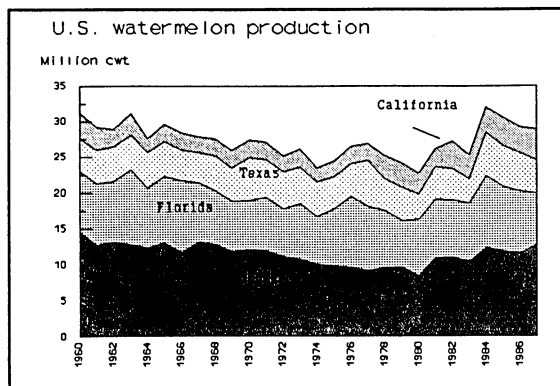
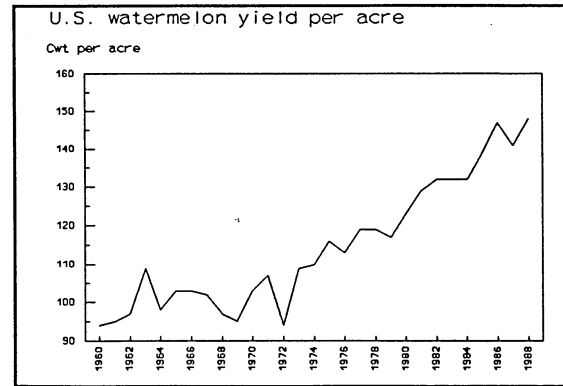
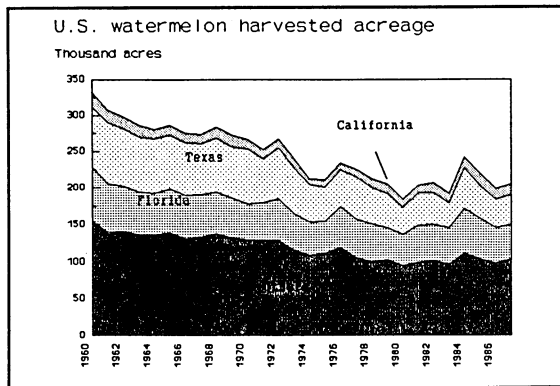
Further gains in utilization are sought by the industry. To this end, watermelon growers voted in early 1989 to begin a national program of research and promotion. This grower-funded program, authorized through title XVI of the 1985 Food Security Act, is geared toward strengthening and expanding the market for U.S. watermelons.

International trade has not generally been a major factor in the U.S. watermelon industry. Since 1972, the United States has been a net importer of fresh watermelons. As with most other vegetables, the most important exporter to the United States is Mexico. Canada is by far the leading export market for U.S. watermelons, accounting for over 95 percent of U.S. export volume. The value of watermelon seed exports now surpasses that of fresh exports.

According to a 1979 Vegetable Pesticide Survey, growers tend to use pesticides less intensively for watermelons than for other crops. In this survey, watermelon planted area represented 9 percent of the total vegetable acreage covered by the sample, but just 2 percent of the total quantity of chemicals applied.

Transportation and packaging issues for watermelons are and have been difficult for the industry to deal with effectively. Most watermelons are shipped by truck with minor quantities arriving by rail or piggyback. Difficulty in securing adequate transportation at times during the season remains a problem.

Summary Figure 1



The U.S. Watermelon Industry

Amy J. Allred
Gary Lucier

Introduction

Until the early 1980's, the U.S. watermelon industry appeared locked in decline. U.S. production was trending downward and domestic utilization in a tailspin. Domestic watermelon production fell from 29.3 million hundredweight (cwt) in 1960 to 26.1 in 1981 - the last year of official U.S. Department of Agriculture (USDA) national watermelon production estimates. With output falling and population growing, per capita utilization declined by a third - falling from 16.1 pounds in 1960 to a record low 10.7 pounds in 1980. Industry efforts dealing with these problems were not well coordinated.

Changes during this decade may have given renewed vigor to the industry. Changes include a modification in the consumption patterns of consumers, introduction of new varieties, and passage of a watermelon research and promotion program.

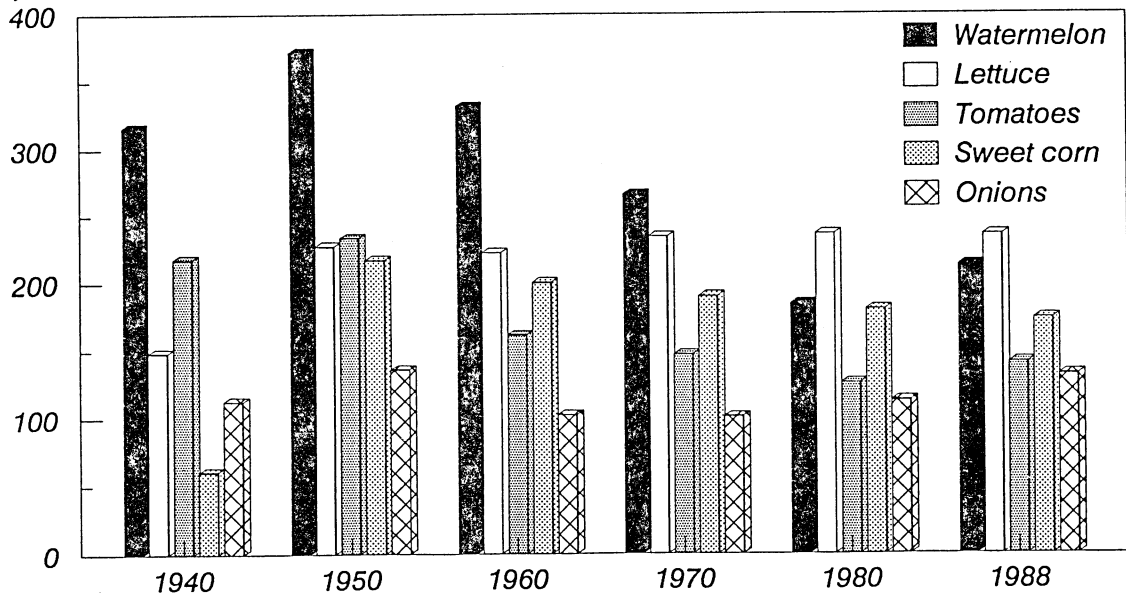
Although watermelon has historically been one of the largest users of fresh vegetable acreage, USDA ceased estimating national watermelon statistics (acreage, production, value) at the close of the 1981 season (fig. 1). Since then, nine States accounting for about 70 percent of U.S. production have continued to provide watermelon statistics (fig. 2). Data from these nine States indicate that U.S. production and utilization have been increasing during the 1980's. Utilization is estimated to have increased roughly 3 percent per year between 1980 and 1988.

Expansion in watermelon production has been the result of relatively favorable grower prices and the interest of many farmers in diversifying into several crop enterprises. Rising consumption has been due to a general trend toward more fresh produce in the diet, increased "off-season" availability of watermelons through rising imports, the convenience offered by new "icebox" and seedless watermelons, and the emphasis on enhanced produce marketing in retail stores.

This study provides general economic information about the U.S. watermelon industry. Its purpose is to 1) organize and present the latest data available for watermelons, 2) document historical

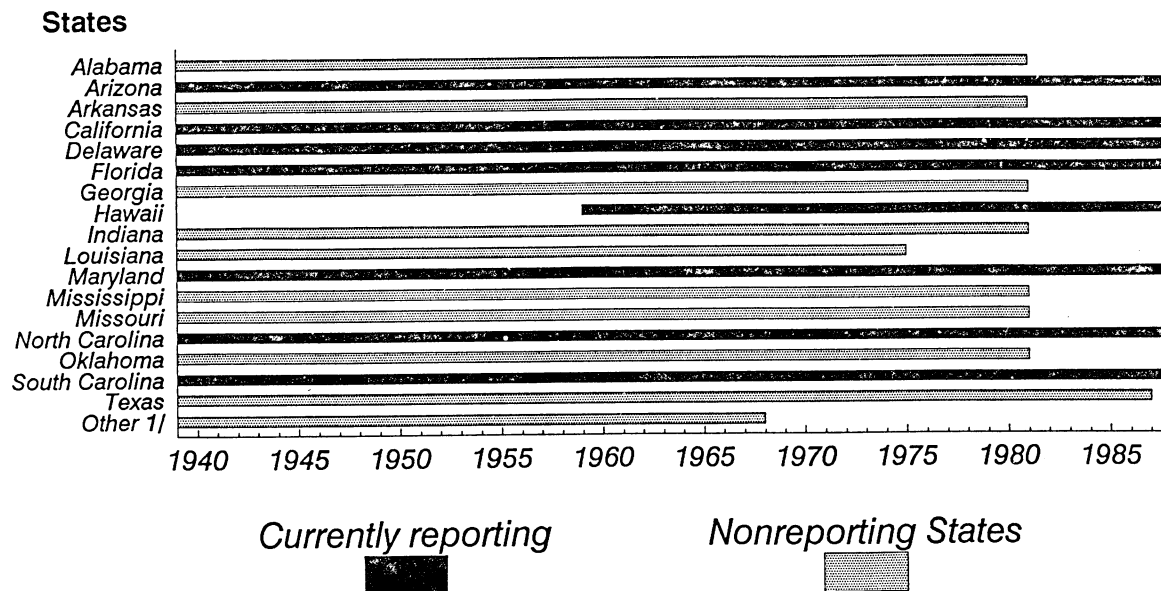
Figure 1
U.S. watermelon harvested area compared with four major fresh vegetables

1,000 acres



Source: NASS, USDA, except 1988 watermelon acreage based on ERS estimates.

Figure 2
Availability of U.S. watermelon data



1/ Other States include: IL, OR, VA, WA (39-68), IA (39-64), and NJ (39-52). California data after 1981 from California County Commissioners.

industry changes, 3) analyze price, supply, and utilization trends, and 4) review the research and promotion program enacted by the industry in April 1989.

History

Watermelons are thought to be indigenous to Africa and have been cultivated for over 4,000 years. Introduced into Europe early in the Christian era, watermelons officially arrived in the United States with both African slaves and European colonists. Seeds were also taken to Brazil, the West Indies, the islands of the Pacific, New Zealand, and Australia (10).¹ In addition to these known African roots, watermelon may have American origins as well. Early French explorers reportedly found Indians growing watermelons in the Mississippi Valley.

The colonial watermelon was small by present standards, averaging on the low end of today's 5- to 50-pound range (watermelons have been known to reach 100 pounds). Unlike today, there were few alternative cultivars but low-sugar varieties used for watermelon rind pickles were common by 1796. During the Civil War, the South boiled down watermelons as a source of sugar and molasses. Professional melon breeding became more common between 1880 and 1900. By the late 19th century, catalogs were offering 20 to 30 cultivars (9).

Watermelon is a trailing annual with stems which can reach 15 feet in length. It is known in botanical circles as Citrullus lanatus of the Cucurbitaceae (or Gourd) family. Other cucurbits include gourds, pumpkins, squashes, cantaloupes, cucumbers, gherkins, and chayote. The globular to oblong melon has smooth skin and weighs 5 to 50 pounds. Watermelon consists of a firm outer rind, a 1/2- to 1-inch thick inner rind, and an interior colored edible pulp that may or may not contain seeds. The flesh may be white, cream-color, honey-color, yellow, pale red, red, or scarlet (table 1).

A warm-season crop, watermelons are most productive in regions with at least a 4-month, frost-free growing season (19). About 80 to 120 days are needed for fruit to mature, with optimum growth occurring with 70- to 80-degree Fahrenheit (F) days and 65- to 70-degree F nights. Watermelon is generally not sensitive to extremes in humidity and, hence, can be grown in many areas. Bees or other insects are vital for proper pollination. The plants require a good water supply during their early growth stages, but good quality fruit depends on warm, dry weather conditions. Watermelons prefer light soils for their extensive, but shallow, root systems (19).

¹ Underscored numbers in parentheses refer to sources listed in the References.

Table 1--Selected varieties and characteristics of watermelons grown in the United States

Cultivar	Size (pounds)	Shape	Rind color	Flesh color
Charleston Gray	25-35	Oblong	Grey-green	Bright red
Dixie Queen	25	Oval	Striped	Red
Garrisonian	35	Oblong	Striped	Red
Mirage	25	Oblong	Striped	Red
Prince Charles	25	Oblong	Dark green	Red
Sweet Princess	30	Oblong	Pale green	Red
Crimson Sweet	25	Oval	Striped	Deep red
Black Diamond	40	Round	Dark green	Red
Dixie Lee	25	Round	Striped	Intense red
Jubilee	35	Oblong	Striped	Bright red
Klondike Striped	12-29	Oblong	Striped	Red
Klondike R-7	12-29	Oblong	Dark green	Red
Peacock Improved	12-29	Oblong	Dark green	Orange-red
Royal Sweet	12-29	Oblong	Striped	Red
Klondike 155	12-29	Oblong	Dark green	Dark pink
Klondike Black Seeded	12-29	Oblong	Dark green	Dark pink
Klondike Striped Blue Ribbon	12-29	Oblong	Striped	Red
Peacock Resistant	12-29	Oblong	Dark green	Orange-red
Sugar Baby	8-10	Round	Pale green	Red
Allsweet	25-35	Oblong	Striped	Red
Petite Sweet	8-10	Round	Striped	Red
Crimson Sweet	25	Round	Striped	Deep red
Blackstone-Improved Black Diamond	30-50	Round	Dark green	Red
Blue Bell	15	Round	Dark green	Red
Tri-X 313	18-25	Round	Striped	Red
Tender Sweet	25-40	Oblong	Striped	Yellow
Summitt	25-35	Round	Green	Red
Desert King	20-30	Round	Lt. green	Yellow
Yellow Baby	5-10	Round	Striped	Yellow
NH Midget	2-4	Round	Med. green	Red
Mickeylee	10	Round	Grey-green	Bright red

Source: Cooperative Extension Service, USDA, various publications.

Domestic Supply

Because of its physical size and the vining nature of its growth, watermelon is an acreage intensive commodity. According to the 1987 Census of Agriculture (census), watermelons are the sixth largest users of U.S. vegetable land, surpassed by such relative giants as tomatoes (fresh and processing), sweet corn (fresh and processing), and lettuce. Florida is the leading producer of watermelons, marketing twice as many melons as Texas, the second largest watermelon State. California, Georgia, Indiana, South Carolina, and Missouri are also among 25 States that reported 500 or more harvested acres in the 1987 census.

Watermelon supplies are available nearly year-round. The marketing season for domestic watermelons begins in early April and is usually completed in October, with 97 percent of the domestic crop shipped between May and August. Florida's marketing season begins in late April, with Texas in mid-May, Alabama and Mississippi in mid-June, and California in mid-July. The peak supply of watermelon is centered around July 4.

Once available only in the summer months from domestic supplies, watermelon is now becoming a year-round resident of the produce department as Mexican, Central American, and Caribbean imports increase. From November through June, supplies are available from Mexico, Panama, Guatemala, El Salvador, Dominican Republic, Venezuela, Honduras, and Costa Rica. In the 1950's, Cuba was the second largest exporter of watermelons to the United States. The supply of U.S. grown watermelons trended down slightly from almost 3 billion pounds in 1960 to 2.7 billion in 1980. While U.S. production declined over this period, imports increased and continue to trend upward. However, imports have historically been a small part of total supply, comprising about 9 percent of total supply in the late 1970's and early 1980's.

Number of Farms

According to the census of agriculture, as with other agricultural commodities, the number of farms reporting watermelon acreage has declined dramatically over time. In 1909, 35,345 farms reported watermelon acreage. After peaking at 199,367 farms in 1934, the number fell to 10,234 in 1987. Partly a result of a change in the definition of a farm, the number of farms reporting watermelon acreage fell 69 percent from 1959 to 1987.² This compares with a 46-percent drop in the total number of farms during this period. Few specialized watermelon farms likely exist in the United States today.

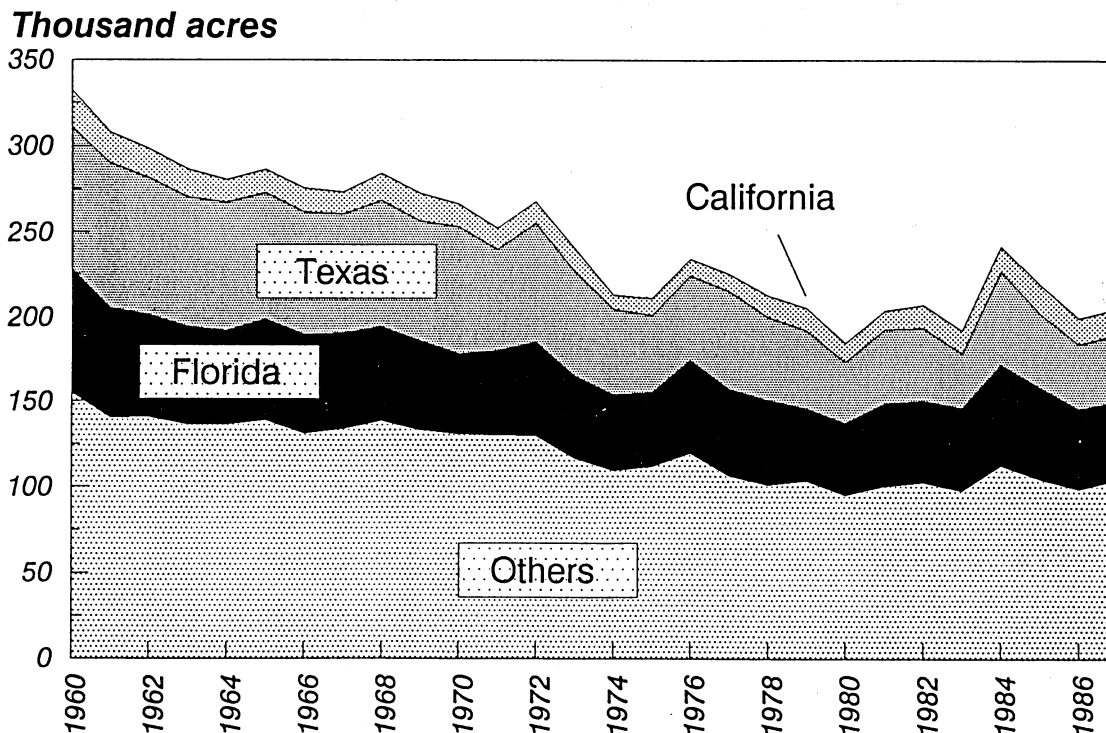
Some growers probably just stopped producing watermelons in favor of alternative crops. Other growers left agriculture completely for such reasons as unfavorable economics and retirement. The remaining growers have harvested larger acreage in watermelons, especially in more recent years. The long-term decline in farms reporting watermelon acreage has been evident across all States.

Acreage Harvested

According to the 1987 Census of Agriculture, watermelons accounted for about 6 percent of harvested vegetable acreage. Sweet corn (for fresh and processing uses) held the top position with 19 percent and tomatoes (fresh and processing) was second at 12 percent of harvested vegetable acreage. According to data from USDA's National Agricultural Statistics Service (NASS), U.S. watermelon acreage was on a downward trend from 1960 to 1981, falling from 332,290 to 203,600 harvested acres (fig. 3).

² The official census farm definition in use today was adopted in 1974. A farm is defined as an establishment with annual sales, or potential sales, of \$1,000 or more. The definition of a farm changed several times after 1934. This would be an important caveat in comparing the number of watermelon farms with the number of all farms over time if farms raising watermelons were more likely to be marginal with respect to the prevailing farm definition than the average U.S. farm. However, there is no evidence to support either accepting or rejecting this premise.

Figure 3
U.S. watermelon harvested acreage



Source: NASS, USDA through 1981. Florida and Texas Agricultural Statistics Offices, California County Commissioners, and ERS (for all others) for 1982-87.

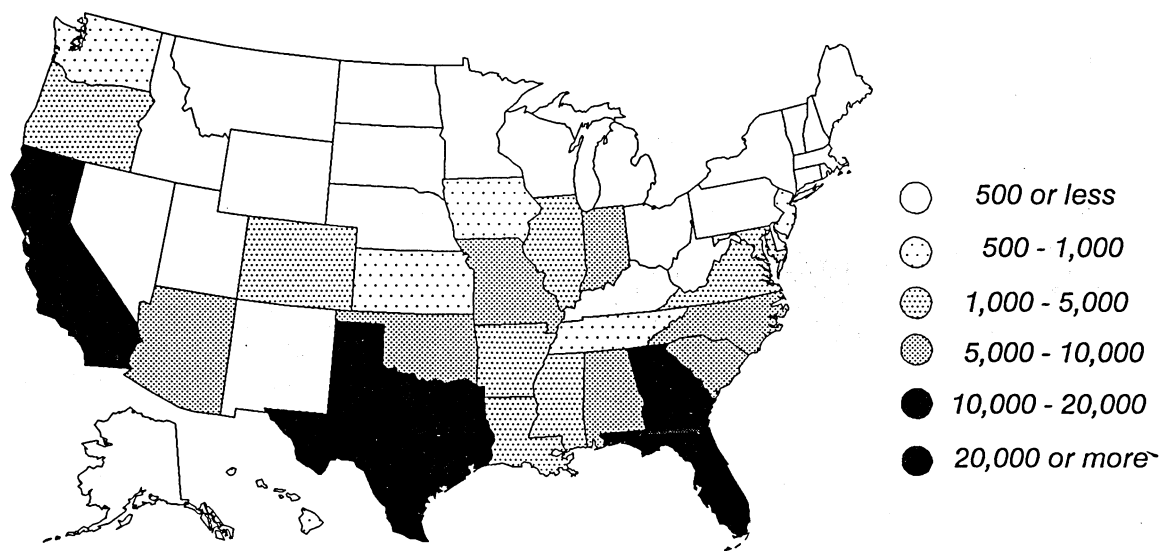
Texas has historically accounted for the largest proportion of acreage harvested, with Florida second and Georgia third (fig. 4). Texas acreage has been sliced in half since 1960, declining about 3 percent per year from 83,000 in 1960 to 40,000 in 1987. Florida's harvested acreage has also declined dramatically since 1960, with a 2-percent average annual drop from 73,000 to 46,100 acres in 1987. However, better yielding varieties and improved production methods allowed output to increase despite the reduction in area.

Of the nine States reporting harvested area from 1960 to 1987, acreage fell in five of the States (table 2). In addition to Florida and Texas, acreage fell in California, South Carolina, and North Carolina but increased in Arizona, Delaware, Hawaii, and Maryland.

Irrigation

Irrigation plays an important role in watermelon production, especially during the early growth stages, with about 15 inches of water needed each season. Because of this, all major producing States irrigate at least 25 percent of harvested acreage.

Figure 4
U.S. watermelon acreage, 1987



Source: Bureau of the Census, U.S. Dept. of Commerce

According to the 1987 Census of Agriculture, the Western States irrigate all of their acreage (table 3). California, which irrigates 100 percent of its watermelon crop, accounted for about 10 percent of U.S. production in 1981.

In Florida, the largest producer of watermelons, 82 percent of watermelon acreage is under irrigation — up from 70 percent in 1982. Texas, the second largest producer, irrigated 34 percent of its acreage.

Irrigation water subsidies, primarily in California and Arizona, are probably the most visible type of government assistance watermelon producers receive (others include FmHA subsidized credit, Federal crop insurance, extension assistance, horticultural research, etc.). Western water subsidies could be threatened in the future as the struggle over water rights and the cost of this water continues. At issue is the competition from urban use and legislation addressing water quality and ownership rights.

Yield

Like yields of most other U.S. agricultural commodities, watermelon yields have been trending upward (fig. 5). Because of extensive development in breeding new seed varieties and technological advancement in irrigation, harvesting, and handling, U.S. yields rose 29 percent from an average of 95 cwt per acre during the 1960-62 period to 129 cwt per acre during 1979-81.

Table 2--Acreage, yield, and production: nine reporting States

State	Acres harvested		Yield per acre		Production	
	1960	1987	1960	1987	1960	1987
	-- Acres --		-- Cwt --		-- 1,000 cwt --	
Florida	73,000	46,100	115	157	8,395	7,238
Texas	83,000	40,000	55	115	4,565	4,600
Arizona	4,600	5,200	155	295	713	1,534
South Carolina	28,000	12,000	77	182	2,156	2,188
Maryland	3,800	4,900	155	240	589	1,176
North Carolina	11,800	8,800	70	74	826	651
Delaware	1,200	1,230	155	248	186	305
Hawaii	340	740	79	186	27	138
California 1/	21,400	14,873	168	293	3,596	4,359
9-State total	227,140	133,843	93	166	21,053	22,189

1/ Data for 1987 from the County Agricultural Commissioners' Report which may not be directly comparable with USDA, NASS data.

Sources: USDA, NASS and State Statistical Offices.

States that irrigate a high proportion of their acreage, such as California and Arizona, have historically experienced among the highest average yields. Data from the California County Agricultural Commissioners indicate that the yield trend for California watermelon has flattened in the 1980's, with 1983 to 1985 being particularly poor years (appendix table 5). Arizona yields increased 2.2 percent per year and peaked in 1987 at 290 cwt. States such as Georgia, with a smaller percentage of irrigated land have historically had lower yields (appendix table 8).

Production

According to official USDA statistics, U.S. watermelon production fell from 29.3 million cwt in 1960 to 26.1 in 1981 (fig. 6). Since 1981, however, a shift seems to have occurred. State-level statistics from nine States representing about 70 percent of watermelon production suggest a 10-percent increase in output since 1981. This increase is likely due to several factors aside from better yields. First, since the early-1980's, watermelon producers have been more responsive to consumer preferences. Their willingness to shift to smaller "icebox" and seedless melons has apparently strengthened their position in the produce department.³ Second, some traditional row-crop farmers shifted to commodities such as watermelons to diversify or increase their cash-flow. A third factor is that grocery stores have offered more presliced melons, increasing the convenience of watermelons.

³ Icebox melons can be described as watermelons weighing 5 to 10 pounds bred specifically to fit easily inside a standard refrigerator.

Table 3--Harvested and irrigated watermelon acreage, by State,
1987 and percent irrigated for 1982 and 1987

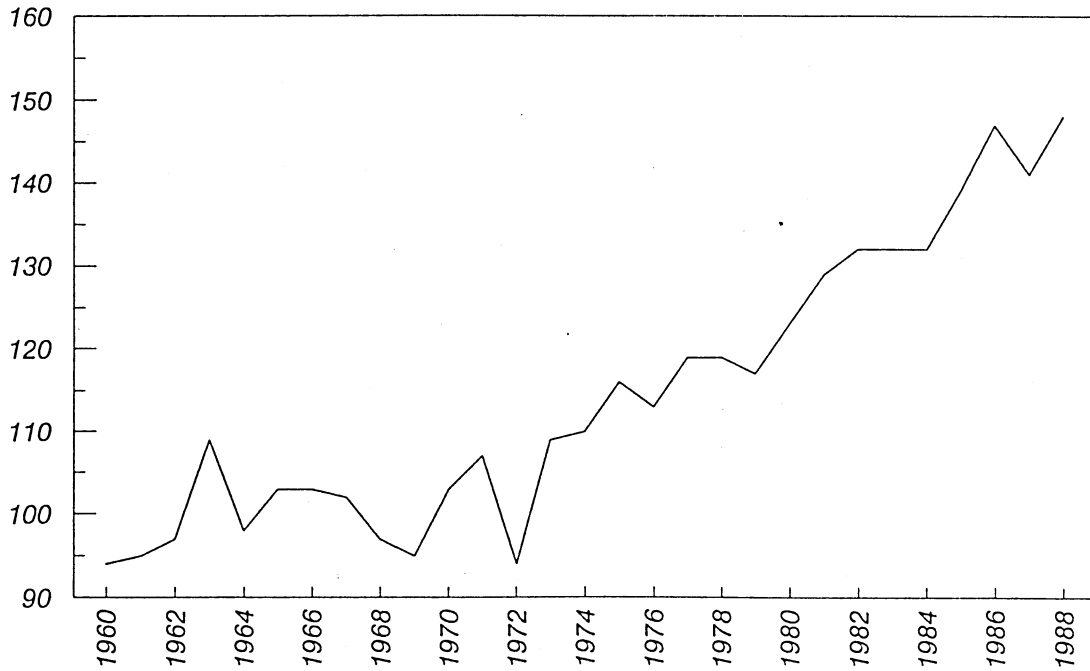
State	Harvested acreage		Percent irrigated	
	1987	1982	1987	1982
	-- Acres --		-- Percent --	
Texas	49,061	43,951	33.5	26.5
Florida	35,943	36,504	82.1	70.2
California	19,601	17,954	100.0	100.0
Georgia	14,389	16,970	51.5	25.8
South Carolina	8,464	9,800	22.5	13.0
North Carolina	7,369	7,487	17.7	2.4
Missouri	6,765	4,382	18.4	12.3
Oklahoma	6,613	5,473	23.7	24.3
Arizona	6,016	4,727	100.0	100.0
Alabama	5,716	6,327	11.8	9.5
Indiana	5,343	3,153	17.8	7.3
Arkansas	3,811	3,426	6.6	17.7
Mississippi	3,471	5,234	5.6	0.6
Louisiana	2,726	2,899	7.6	1.1
Virginia	2,674	2,512	14.9	3.2
Maryland	2,654	2,317	56.3	46.3
Delaware	1,589	1,311	78.4	70.4
Illinois	1,355	925	29.2	25.4
Oregon	1,242	1,364	87.8	88.6
Colorado	1,173	893	100.0	100.0
Kansas	841	638	41.1	32.1
Hawaii	692	173	98.6	98.8
Tennessee	627	794	16.6	0.8
New Jersey	608	516	52.6	64.0
Washington	584	339	100.0	100.0
Iowa	517	345	60.3	51.6
New Mexico	443	698	96.6	100.0
Utah	396	324	100.0	100.0
Kentucky	380	166	8.4	6.0
Pennsylvania	376	205	36.4	21.0
Ohio	328	172	46.0	12.2
South Dakota	322	566	9.6	7.6
Michigan	281	125	33.5	22.4
Nebraska	274	609	31.0	12.8
Wisconsin	197	256	23.9	28.5
Minnesota	93	266	30.1	19.9
New York	72	53	45.8	30.2
Idaho	67	107	98.5	100.0
North Dakota	11	8	36.4	100.0
Vermont	8	1	(d)	(d)
Massachusetts	8	41	50.0	19.5
Connecticut	7	2	(d)	(d)
West Virginia	6	12	0	(d)
New Hampshire	2	(d)	(d)	(d)
Other States	17	(d)	76.5	(d)
Total U.S.	193,127	184,043	50.2	41.5

(d) = not shown to avoid disclosure.

Source: U.S. Department of Commerce, Bureau of the Census.

Figure 5
U.S. watermelon yield per acre

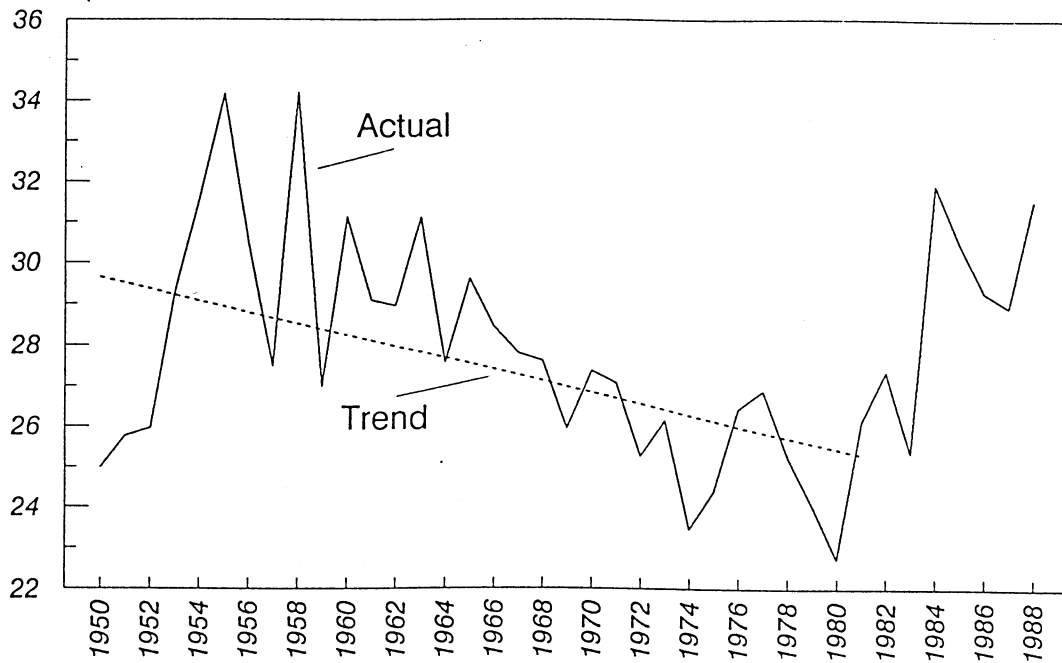
Cwt per acre



Source: NASS, USDA for 1960-81 data. Data for 1982-88 estimated by ERS.

Figure 6
U.S. watermelon production

Million cwt



Sources: NASS, USDA through 1981 and ERS, USDA estimates 1982-88.

Florida, Texas, and California have been the top three producers of watermelon for many years (table 4). Florida, the largest watermelon producer, has roughly a 30-percent share of the domestic market. Florida production had been on a slight downward trend since 1960. However, 1988 output rebounded sharply to 9.2 million cwt as both acreage and yield increased (appendix table 7). Texas is the second leading producer with a 15- to 17-percent market share. Texas production in 1987 (the last year data was reported) was 4.6 million cwt, consistent with the relatively flat trend since 1960 (appendix table 22). According to County Agricultural Commissioner data, California's acreage and production have trended upward during the 1980's with 1988 output up more than a third from 1980 (appendix table 5). Although Texas is the second-leading producer, California tends to ship more of its output to other States. This makes California the second leading shipper of watermelons (table 5).

World Production

During the 1983-87 period, the United States accounted for about 4 percent of global watermelon production (appendix table 1). However, relative to other countries, the United States ranks fifth in world watermelon production. Turkey, a major fruit and vegetable producing and consuming nation, had been the perpetual

Table 4--U.S. watermelon production, by States

State	1950	1960	1970	1980	1981	1986	1987	1988
1,000 cwt								
Florida	5,100	8,395	6,888	7,863	8,085	8,749	7,238	9,213
Texas 1/	4,410	4,565	6,000	3,405	4,629	5,320	4,600	6,000
Georgia	4,235	2,890	2,805	2,590	2,904	--	--	--
California	2,370	3,596	2,528	3,018	2,526	3,726	4,359	3,663
South Carolina	2,160	2,156	1,633	1,068	1,265	1,417	2,188	1,402
Alabama	1,224	1,500	1,218	747	1,055	--	--	--
Mississippi	570	495	665	735	1,020	--	--	--
Indiana	688	1,022	1,037	770	944	--	--	--
Oklahoma	675	638	720	210	840	--	--	--
Arizona	775	713	688	572	679	1,350	1,534	1,500
North Carolina	458	826	465	600	554	456	651	714
Missouri	315	990	738	288	481	--	--	--
Maryland	275	589	756	450	479	990	1,176	927
Delaware	148	186	400	320	347	357	305	372
Arkansas	619	684	544	80	320	--	--	--
Hawaii	--	27	28	14	16	143	138	189
Louisiana	360	225	288	--	--	--	--	--
Illinois	224	180	--	--	--	--	--	--
New Jersey	44	--	--	--	--	--	--	--
Iowa	90	80	--	--	--	--	--	--
Oregon	77	214	--	--	--	--	--	--
Virginia	112	1,008	--	--	--	--	--	--
Washington	66	133	--	--	--	--	--	--
Total U.S. 2/	24,995	31,112	27,373	22,716	26,128	--	--	--
9-State total	15,696	21,053	19,386	17,310	18,580	22,508	22,189	23,980
Percent of U.S.	63	68	71	76	71	--	--	--

-- = Estimates not available.

1/ 1988 production is estimated based on the percent change in annual Agricultural Marketing Service shipment data. 2/ U.S. total was discontinued after 1981. Hawaii was excluded from the U.S. total from 1950-81. States in U.S. total vary over time.

3/ California data after 1981 is from the California County Agricultural Commissioners.

Sources: National Agricultural Statistics Service, State Statistical Offices, and the California County Agricultural Commissioners' report.

Table 5--State watermelon shipments

State	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1,000 cwt											
Alabama	321	350	200	--	--	--	--	--	--	--	--
Arizona	491	674	613	664	1,101	810	1,040	915	1,177	1,194	1,280
California	2,118	1,528	1,710	2,558	3,381	3,452	3,058	2,755	3,407	3,339	4,060
Florida	7,212	5,519	6,824	7,055	6,837	6,950	8,925	8,397	7,604	5,362	7,366
Georgia	2,617	2,565	2,484	2,754	2,969	2,329	1,480	2,516	1,600	1,634	1,846
Mississippi	712	--	616	1,062	865	549	639	504	506	462	288
Missouri	409	427	263	529	714	367	970	978	855	1,159	624
North Carolina	341	338	550	878	656	415	443	508	431	627	708
South Carolina	864	1,031	693	918	1,038	825	874	1,343	1,021	954	1,274
Texas	2,224	2,635	1,343	1,909	2,123	2,188	2,478	2,974	2,956	2,430	3,220
Virginia	328	164	260	417	348	285	376	331	289	172	328
Total 1/	17,637	15,231	15,556	18,744	20,032	18,170	20,283	21,221	19,846	17,333	20,994

-- = not available. 1/ Domestic shipments only.

Source: USDA, Agricultural Marketing Service.

leader in watermelons, accounting for 18 percent of world production in 1987. However, since 1986, China (PRC) has taken the lead with large gains in output throughout the 1980's. China now produces 19 percent of the world's watermelons compared with 16 percent in 1980. The USSR rounds out the big three with 16 percent. Egypt is a distant fourth with 5 percent.

Genetics and Breeding

The successful introduction of several hybrid varieties has changed watermelon production. Growers using hybrids have experienced increased yields, improved disease resistance, increased uniformity, and early maturity. The results of higher quality and yields have translated into higher consumer satisfaction and stronger demand. Also, improved disease resistance has led to higher quality and yields, plus reduced crop rotation time. Several new varieties have good tolerance to fusarium wilt, a disease that can eliminate fields from future watermelon production (15). Some watermelon seeds are also developed for anthracnose resistance (10).

Color, texture, size, shape, and flavor are variables that can be altered and are readily evident to the consumer (16). There are over 50 varieties of watermelons available and over 14 seedless varieties now being developed. Currently, a great deal of research is being directed toward developing smaller and seedless varieties of watermelon that would be more convenient for retail consumers (18).

Varieties

Of the more than 50 different varieties of watermelons available, some of the more common are Charleston Gray, Crimson Sweet, Cal Sweet, Peacock, Jubilee, Klondike, and Sugar Baby. Most varieties are grown regionally, with only a few produced on a national scale.

Trends in the 1988 Florida crop indicated shifts toward the Jubilation variety, striped melons, and a turn away from Charleston Grays. The shift to striped melons has been attributed to eye appeal and good flavor. The Jubilation is a new hybrid melon characterized by an oval, slightly oblong shape, a hard rind, rich red interior, and sweet flavor. Other popular melons in Florida are the Royal Jubilee, Prince Charles, Crimson, and Charleston Gray. Seedless watermelons are slowly catching on with growers in Florida. The icebox melons are slowly catching on with growers and shippers. Some reluctance in moving to these new varieties can be explained by the fact that icebox varieties do not ship as well as other varieties. The rind is rather thin and is easily damaged by the rigors of current transportation methods (16). Because Florida accounts for a large proportion of Southeast watermelon production, their varieties are indicative of what is generally grown in that region.

Popular Texas melons are Royal Sweets, All-Sweets, Crimson Sweets, and Charleston Grays. The major California variety is Cal-Sweet. Other prominent California varieties include Klondike, Peacock Improved, Picnic, and Royal Sweet. As in Florida, there are currently few seedless varieties raised in Texas or California (16).

Seedless Varieties

Growers have been slow in shifting to production of seedless melons. Expensive seed, germination problems, and lower yields have contributed to this. Also, early varieties of seedless melons lacked the color and sweetness of established varieties (14). However, the combination of advances in plant and growing technology, consumer interest in convenient foods, and backing by large produce marketers have earmarked seedless varieties as a future growth segment in the industry.

Japanese scientists were the first to actively breed seedless melons, which have been produced for almost 40 years. In the United States, experimental production trials were reported in the early 1950's. A seedless melon is developed by crossing a diploid (a normal melon with 22 chromosomes) with a tetraploid (44 chromosomes). The resulting triploid (33 chromosomes), is a true hybrid that is sterile and cannot reproduce (10). Since they are sterile, for pollination to occur, the seedless hybrids must be planted near a seeded variety (preferably an unstriped variety). Although some seedless watermelons contain an occasional hard black seed, most seeds are small, thin, white structures that are edible (20).

Seed availability is currently a critical limiting factor in the growth of seedless varieties. However, the network of suppliers offering this special seed is slowly expanding. If consumer interest in seedless grows, more seed companies will expand work on development of seedless varieties.

The future importance of seedless varieties is still uncertain. While seedless melons are more convenient, the higher price and

small edible seeds are not popular with some consumers (14). Seedless is currently more expensive to raise and these higher costs are passed on to the consumer (16).

Growing and merchandising seedless melons have also limited availability. It takes more technical knowledge to grow seedless melons. In harvesting, the melons must be picked at full maturity. Determining full maturity is a bit more difficult with seedless varieties, which makes raising them more challenging for a first-time grower. In merchandising, the key is to sell the melons cut and wrapped, which advertises the convenience and novelty. Fortunately, this does fit in with current marketing trends in the produce industry which is moving toward more pre-cut and prepared commodities as convenience-conscious consumers demand it (20).

Trade

International trade has not been a major factor in the U.S. watermelon industry. The bulkiness and perishability of watermelons tend to make widespread trade difficult. Since 1972, trade statistics suggest that the United States has been a consistent net importer of fresh watermelons (table 6). Prior to 1969, the United States traditionally exported more watermelons

Table 6--U.S. fresh watermelon trade 1/

Year	Exports	Imports	Balance 2/
1,000 pounds			
1958	64,084	43,521	20,563
1959	64,709	57,967	6,742
1960	83,640	71,994	11,647
1961	82,731	45,141	37,590
1962	64,304	49,635	14,668
1963	84,234	63,020	21,215
1964	67,659	57,484	10,174
1965	83,474	71,467	12,006
1966	103,494	61,721	41,773
1967	106,250	67,942	38,308
1968	102,464	65,027	37,437
1969	86,085	99,615	-13,531
1970	91,171	119,116	-27,945
1971	114,704	113,186	1,518
1972	102,979	159,090	-56,111
1973	86,341	168,498	-82,157
1974	92,910	166,518	-73,608
1975	114,680	145,578	-30,898
1976	85,298	191,454	-106,156
1977	84,651	175,337	-90,686
1978	79,902	199,620	-119,718
1979	61,948	219,138	-157,190
1980	51,924	205,724	-153,800
1981	58,825	125,660	-66,835
1982	73,924	237,436	-163,512
1983	69,488	186,234	-116,746
1984	65,263	283,445	-218,182
1985	44,508	220,021	-175,513
1986	58,227	197,416	-139,189
1987	48,051	307,605	-259,554
1988	58,972	262,423	-203,451

1/ Excludes seed trade. 2/ Exports less imports.

Source: USDC, Bureau of the Census.

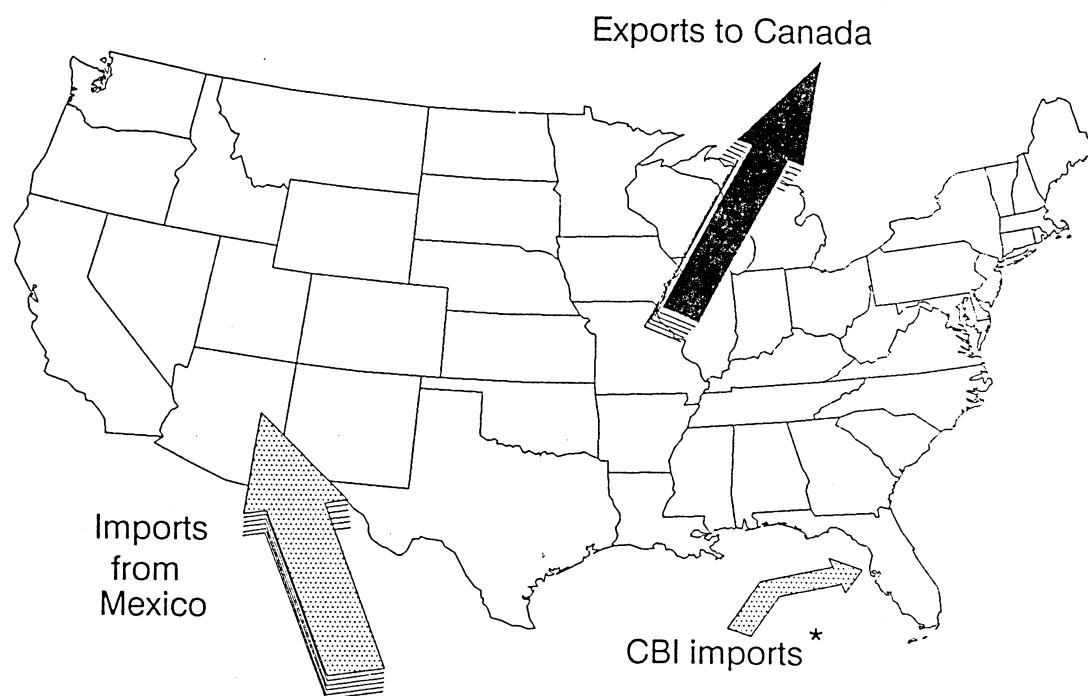
than it imported. As with most other vegetables, the most important exporter to the United States is Mexico. Canada is by far the leading market for U.S. watermelons, accounting for over 95 percent of U.S. export volume (fig. 7). The proximity of these two countries to the United States and the bulky nature of watermelons likely led to the narrowness of the U.S. watermelon import and export markets.

Since Canada is not a significant producer of watermelon and already relies on the United States for much of its supply, the U.S.-Canada Free Trade Agreement probably will not make a significant difference in U.S. exports. However, one result of the trade agreement will likely be improved accounting of U.S. exports to Canada. These data have reportedly been severely understated in the past and improvements in the quality of this data could well reverse the negative watermelon trade position now indicated.

Fresh Imports

The United States is the world's leading importer of fresh watermelon. Although there have been notable downturns, watermelon imports have been trending upward by about 7 million pounds annually since 1958 (table 7). Imports reached a record-high 305 million pounds in 1987, but still accounted for less than a tenth of domestic supply. In the 1980-88 period, watermelon imports averaged 203 million pounds. This was up 22 percent from 1970 to 1979 and 211 percent higher than the 1960-69 period.

Figure 7
Major trade flows for U.S. watermelons



* Caribbean Basin Initiative countries.

Table 7--Monthly U.S. fresh watermelon imports

Item/month	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1,000 pounds												
Volume:												
January	7,051.4	7,486.6	11,086.0	3,493.9	7,839.1	2,533.9	6,266.0	11,012.9	8,684.5	7,942.5	15,436.1	31,355.1
February	15,549.4	17,521.4	18,693.5	8,217.1	14,658.4	7,662.5	12,034.4	17,272.0	12,276.0	28,708.0	20,818.1	33,445.7
March	29,120.9	28,298.2	21,300.8	21,916.4	33,023.7	25,844.8	50,819.8	41,576.0	35,494.3	54,075.1	47,864.5	73,573.0
April	73,586.4	54,569.5	51,631.4	30,063.9	57,517.4	24,406.6	61,710.7	50,258.7	52,040.0	37,552.3	60,636.9	99,509.1
May	57,329.7	56,075.2	83,707.1	46,112.3	76,434.0	66,491.4	91,180.6	49,067.1	62,443.2	77,300.0	88,508.1	90,184.9
June	9,236.9	42,706.7	16,515.9	11,094.1	41,929.3	38,494.5	48,846.4	39,259.5	13,747.8	86,825.5	16,975.2	19,064.4
July	5,112.2	8,052.7	2,261.3	3,848.7	2,151.0	17,288.1	5,020.6	2,552.9	5,018.4	4,031.7	3,312.8	5,390.2
August	624.6	88.2	396.9	294.1	201.1	2,488.7	1,662.7	399.4	615.6	462.6	509.6	88.2
September	225.0	771.0	95.3	0.0	534.2	42.2	442.0	72.6	0	176.4	33.6	313.6
October	521.0	31.6	0.0	0.0	8.8	0.2	1.2	77.3	0.9	264.6	503.8	642.8
November	149.3	150.7	0.0	0.0	356.3	30.9	1,074.1	1,886.8	1,130.3	2,759.4	1,817.9	915.3
December	1,110.5	3,382.5	36.6	619.7	2,782.4	949.9	4,386.8	6,585.2	5,964.7	7,506.4	6,006.1	--
Annual	199,617.3	219,134.2	205,724.7	125,660.1	237,435.7	186,233.7	283,445.4	220,020.6	197,415.6	307,604.5	262,422.8	--
1,000 dollars												
Value:												
January	365	352	382	233	817	70	382	513	570	405	1,146	2,689
February	465	526	679	647	934	210	743	812	518	1,234	1,850	2,218
March	842	1,180	1,319	1,712	1,464	1,485	2,495	2,905	2,048	3,019	4,239	4,952
April	2,945	2,807	2,708	2,823	3,005	2,048	2,910	4,058	4,092	3,126	5,869	6,297
May	2,649	3,938	4,854	3,524	3,220	5,129	4,061	3,144	3,315	7,859	6,265	4,627
June	578	1,577	977	466	2,044	3,086	1,689	2,413	438	4,952	1,111	825
July	215	241	93	212	58	322	74	74	120	137	225	209
August	30	3	19	13	4	61	20	5	14	14	20	3
September	11	14	2	0	23	2	9	11	2	6	2	29
October	26	2	0	0	5	*	1	3	0	3	24	66
November	8	8	0	0	13	3	51	55	40	160	140	45
December	66	236	2	53	107	43	229	292	234	548	625	--
Annual	8,200	10,883	11,036	9,683	11,693	12,459	12,664	14,286	11,392	21,462	21,515	--

* = Less than \$1,000. -- = Not available.

Source: U.S. Department of Commerce, Bureau of the Census.

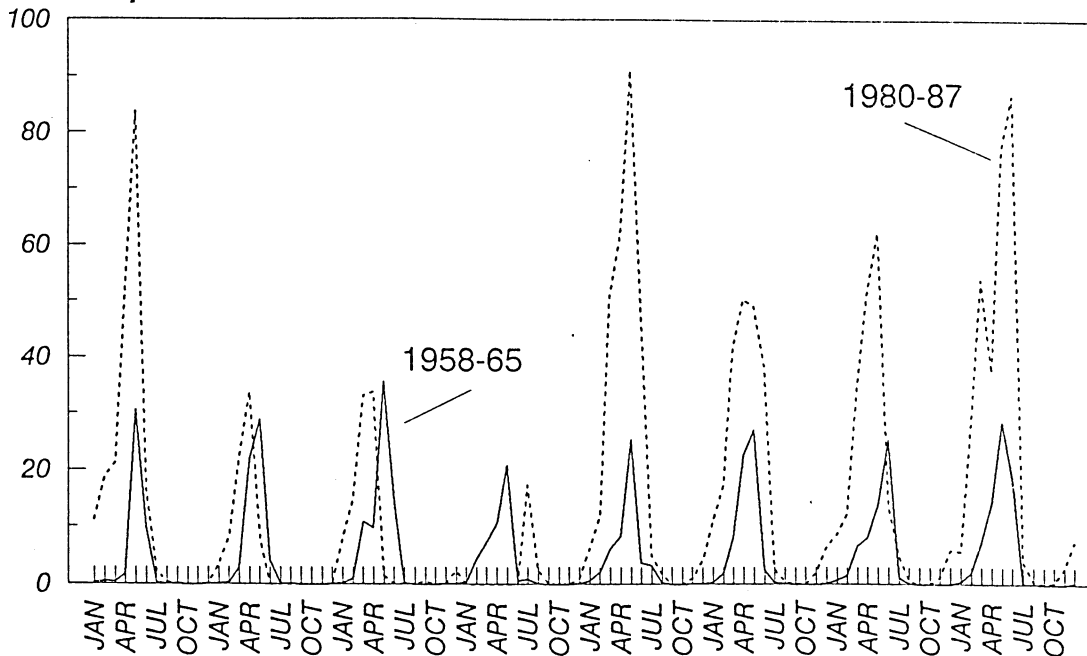
On a per capita basis, watermelon imports have swelled 245 percent from the 1960-62 period to 1986-88. During the 1960-62 period, imports accounted for just 0.3 pound (2 percent) of total per capita utilization. However, by the 1986-88 period, per capita imports had risen 245 percent to 1.0 pound per person (8 percent of total use). This robust increase in imports suggests such explanations as changing consumer preferences toward fresh produce, increased "off-season" imports, declining U.S. domestic production, the general explosion in U.S. agricultural trade in the 1970's, and the emergence of Mexico as a low-cost horticultural exporter.

Perhaps the most important of these explanations is increased off-season imports. U.S. consumers are breaking down the wall of seasonality in produce consumption by demanding that traditional summer fare, like watermelon, be available year-round. Countries, like Mexico, are responding to these signals by increasing shipments during the winter (table 8).

In 1988, the United States imported watermelons from 13 different countries, up from 5 countries in 1978. However, Mexico continues to account for more than 90 percent of the watermelons imported into the United States. Most Mexican watermelons bound for the U.S. market are shipped from the states of Sonora, Sinaloa, Jalisco, and Veracruz. Largely because of the

Figure 8
U.S. monthly watermelon imports
1958 - 1965 and 1980 - 1987

Million pounds



Source: Bureau of the Census, USDC.

Table 8--U.S. fresh watermelon imports, by country

Trading partner	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
	1,000 pounds										
Australia	0.0	0.0	0.0	0.0	80.6	0.0	0.0	0.0	0.0	0.0	0.0
Belize 1/	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	277.1	476.7
Brazil 2/	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0
Canada	71.1	87.5	54.0	60.9	0.0	0.0	28.3	119.9	0.0	0.0	134.9
Chile 2/	0.0	0.0	0.0	0.0	0.0	0.0	28.5	52.9	0.0	0.0	0.0
Colombia 2/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0	0.0
Costa Rica 1/	0.0	0.0	0.0	0.0	0.0	21.5	43.0	238.8	0.0	0.0	1,346.8
Dominica 1/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7	0.0	0.0
Dominican Republic 1/	0.0	0.0	0.0	0.0	45.0	15.5	65.9	595.0	2,673.3	1,214.9	1,724.3
Ecuador 2/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.4	0.0	0.0	0.0
El Salvador 1/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,013.7	4,050.9	3,297.9	185.8
France	0.4	0.0	0.0	0.0	0.0	0.0	0.0	29.7	0.0	0.0	0.0
Guatemala 1/	7.5	0.0	0.0	28.2	0.0	0.0	131.2	1,548.6	4,349.9	5,677.1	2,070.6
Honduras 1/	0.0	0.0	73.7	27.9	67.0	17.5	381.2	373.2	1,757.6	405.3	775.3
Hong Kong	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.4	0.9	0.0	0.0
Jamaica 1/	0.0	0.0	0.0	0.0	0.0	233.8	395.0	0.0	0.0	0.0	0.0
Japan	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.7
Malaysia 2/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	61.5
Mexico 2/	199,518.3	218,866.4	205,446.9	125,257.4	237,233.2	185,861.1	281,976.8	213,306.9	177,153.6	295,010.2	254,679.1
Monaco	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.1
Morocco 2/	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0	45.0	0.0
Mozambique 2/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	62.7
Netherlands	0.0	0.0	0.0	0.0	0.0	0.8	47.8	0.0	0.0	0.0	0.0
Nicaragua 2/	0.0	0.0	0.0	172.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Panama 1/	0.0	0.0	0.0	0.0	0.0	71.9	271.3	2,162.7	7,162.3	1,639.0	860.3
South Korea	0.0	180.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.5	0.0	0.0	0.0
St Vincent & Grenadines 1/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	251.4	0.0	0.0
Sweden	0.0	0.0	0.0	0.0	0.0	0.0	17.1	0.0	0.0	0.0	0.0
Thailand 2/	0.0	0.0	0.0	0.0	9.9	1.1	1.2	0.0	0.0	0.0	0.0
Venezuela 2/	0.0	0.0	150.1	113.3	0.0	0.0	58.0	472.8	0.0	0.0	0.0
World	199,617.3	219,134.2	205,724.7	125,660.1	237,435.7	186,233.7	283,445.4	220,020.6	197,415.6	307,604.5	262,422.8

1/ Eligible for duty-free status under the Caribbean Basin Economic Recovery Act.

2/ Eligible for duty-free status for the Dec. 1 - Mar. 31 period under the Generalized System of Preferences.

Source: U.S. Department of Commerce, Bureau of the Census.

incentives offered by the Caribbean Basin Economic Recovery (CBER) Act, the remainder of non-Mexican imports now arrive sporadically from Caribbean countries like Guatemala, El Salvador, Panama, and the Dominican Republic.⁴

While U.S. watermelon utilization remains largely seasonal in nature, imports have stretched the season of availability from the April-September window surrounding the traditional fourth of July apex. Imports, which tended to peak in May during the late 1950's and early 1960's, now peak in April during the earliest and most lucrative portion of the domestic season. Imports also tend to begin earlier now than 20 years ago, beginning in November instead of January (fig. 8).

⁴ Before enactment of the CBER Act, watermelons from many Caribbean nations were already enjoying tariff-free entry into the United States during the winter months. Monetary and technological U.S. development aid have also been factors in developing Caribbean Basin Initiative.

Table 9--U.S. edible watermelon seed imports by country

Item/country	1980	1981	1982	1983	1984	1985	1986	1987	1988
1,000 pounds									
Volume:									
Hong Kong	7.7	26.3	28.5	77.1	85.8	140.4	250.2	332.4	430.6
China	6.8	45.1	136.9	188.4	290.5	166.4	195.1	337.6	213.8
Taiwan	6.8	46.4	81.9	35.0	10.1	22.4	20.8	14.7	45.6
Thailand	25.9	64.2	88.3	27.8	51.3	24.7	25.1	3.4	8.6
Australia	*	*	*	*	*	*	*	*	120.0
Israel	*	*	2.2	*	*	*	5.3	*	7.4
Philippines	*	*	*	0.9	*	*	5.2	12.6	11.1
United Arab Emirates	*	*	*	*	*	*	*	*	2.2
Nigeria	*	*	*	*	*	*	*	0.7	6.7
All others	13.3	89.6	47.7	29.5	10.3	31.6	12.0	9.0	0.0
World	60.4	271.6	385.5	358.6	448.0	385.5	513.8	710.3	846.0
1,000 dollars									
Value									
Hong Kong	8	31	33	72	85	125	222	290	383
China	8	50	95	139	215	130	125	231	181
Taiwan	10	76	126	76	15	27	31	33	12
Thailand	14	38	49	16	27	11	19	18	5
Australia	*	*	*	*	*	*	*	*	48
Israel	*	2	1	*	*	*	7	*	38
Philippines	*	*	*	1	*	*	7	15	11
United Arab Emirates	*	*	*	*	*	*	*	*	5
Nigeria	*	*	*	*	*	*	*	2	1
All others	7	69	25	40	6	34	19	9	0
World	47	266	330	344	347	327	430	598	684

* = Data, if any, included in all other.

Source: U.S. Department of Commerce, Bureau of the Census.

Although most of this import trend can be explained by the increased off-season demand for fresh watermelons by U.S. consumers, shrewd marketing management on the part of Mexican producers in satisfying an off-season market niche could also play a small role. Accordingly, it is not unusual today to find watermelon both in supermarkets and in restaurant salad bars during the winter months.

Seed Imports

The United States imports small quantities of watermelon seed. Most of this seed is sold for human consumption in prepared (roasted) form. In 1988, the United States imported 846,000 pounds valued at \$684,000. With U.S. consumers interested in new foods, imports for food use trended sharply upward from just 60,000 pounds in 1980. Hong Kong, China (PRC), and Australia accounted for 90 percent of watermelon seed imports in 1988 (table 9). Australia is a newcomer to U.S. watermelon seed trade, while China and Hong Kong have been the leaders since 1983. Hong Kong's share of the U.S. watermelon seed market has grown steadily since 1980.

Ports of Entry

With most U.S. watermelon imports originating in Mexico, they enter the United States in the border towns of Nogales, AZ, and Hidalgo, TX (appendix table 28). These two ports account for about 87 percent of the watermelon border crossings, with each location sharing about half of this volume. San Luis and Progreso, TX, also serve as gateways for Mexican melons. In the eastern United States, most Caribbean watermelons enter at ports in West Palm Beach and Port Everglades, FL.

Fresh Exports

Reflecting the trend in domestic production, watermelon exports have trended downward since peaking at 114.7 million pounds in 1975. Trade data indicate that watermelon exports have been trending downward by 800,000 pounds annually since 1971. Since reported exports have not been expanding, U.S. watermelon production still largely serves the domestic market, with exports accounting for an estimated 2 percent of total utilization.⁵

The \$7 million in watermelon exports in 1988 were, as usual, largely centered around the peak production period of June/July (table 10). The major destination for about 98 percent of the watermelons sold outside the country has remained Canada. Through 1980, utilization trends in Canada had been very similar to the negative per capita watermelon trend experienced in the

⁵ U.S. exports to Canada during the 1980's may be understated due to statistical reporting problems which have developed at the U.S.-Canada border.

Table 10--Monthly U.S. fresh watermelon exports

Item/month	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
1,000 pounds												
Volume:												
January	443.7	1,057.0	420.4	110.9	479.3	991.3	245.6	78.9	191.2	61.8	119.4	81.9
February	681.8	486.0	574.2	390.6	1,074.7	1,211.9	547.1	149.2	209.9	262.8	528.9	697.1
March	985.7	225.7	601.4	1,286.4	992.5	1,275.4	421.1	1,520.1	820.7	587.7	1,270.1	1,707.8
April	1,303.6	378.8	672.4	1,345.7	963.7	1,185.3	1,866.7	981.5	1,589.3	2,154.7	2,360.6	6,051.3
May	8,614.3	5,987.6	6,622.8	5,643.6	9,136.2	7,428.2	8,825.0	5,392.5	9,877.9	8,484.5	10,599.4	11,904.3
June	29,974.1	16,544.6	15,592.2	16,960.4	22,140.6	21,033.3	19,365.9	17,001.5	21,494.1	19,909.1	21,436.3	25,805.0
July	22,195.2	24,735.3	16,863.2	19,249.2	23,787.8	17,654.5	19,623.5	13,189.9	13,204.7	10,176.9	13,916.1	18,986.5
August	13,363.6	12,098.3	7,646.0	11,280.6	13,039.9	14,194.3	11,595.7	5,436.8	6,920.4	4,704.9	6,066.9	16,736.2
September	1,530.8	63.3	1,560.2	1,757.4	1,430.4	1,694.7	925.8	310.1	2,828.3	1,124.1	860.8	2,241.3
October	545.8	102.5	939.7	715.4	602.5	715.3	761.4	179.2	429.9	140.5	244.0	520.5
November	41.6	250.0	312.3	65.1	187.6	1,575.8	654.0	124.0	395.5	110.4	965.4	184.8
December	222.2	18.6	118.6	19.5	89.1	527.8	431.6	144.3	264.6	333.5	604.5	--
Annual	79,902.3	61,947.6	51,923.6	58,824.9	73,924.3	69,487.7	65,263.3	44,508.0	58,226.5	48,051.0	58,972.3	--
1,000 dollars												
Value:												
January	36	59	52	8	45	180	31	9	20	8	10	7
February	77	71	71	30	98	121	41	12	18	18	83	63
March	72	34	33	118	128	122	28	120	101	58	171	113
April	70	38	86	106	99	147	142	136	137	160	224	429
May	496	297	551	430	797	729	702	507	748	642	895	812
June	1,367	757	1,253	1,302	1,724	1,777	1,502	1,181	1,433	1,362	1,656	1,551
July	968	1,027	1,208	1,438	1,530	1,204	1,353	839	881	724	1,088	1,174
August	491	534	558	765	702	928	775	315	458	273	537	1,021
September	55	6	105	127	90	129	76	14	174	75	64	184
October	15	7	70	43	58	46	61	16	28	9	22	62
November	5	8	38	6	30	237	69	11	24	14	75	35
December	8	4	27	5	16	42	35	17	27	67	72	--
Annual	3,659	2,841	4,051	4,378	5,314	5,662	4,816	3,177	4,048	3,411	4,896	--

-- = Not available.

Source: U.S. Department of Commerce, Bureau of the Census.

Table 11--U.S. fresh watermelon exports, by country

Trading partner	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1,000 pounds											
Australia	0.0	0.0	0.0	0.0	0.0	26.6	0.0	0.0	0.0	0.0	0.0
Bahamas	21.6	9.9	0.0	1.9	2.8	0.0	0.0	0.0	0.0	0.0	24.1
Bermuda	231.7	249.3	144.6	14.5	129.2	181.7	323.7	71.1	156.9	198.4	61.1
Canada	78,506.6	60,649.7	50,633.5	58,138.5	72,077.2	66,774.7	64,874.0	44,136.5	57,613.4	46,920.9	57,100.7
Cayman Islands	0.0	0.0	13.5	10.8	0.0	83.1	8.3	0.0	0.0	0.0	0.0
Finland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.3	180.9	137.3	517.7
France	0.0	0.0	0.0	0.0	0.0	44.1	0.0	0.0	0.0	0.0	0.0
West Germany	33.9	2.5	2.7	6.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Guadeloupe	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.0
Hong Kong	74.2	41.6	0.0	0.0	3.6	464.3	38.5	0.0	0.0	0.0	0.0
Iceland	0.0	0.0	0.0	0.0	30.3	0.0	0.0	0.0	0.0	0.0	0.0
Italy	0.0	0.0	0.0	0.0	0.0	88.2	0.0	0.0	0.0	0.0	0.0
Japan	0.0	0.0	0.0	0.0	53.2	23.6	15.3	0.0	0.0	127.0	352.0
Leeward & Windward Isles	0.0	1.2	2.1	80.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Martinique	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	97.0
Mexico	60.0	5.8	28.3	138.9	272.1	0.0	0.0	140.4	68.3	247.2	436.7
Neth Antilles	0.0	0.0	2.7	0.0	4.6	2.4	0.0	0.0	0.0	0.0	0.0
Netherlands	267.0	151.2	138.6	174.8	246.2	1,415.6	0.0	0.0	0.0	70.0	34.2
Norway	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.1	0.0	0.0
Panama	0.0	0.0	18.2	0.0	0.0	0.0	0.0	0.0	119.9	0.0	0.0
Spain	0.0	0.0	0.0	0.0	34.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden	644.4	769.4	734.5	182.8	719.0	143.9	0.0	78.3	32.0	274.1	128.0
Trinidad & Tobago	0.0	0.0	0.0	0.0	178.5	36.0	0.0	0.0	0.0	0.0	0.0
United Kingdom	62.9	67.1	0.0	76.0	173.4	203.5	3.5	45.4	18.0	76.2	123.8
Venezuela	0.0	0.0	205.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
World	79,902.3	61,947.6	51,923.6	58,824.9	73,924.3	69,487.7	65,263.3	44,508.0	58,226.5	48,051.0	58,972.3

Source: U.S. Department of Commerce, Bureau of the Census.

United States. Since Canada is the major destination for U.S. watermelon exports, the negative utilization trend may help explain some of the loss in U.S. export sales since the early 1970's. Other destinations for fresh U.S. watermelons in 1988 include Finland, Japan, and Mexico (table 11).

There are some problems inherent in shipping watermelons to distant countries. One obvious problem is a matter of bulk and weight. Watermelons consist largely of water and, depending on variety, can weigh 30 pounds or more. This presents a problem of freight costs per unit, especially if they must be shipped by air. A retail premium must be demanded for these melons if transportation costs are to be covered. The problem of transportation and handling costs for such a bulky commodity offers one explanation to the historically low volume of exports. Other possible answers include perishability and few marketing campaigns promoting U.S. watermelons in other countries.

With proper handling, distance to market can largely be considered a negligible factor. However, in the past when cooling facilities were not as accessible, this could have been a limiting factor in building new markets. However, the United States tends to ship to population centers within reasonable distance (like Canada and Mexico), thus minimizing transportation costs and assuring the delivery of a high-quality product.

Table 12--U.S. watermelon seed exports by country

Item/country	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988

1,000 pounds										
Volume:										
Iraq	276.2	336.3	*	325.0	702.4	491.4	448.8	440.9	*	683.7
Italy	74.0	100.4	23.4	26.5	122.9	117.4	86.6	48.8	189.6	259.4
Israel	*	*	0.1	*	0.0	132.5	71.9	124.2	51.6	58.9
Mexico	59.1	144.9	109.9	223.8	253.3	179.5	231.4	124.3	104.6	175.6
United Kingdom	152.5	49.6	38.1	95.8	*	20.2	25.2	82.1	115.1	134.2
Brazil	29.3	37.4	40.2	20.0	27.3	3.0	5.0	30.0	36.2	87.9
Netherlands	45.2	61.0	151.7	148.8	282.2	143.7	227.3	565.3	133.9	78.5
Algeria	50.7	*	121.0	*	*	*	*	*	*	77.2
Philippines	13.0	14.7	18.0	28.4	7.0	*	2.3	1.7	20.3	54.7
Saudi Arabia	34.1	45.7	39.5	42.6	40.2	25.4	27.9	40.4	57.5	61.6
All others	612.1	783.1	1,102.2	638.1	1,385.5	813.4	770.1	704.0	607.0	572.3
World	1,346.1	1,573.1	1,644.2	1,548.9	2,820.8	1,926.5	1,896.3	2,161.7	1,315.9	2,244.1

1,000 dollars										
Value:										
Iraq	873	1,273	*	287	2,373	1,906	1,488	1,487	*	2,276
Italy	150	339	138	99	376	404	424	241	678	1,730
Israel	*	*	3	*	2	336	252	366	163	873
Mexico	165	348	326	666	837	642	772	401	350	591
United Kingdom	317	127	97	238	*	49	56	201	276	377
Brazil	89	98	152	86	120	17	22	144	205	359
Netherlands	138	141	407	405	688	357	633	1,398	501	300
Algeria	183	*	376	*	*	*	*	*	*	298
Philippines	44	50	67	131	30	*	7	7	93	221
Saudi Arabia	120	179	194	172	166	111	105	167	312	211
All others	1,975	2,588	4,099	2,265	4,156	2,920	2,061	2,528	1,775	1,886
World	4,055	5,143	5,859	4,349	8,748	6,742	5,821	6,942	4,352	9,122

* = Data, if any, included under all other.

Source: U.S. Department of Commerce, Bureau of the Census.

Seed Exports

The United States exported \$9.1 million worth of watermelon seed in 1988 (table 12). With the exception of 1982, the value of seed exports has surpassed that of fresh exports annually since 1979. Seeds are used for both planting and roasting (food use). Iraq is a big importer of U.S. watermelon seeds (largely for food use) accounting for 30 percent of the 2.2 million pounds exported in 1988. Italy was the second most important market in 1988 at 12 percent of total volume. About 44 percent of seed exports occur during the November to January period.

World Trade

Probably for the same reasons limiting U.S. watermelon trade, very little of the world's watermelon output finds its way into international trade. In 1987, just \$217.8 million (747,000 metric tons) of watermelon was exported around the globe (table 13). About a fourth of recorded world trade in watermelons occurs between the United States and Mexico. The proximity of these two countries explains why Mexico has consistently been the world's leading exporter since 1984. Spain, Italy, Greece, and Hungary are also leading watermelon exporters. The United States, Germany (FDR), France, Italy, and Saudi Arabia are leading importers of watermelon.

Table 13--World watermelon trade volume, 1961-87

Country	1961-65	1966-70	1971-75	1976-80	1981-85	1986	1987
Metric tons							
Imports:							
United States	26,018	35,342	68,299	117,505	95,509	89,544	139,526
Germany, FDR	5,849	16,931	47,407	69,932	70,128	79,879	77,069
France	0	0	0	15,443	50,353	53,106	59,658
Italy	1,190	12,446	7,888	17,644	25,274	47,558	50,907
Saudi Arabia	0	3,574	693	4,520	13,173	21,458	21,458
Singapore	0	0	0	5,083	11,458	14,531	17,886
United Kingdom	0	0	0	2,734	14,607	15,200	17,716
Gaza Strip	0	1,220	10,100	13,100	14,180	11,000	11,000
Netherlands	0	0	0	1,298	8,496	8,254	10,383
Belgium-Luxembourg	0	0	0	1,284	7,330	8,167	8,752
Others	54,943	31,520	48,275	12,083	58,573	23,147	25,964
World	88,000	101,033	182,661	260,627	369,081	371,844	440,319
Exports:							
Mexico	23,029	35,769	65,486	90,806	119,554	243,818	295,561
Spain	136	225	7,660	25,392	88,178	125,450	123,195
Italy	12,024	31,783	57,915	72,781	60,341	62,640	65,203
Greece	268	3,557	18,298	33,299	36,894	75,291	50,823
Hungary	22,899	23,211	24,389	40,789	44,596	44,218	40,440
Gaza Strip	0	280	1,780	1,878	23,306	30,500	30,500
Saudi Arabia	0	9,464	8,408	4,442	34,689	30,000	30,000
United States	34,775	44,739	48,599	36,105	31,489	31,071	25,225
Egypt	0	0	0	13,375	16,425	21,827	20,000
Malaysia	0	0	0	10,901	13,485	18,049	18,049
Others	79,782	56,388	49,929	42,741	64,762	56,998	47,850
World	172,914	205,415	282,465	372,509	533,719	739,862	746,846

Source: Data tape from the Food and Agriculture Organization, United Nations.

Domestic Utilization

In the United States, virtually all watermelons are eaten fresh (1). They are eaten as a dessert or snack, as well as in fruit salads. In some areas of the United States, people make pickles, relish, jam, and preserves with the rind. A popular summer treat, watermelons have different uses in other countries. In southern Russia, watermelon juice is used to make beer, or the juice is boiled down to a molasses-like syrup for its sugar. In the Middle East and Africa, the flesh of watermelon is used as a staple food and animal feed as well as a source of water in some dry areas (10). In Asia, the seeds are roasted and sold in bags like popcorn (9). In the Orient, watermelon is often preserved through salting or brining.

Per Capita Utilization Trends

From 1960 to 1980, per capita utilization of watermelon declined about 2 percent per year to 10.6 pounds (table 14). With the termination of the USDA's watermelon estimates program in 1982, it has been impossible to continue estimating a consistent per capita utilization series since U.S. production data are no longer available.

Table 14--Estimated watermelon supply and utilization, 1960-88 1/

Year	Production	Imports	Total supply	Exports	Available utilization	Popu- lation 2/	Per capita use
	----- Million pounds -----					Millions	Pounds
1960	3,111.2	72.0	3,183.2	83.6	3,099.6	180.7	17.2
1961	2,908.3	45.1	2,953.4	82.7	2,870.7	183.7	15.6
1962	2,896.1	49.6	2,945.7	64.3	2,881.4	186.5	15.5
1963	3,110.2	63.0	3,173.2	84.2	3,089.0	189.2	16.3
1964	2,757.5	57.5	2,815.0	67.7	2,747.3	191.9	14.3
1965	2,960.3	71.5	3,031.8	83.5	2,948.3	194.3	15.2
1966	2,843.6	61.7	2,905.3	103.5	2,801.8	196.6	14.3
1967	2,779.0	67.9	2,846.9	106.2	2,740.7	198.7	13.8
1968	2,761.6	65.0	2,826.6	102.5	2,724.2	200.7	13.6
1969	2,595.0	99.6	2,694.6	86.1	2,608.5	202.7	12.9
1970	2,737.3	119.1	2,856.4	91.2	2,765.2	205.1	13.5
1971	2,709.4	113.2	2,822.6	114.7	2,707.9	207.7	13.0
1972	2,528.0	159.1	2,687.1	103.0	2,584.1	209.9	12.3
1973	2,617.0	168.5	2,785.5	86.3	2,699.2	211.9	12.7
1974	2,346.6	166.5	2,513.1	92.9	2,420.2	213.9	11.3
1975	2,439.5	145.6	2,585.1	114.7	2,470.4	216.0	11.4
1976	2,645.9	191.5	2,837.4	84.3	2,753.1	218.0	12.6
1977	2,688.5	175.3	2,863.8	84.7	2,779.2	220.2	12.6
1978	2,527.0	199.6	2,726.6	79.9	2,646.7	222.6	11.9
1979	2,407.6	219.1	2,626.7	61.9	2,564.8	225.1	11.4
1980	2,271.6	205.7	2,477.3	51.9	2,425.4	227.8	10.6
1981	2,612.8	125.7	2,738.5	58.8	2,679.6	230.1	11.6
1982	2,733.9	237.4	2,971.4	73.9	2,897.4	232.5	12.5
1983	2,534.0	186.2	2,720.3	69.5	2,650.8	234.8	11.3
1984	3,190.5	283.4	3,474.0	65.3	3,408.7	237.0	14.4
1985	3,043.8	220.0	3,263.8	44.5	3,219.3	239.3	13.5
1986	2,929.6	197.4	3,127.0	58.2	3,068.8	241.6	12.7
1987	2,893.1	307.6	3,200.7	48.1	3,152.7	243.9	12.9
1988 3/	3,152.4	262.4	3,414.8	59.0	3,355.9	246.1	13.6

1/ Includes any processing uses. Estimated production beginning with 1982 is based on nine-State data adjusted to the national level. 2/ Total U.S. population including armed forces overseas. 3/ Preliminary.

Source: Economic Research Service, USDA.

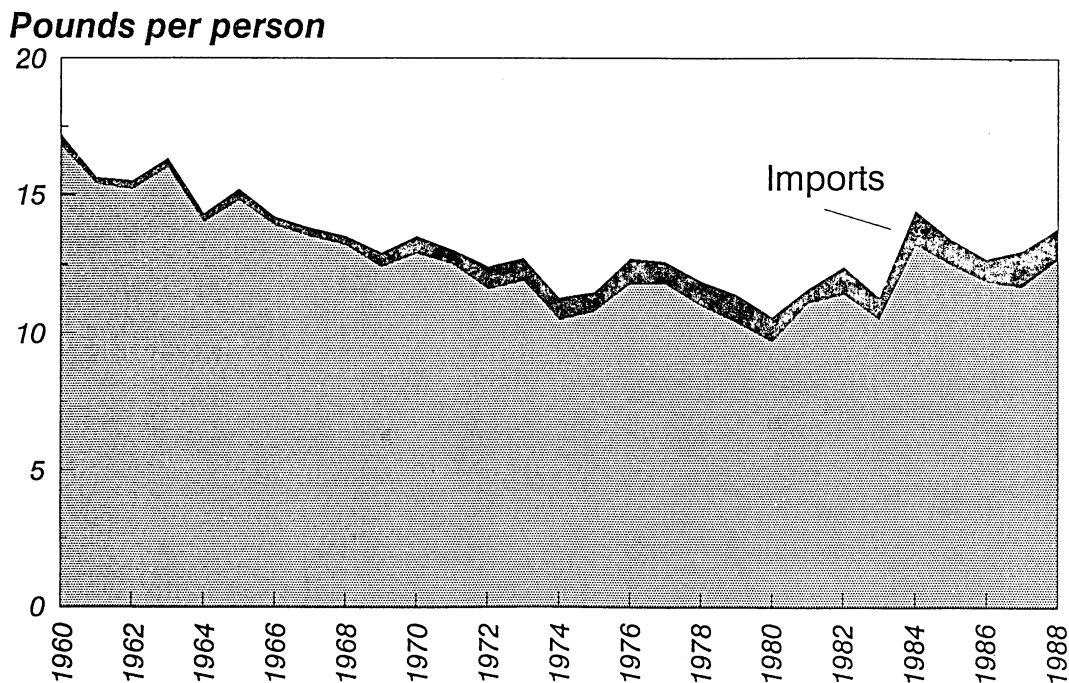
However, statistics from States that have continued making production estimates indicate that U.S. production has increased since 1980. Utilizing data from these States, a few simple equations were estimated using ordinary least squares to derive U.S. production, allowing per capita utilization to be estimated for the 1982-88 period (appendix 2). Following this procedure, with the nine reporting States as movers, per capita utilization is estimated to have increased from 11.6 pounds in 1981 to 13.6 pounds in 1988, a 17-percent increase (fig. 9).

Increasing watermelon utilization does seem probable because of increases in fresh produce utilization, the year-round availability of a wider variety of produce due to imports, increased availability in grocery stores and restaurants, and consumers' interest in the newly introduced icebox and seedless watermelons. Since 1970, fresh vegetable utilization has increased significantly from 70.6 pounds to 100.3 pounds in 1988.

However, statistics derived from "Fresh Trends 1988"--a household mail survey conducted for The Packer, a produce industry publication--do explain some of the basic reasons why watermelon consumption has traditionally lagged use of other produce.

Although 12 percent of the respondents listed watermelon as one of their three favorite fruits for snacking, 27 percent of those surveyed placed watermelon in the list of the top five items that

Figure 9
U.S. watermelon use from domestic and imported sources



Source: Economic Research Service.

are least consistent in overall quality and value. Only peaches, strawberries, and cantaloupes were considered more inconsistent than watermelons (17).

Because of the inconvenient size of watermelons and the lack of consistent quality, more than half of those surveyed said they purchased watermelon once a month or less often when it is available. Of the 60 percent who said they purchased it that often, 23 percent said they purchased it monthly and 36 percent said they purchased it less than once a month. Twenty-two percent said they purchased it once every two to three weeks; 15 percent said they purchased it weekly; and 4 percent said they purchased it twice a week or more often (17). These are some of the areas that the industry can improve upon with their proposed national research and promotion program (see Marketing section).

While consumers have been more interested in convenience, the shifts to production of smaller melons has been slow. Satisfactory yields have been difficult to achieve with smaller sized melons, causing growers to continue producing the better yielding, larger sized varieties. Most of the smaller, icebox melons are imported. However, there is evidence of some shifting of domestic production to smaller sized melons. The University of Florida recently developed two new varieties weighing between 5 and 10 pounds, Minilee and Mickilee, designed to fit neatly inside a refrigerator. Private companies are also developing icebox varieties.

Despite apparent consumer preference for icebox varieties, the growth in the food service industry has continued to encourage the production of larger sized watermelons. Thus, at this level in the marketing chain, the shift to icebox varieties does not necessarily compete with the full-sized watermelons. Instead, the icebox varieties fill a market niche for consumers who want smaller melons. The traditional 30-pound melon may be going out of style at the retail level because smaller families cannot readily use that quantity (16). However, the food service sector will likely continue to demand larger watermelons. Retailers are adding value to the larger watermelons by cutting and wrapping them into smaller, more marketable sizes.

Utilization Demographics

Demographic data are available for watermelon purchases (table 15). According to the "Fresh Trends 1988" survey, the majority of respondents who had purchased watermelon in the last 12 months were between 30 and 39 years of age, were college graduates, had a household size of four or more, had incomes of \$30,000 a year or more, and lived in the Southern United States. Demographics for those consuming seedless melons were slightly different. The majority of respondents who purchased seedless watermelons in the last 12 months were age 40 to 49, had a household size of two to four, were college graduates, had incomes of \$30,000 a year or more, and resided in the Western United States (17).

Table 15--Demographic characteristics of watermelon consumers, 1987

Characteristic	Variety			
	All types		Seedless	
	Number of respondents	Group percent	Number of respondents	Group percent
Age:				
18-29	155	17.0	9	10.0
30-39	247	27.0	22	24.4
40-49	165	18.1	25	27.8
50-59	148	16.2	17	18.9
60 plus	199	21.8	17	18.9
Total	914	100.0	90	100.0
Household size:				
1 member	179	18.5	20	20.2
2 members	298	30.8	31	31.3
3 members	182	18.8	17	17.2
4 + members	309	31.9	31	31.3
Total	968	100.0	99	100.0
Education:				
High school grad. or less	452	48.1	39	40.6
College plus	487	51.9	57	59.4
Total	939	100.0	96	100.0
Income:				
Under \$10,000	151	15.6	14	14.3
10,000-14,999	118	12.2	11	11.2
15,000-19,999	108	11.1	7	7.1
20,000-29,999	202	20.9	11	11.2
30,000 plus	389	40.2	55	56.1
Total	968	100.0	98	100.0
Region:				
Northeast	205	21.2	25	25.5
Northcentral	251	26.0	20	20.4
South	328	33.9	26	26.5
West	183	18.9	27	27.6
Total	967	100.0	98	100.0

Source: A survey of households conducted for "The Packer" by Vance Research Services and published in "Fresh Trends 1988."

Nutritional Benefits

A primary reason for individuals to increase produce utilization is for the nutritional benefits which subsequently lead to better health. However, the "Fresh Trends 1988" survey indicated that watermelon was not one of the fruits consumers purchased for health reasons. This indicates that consumers are either unaware of the nutritional aspects of watermelon or they purchase watermelon for such reasons as taste.

Yet, in a recent study, "The Complete Eater's Guide and Nutrition Scoreboard," watermelons rank as the most nutritious fruit available, ahead of cantaloupe, papaya, oranges, grapefruit, bananas, and apples (kiwifruit was not among those ranked) (5). Apparently, the sweet flavor discourages some dieters who associate sweetness with high-caloric content. A typical

watermelon contains 88 to 92 percent water and 8 to 12 percent natural sugars. However, the nutritional content of watermelon is impressive. According to nutritional data supplied by USDA, one serving consisting of a 1-inch by 10-inch slice weighing 482 grams supplies:

- o 77 percent of the recommended daily allowance (RDA) for vitamin C,
- o 35 percent of the RDA for vitamin B6,
- o 26 percent of the RDA for B1 (thiamin),
- o 18 percent of the RDA for vitamin A,
- o 4 to 13 percent of the RDA for many other vitamins and minerals,
- o 560 mg of potassium,
- o no cholesterol, little fat, and just 10mg of sodium, and
- o 152 calories.

Table 16--Pesticide use on watermelons: Acres treated, acre-treatments, and quantities applied, 1979

Active ingredients	Acres treated	Acre-treatments	Pounds applied
	1,000 acres		
Single application			
herbicides:			
Trifluralin	9.3	11.0	5.9
Bensulide	3.6	5.0	12.3
DCPA	0.8	4.8	2.4
Naptalam	0.8	0.8	1.3
Butralin	0.8	0.8	1.6
Other	--	7.5	5.4
Total	--	30.0	28.9
Insecticides:			
Methomyl	5.4	23.5	19.3
Parathion	7.0	19.8	9.9
Carbaryl	6.1	12.8	11.8
Dimethoate	3.1	11.9	4.6
Bacillus thuringiensis	2.3	8.9	1/
Other	--	14.4	16.3
Total	--	91.3	61.9
Fungicides:			
Maneb	17.3	79.5	106.7
Chlorothalonil	22.7	61.9	63.6
Benomyl	7.3	15.9	12.7
Captafol	5.2	11.6	16.1
Mancozeb	2.6	10.1	16.8
Other	--	18.0	22.8
Total	--	197.1	238.8
Nematocides:			
Ethylene dibromide	0.5	0.5	6.8
Tank mixtures	--	17.0	30.5
Total pesticides	156.0	335.9	366.9

-- = data not available.

1/ Quantity data not reported because *Bacillus thuringiensis* is expressed in terms of number of spores per gram rather than in pounds active ingredient.

Source: USDA, Economic Research Service.

Pesticides and Residues

Pesticide residues on produce have become an important issue with consumers. The Food and Drug Administration (FDA) has routinely sampled the food supply for pesticide residues since the 1960's. In 1988, the FDA found no pesticide residues on 92 percent of the watermelons sampled. Further, no samples were found to exceed the established tolerance levels. These results were almost identical to those reported in 1987. Domestic watermelons were found to have a slightly lower incidence of residues than imported melons with 87 percent of the sampled imports containing no trace of residues and no samples exceeded tolerances (7).

According to the 1979 Vegetable Pesticide survey conducted by U.S. Department of Agriculture's Economic Research Service (ERS), watermelon producers tend to use pesticides less intensively relative to other crops (2). In this survey, watermelon planted area represented 9 percent of the total vegetable acreage covered by the sample. However, watermelons were found to account for just 2 percent of the total quantity of chemicals applied to the 12 vegetables included in the sample. Due to the susceptibility of watermelons to a host of plant diseases, it is not surprising that more than 65 percent of the chemicals applied were found to be fungicides (table 16). Chlorothalonil (Bravo), a fungicide, accounted for the largest share of all chemicals applied. This is a chemical whose residue can be reduced by washing the melon - a fact which may be important to those who use watermelon rind in cooking.

Prices

Watermelon is a perishable commodity sold largely in the domestic cash market. The price that growers receive for their product is determined by the basic forces of supply and demand in a competitive marketplace. Since there are no Government programs specifically for watermelons, there are few price-distorting external influences in the watermelon market.⁶ Although there are many varieties of watermelons, each with differing characteristics and weights, the prices discussed here reflect an average of these varieties on a hundredweight (cwt) basis (that is, per hundred pounds of melons).

The growing popularity of seedless varieties and their short supply relative to demand has allowed growers of these varieties to command a premium above most of the seeded varieties. Higher production costs (due partly to seed costs) and lack of experience with seedless varieties, which lead to lower than optimal yields, necessitates a higher price at the farm gate. It

⁶ The existence of subsidized Federal credit, Federal irrigation projects, extension and research assistance, and favorable tax laws are each aimed at general agricultural and are not targeted toward any one commodity as are wheat deficiency payments, for example.

Table 17--Watermelon value per unit for eight selected States and weighted average

Year	Florida	Arizona	Delaware	Hawaii	Maryland	South Carolina	Texas	California	8-State average 1/
Dollars per cwt									
1980	5.92	6.35	7.44	22.36	7.44	3.98	9.04	8.58	6.67
1981	6.52	7.98	3.84	25.88	3.84	3.29	8.00	8.85	6.64
1982	6.90	4.00	4.00	24.91	4.00	3.00	7.76	4.15	6.37
1983	7.20	5.85	4.00	19.69	4.00	2.98	10.40	5.20	7.21
1984	6.20	5.42	5.40	18.48	5.40	5.42	5.18	4.90	5.77
1985	5.95	5.27	5.15	17.00	5.15	3.28	5.20	4.10	5.44
1986	6.23	6.36	5.70	12.60	5.70	5.74	6.75	5.85	6.36
1987	9.64	5.13	6.30	11.90	6.30	3.96	9.35	5.10	8.14
1988	6.79	7.13	6.15	11.70	7.05	5.02	--	6.71	6.71

-- = not available.

1/ Average of the eight States weighted by production. North Carolina is excluded since they no longer report value data. Texas dropped its estimates program in 1988.

Source: NASS (1980-81), California County Agricultural Commissioners (1982-88), State Statistical Services for all others.

is not currently clear how much of the retail market will eventually be commanded by seedless watermelon varieties. However, despite the higher retail price, it is apparent that many consumers look favorably on seedless melons and growers are increasing seedless acreage. The situation in the watermelon market is not unlike that of the grape sector where the introduction of seedless varieties such as Thompson and Red Flame gradually made inroads into the table grape market and now dominate sales.

Trends

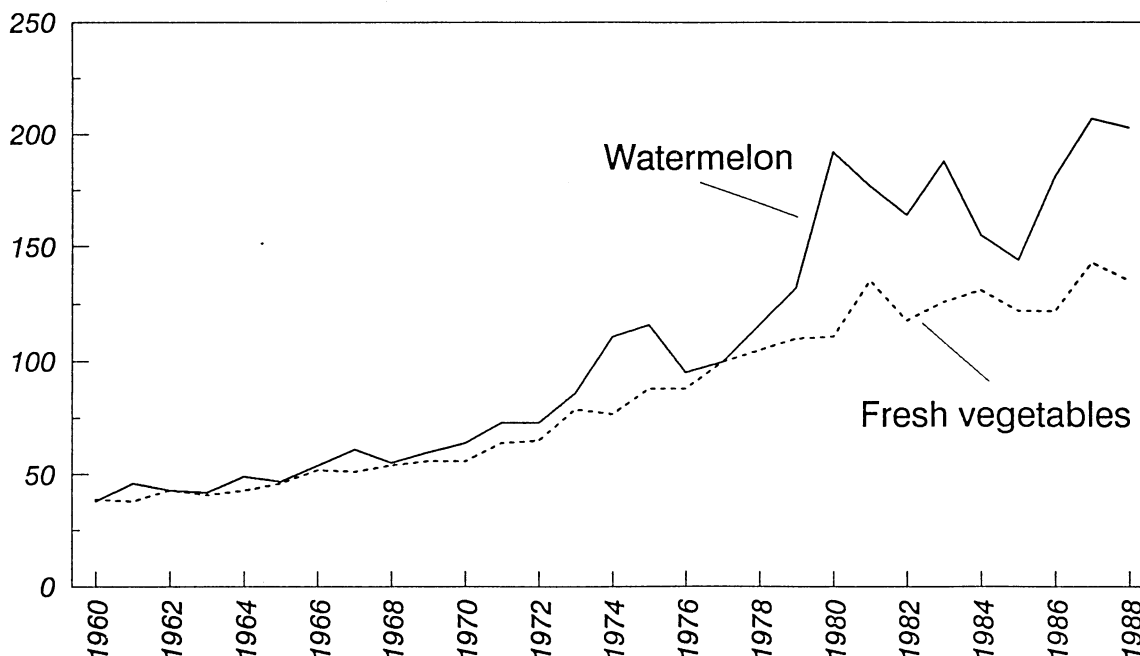
Watermelon season average prices have generally trended upward since 1960. After adjusting for inflation, deflated prices still exhibited a surprisingly strong 9-cent annual upward trend from 1960-80. However, since 1980, the trend for deflated season average prices has flattened.⁷

This upward trend and leveling off is consistent with the trend observed in the fresh vegetable grower price index during this time period (fig. 10). It is believed that the influx of fresh vegetable imports during the 1980's may have contributed to the decline in domestic vegetable grower prices. However, since watermelon imports largely occur during the off-season, it is difficult to support this supposition.

⁷ Since USDA stopped reporting watermelon prices after 1981, a series based on the eight States still collecting both watermelon production and values was constructed. These eight States accounted for the majority of U.S. production in 1981. Although not directly comparable with the U.S. season average published by USDA prior to 1982, the series is useful in describing the trend in grower prices.

Figure 10 U.S. grower prices for watermelons and fresh vegetables

1977=100



Source: USDA, NASS.

Based on data from States still reporting watermelon statistics, it appears that U.S. production increased during the 1980's. In the absence of a coordinated advertising campaign or an expanding export market, the domestic market likely became saturated, causing prices to level off. Average grower (f.o.b.) prices for seven reporting States fell in 1988, averaging under \$7 per cwt as production rose markedly in many areas (table 17).

Variability

Largely because of the prevalence of irrigation over the past few decades, watermelon production and grower prices have largely avoided the wild year-to-year variations experienced by other commodities. This is illustrated by a coefficient of variation consistently under 20 cents per cwt since the 1950's (table 18).

This level of variability compares favorably with such program commodities as corn, soybeans, and wheat, whose price variations have been greater. It is tempting to conclude that this relatively low variation may be indicative of lower price risk and more stable markets as compared with other crops. However, this may not be the case since watermelons must frequently be abandoned (plowed under) in the field for economic reasons (that is, harvest costs would have exceeded market returns). Since harvest costs are a substantial proportion of total costs, market returns rarely fall below average harvest costs. This gives the appearance of relative price stability from year to year.

Table 18--U.S. watermelon grower price analysis

Period	Mean	Variance	Standard deviation	Coefficient of variation 1/
Dollars per cwt				
1940-49	1.13	0.22	0.47	0.41
1950-59	1.43	0.05	0.23	0.16
1960-69	1.70	0.07	0.26	0.15
1970-79	3.33	0.54	0.73	0.22
1980-88 2/	6.16	0.49	0.70	0.11

1/ Standard deviation divided by mean.

2/ Based on data from eight reporting States.

Source: USDA, Economic Research Service.

Seasonality

The marketing season for U.S. watermelons generally runs from April to October. The strongest prices received by growers usually come during the first 2 months of the season (late April to early June) when supplies are low, the weather is warming, and consumers are looking forward to summer fruits and vegetables. Because of their climatic advantage, Florida, California, and Texas are able to take advantage of this early market by shipping melons by the end of April or early May (fig. 11). These early watermelons compete with imported melons from Mexico into mid-June when the Mexican season is completed (fig. 12). At this time, Arizona and Georgia begin shipping watermelons and prices typically settle into their seasonal lows as domestic shipments approach their seasonal peaks.

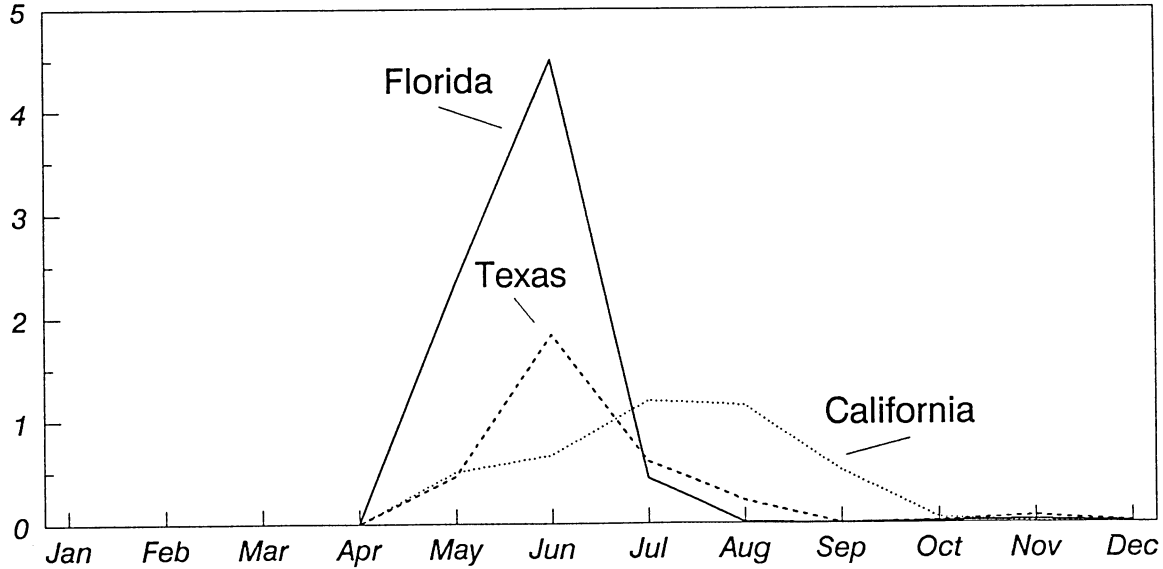
Although watermelon prices at all levels in the marketing chain are usually lowest around July 4 when supplies peak, low prices are not uncommon near the end of the marketing season. This may reflect that consumers are looking toward other fruits such as new-crop peaches, pears, and nectarines in place of watermelon. It could also reflect the approaching cool fall weather since watermelon consumption has been linked to warm weather. California is generally the last to ship watermelons, usually closing the domestic season during the fall.

Price Spreads

San Francisco was the only market that compiled data so price spreads could be calculated for watermelons. In 1988, the retail value (retail prices adjusted for marketing loss) averaged 9 percent above that of 1987 as drought losses in nonirrigated fields (such as in parts of Texas) forced prices higher. Growers received 45 percent of the retail value of watermelons sold in the San Francisco market in 1988. The wholesaling function accounted for roughly 33 percent of the value added to watermelons sold at retail, while retail costs accounted for the remaining 22 percent (table 19).

Figure 11
U.S. watermelon shipments,
major States, 1988

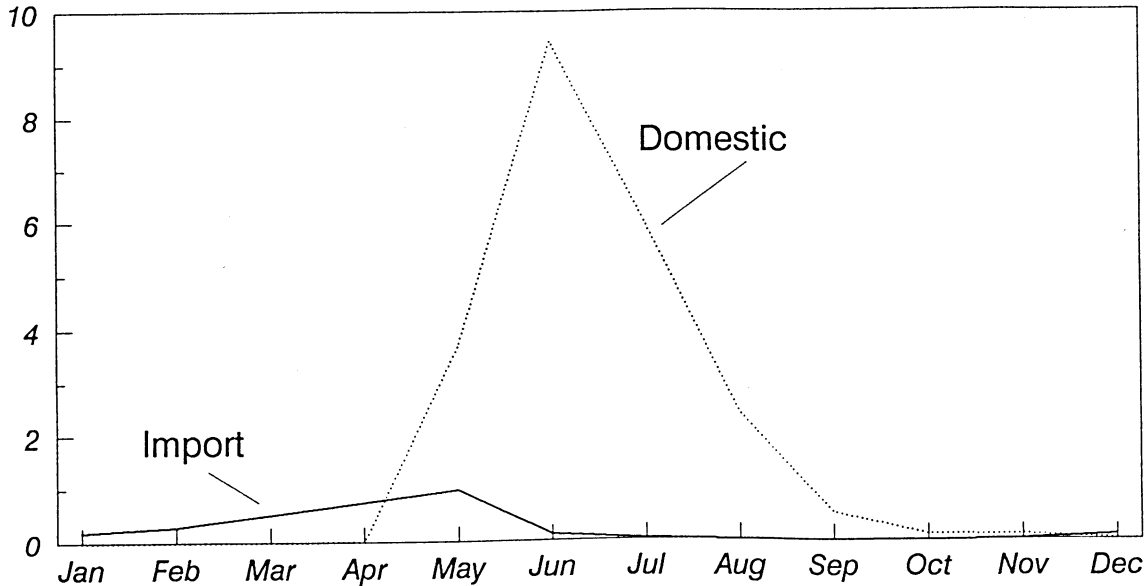
Million cwt



Source: USDA, Agricultural Marketing Service.

Figure 12
U.S. watermelon shipments,
domestic and import, 1988

Million cwt



Source: USDA, Agricultural Marketing Service.

Table 19--Watermelons, San Francisco: Retail value and shipping point prices, and grower-packer share of retail value by month (1st full week) and season, 1987-89 1/

Item	Jun	Jul	Aug	Sep	Season average
Cents per pound (16-20 pounds)					
Retail value: 2/					
1987	17.0	12.4	8.7	10.1	13.4
1988	17.5	17.5	12.0	11.5	12.9
1989	10.6	12.4	15.6	11.5	12.6
Wholesale price: 3/					
1987	12.0	8.0	8.5	13.0	10.0
1988 4/	14.0	12.5	8.8	10.0	10.0
1989	11.5	13.5	10.0	9.0	11.5
Shipping point price (f.o.b.):					
California--					
1987 5/	8.0	3.0	3.0	6.0	4.9
1988	8.0	7.0	5.0	6.0	5.8
1989	5.0	7.0	5.8	5.0	6.0
Percent					
Grower-packer share of retail value:					
1987	47.0	24.2	34.3	59.3	37.0
1988	45.8	40.0	41.8	52.2	44.8
1989	47.3	56.4	37.1	43.5	47.2
Cents per pound (16-20 pounds)					
Wholesale-retail spread:					
1987	5.0	4.4	0.2	-2.9	2.4
1988	3.5	5.0	3.2	1.5	2.9
1989	-0.9	-1.1	5.6	2.5	1.1
Shipping point-wholesale spread:					
1987	4.0	5.0	5.5	7.0	5.0
1988	6.0	5.5	3.8	4.0	4.2
1989	6.5	6.5	4.2	4.0	5.6
Percent					
Wholesale-retail share of retail value:					
1987	29.5	35.6	2.7	-28.5	20.2
1988	19.9	28.5	26.4	13.0	22.4
1989	-8.7	-8.7	36.1	21.7	8.7
Shipping point-wholesale share of retail value:					
1987	23.5	40.3	62.9	69.2	37.3
1988	34.3	31.5	31.8	34.8	32.6
1989	61.3	52.4	26.9	34.8	44.4

1/ Royal Sweet and Peacock varieties.

2/ Adjusted to allow for 8-percent loss incurred during marketing.

3/ Origin same as shipping point.

4/ June 1988 price quoted June 29.

5/ August 1987 price quoted July 31.

Source: USDA, Economic Research Service.

Transportation and Packaging

Transportation and packaging issues for watermelon are and have been major stumbling blocks to expansion of existing markets and development of new markets. Most watermelons are shipped by over-the-road truck with minor quantities arriving by rail or piggyback (table 20). Difficulty in securing adequate transportation at times during the season for the bulky fruit

Table 20--U.S. watermelon shipments 1/

Month	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
1,000 cwt											
Rail & piggyback:											
January	-	-	-	-	-	-	2	1	-	-	-
February	-	-	-	-	-	-	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-
April	-	-	-	-	-	-	4	1	5	-	1
May	73	21	1	18	-	8	283	361	355	151	370
June	222	104	1	43	19	200	501	339	442	390	661
July	28	18	1	9	2	26	32	33	55	133	216
August	3	-	2	-	-	-	-	-	-	1	12
September	-	-	1	-	-	-	-	-	-	-	-
October	-	-	-	-	-	-	-	-	-	1	-
November	-	-	-	-	-	1	-	1	-	-	1
December	-	-	-	-	-	3	1	1	-	-	-
Annual	326	143	6	70	21	238	823	737	857	676	1,261
Truck:											
January	1	-	1	2	2	15	1	2	1	-	-
February	-	-	-	-	-	5	-	-	-	-	-
March	-	-	-	-	-	-	-	-	-	-	-
April	-	22	15	8	652	1	90	126	128	79	16
May	1,282	2,080	1,869	3,308	3,020	1,138	2,883	4,161	4,651	1,860	2,937
June	7,891	6,705	6,692	7,744	7,564	6,460	8,347	9,191	7,259	6,872	8,118
July	6,232	4,761	5,161	5,745	6,901	7,416	5,746	5,225	5,352	6,446	5,543
August	1,686	1,347	1,535	1,620	1,576	2,425	2,140	1,561	1,228	1,109	2,385
September	140	145	155	175	170	298	173	113	233	114	531
October	45	25	80	42	63	101	14	21	19	27	108
November	22	-	22	17	38	60	39	53	82	95	93
December	12	1	19	13	25	13	27	31	36	55	27
Annual	17,311	15,086	15,549	18,674	20,011	17,932	19,460	20,484	18,989	16,657	19,758
Imports: 2/											
January	71	73	115	67	75	79	118	133	120	170	202
February	156	175	195	97	206	115	230	185	202	296	290
March	291	283	290	261	614	251	578	442	470	560	523
April	736	546	676	383	781	474	684	631	865	651	759
May	573	561	824	429	581	813	999	805	572	968	990
June	92	427	54	59	57	250	159	218	147	543	124
July	50	81	9	1	4	16	24	25	23	20	30
August	6	1	1	-	-	2	3	1	-	3	2
September	2	7	-	-	-	-	-	-	-	2	-
October	5	-	-	-	-	-	-	2	1	6	10
November	2	2	-	-	13	2	18	71	68	58	17
December	11	34	4	30	23	44	73	76	95	110	96
Annual	1,995	2,190	2,168	1,327	2,354	2,046	2,886	2,589	2,563	3,387	3,043
Total: 3/											
January	72	73	116	69	77	94	121	136	121	170	202
February	156	175	195	97	206	120	230	185	202	296	290
March	291	283	290	261	614	251	578	442	470	560	523
April	736	568	691	391	1,433	480	779	759	998	730	776
May	1,928	2,662	2,694	3,755	3,606	1,964	4,166	5,327	5,578	2,979	4,297
June	8,205	7,238	6,747	7,846	7,652	6,910	9,007	9,750	7,848	7,805	8,903
July	6,310	4,860	5,171	5,755	6,907	7,458	5,802	5,283	5,430	6,599	5,789
August	1,695	1,352	1,539	1,621	1,576	2,427	2,143	1,562	1,228	1,113	2,399
September	142	152	156	175	171	298	173	113	233	116	531
October	50	25	80	42	63	101	14	23	20	34	118
November	24	2	22	17	51	63	57	125	150	153	111
December	23	35	23	43	48	60	101	108	131	165	123
Annual	19,632	17,425	17,724	20,072	22,404	20,226	23,171	23,813	22,409	20,720	24,062
Percent import	10.2	12.6	12.2	6.6	10.5	10.1	12.5	10.9	11.4	16.3	12.6

- = not available.

1/ Includes quantities shipped for export. 2/ Just as shipments do not cover total volume produced, import shipments do not encompass total imports. 3/ Includes domestic and import shipments by rail, piggyback, truck, boat, and air.

Source: USDA, Agricultural Marketing Service.

remains a problem. Packaging of watermelons is related to the transportation issue with the question of bulk versus container shipments. Bulk shipments are still the most common form of transportation due to tradition and possibly economics, but bin and carton shipments provide handling and marketing advantages and lower shipping losses.

Transportation

For watermelon marketing to be successful, adequate facilities for transporting the crop to market are imperative. Yet, adequate transportation for watermelons is frequently a problem. When watermelons are harvested, shippers face competition for trucks from citrus and many vegetable crops maturing during the same period (4). Because of the difficulty in transporting watermelons relative to other commodities, independent truckers often haul watermelons only if there are no alternatives. Truck availability is tougher in California and Florida, since most trucks leave the State with agricultural commodities, but few tend to bring in commodities. Demand for trucks is frequently greater than the supply of trucks.

Routinely faced with a long unloading process at terminal markets, extended unloading times, high unloading charges relative to other produce, and the prospect of being stuck with culled melons refused by the receiver, truckers are increasingly moving away from accepting bulk watermelon loads. Compounding the problem is that independent truckers are giving way to small- and medium-sized fleets, which generally are not interested in hauling watermelons (16).

The National Watermelon Association (NWA) has wrestled with this problem for years, once trying to get shippers to cover the cost of unloading for truckers. But, most NWA efforts have been unsuccessful. NWA sent out letters to major watermelon receivers requesting changes in their receiving policies. The request encouraged receivers to unload more quickly and stop culling melons. Melons that are refused are left on the truck, and the trucker often has to pay to dump them to have a clear trailer for an outbound load (16).

Unloading charges are one of the main complaints among truckers. Bulk-melon unloading charges can reach up to \$200 per load in some areas of the United States. Truckers try to cover these charges in the melon costs, but frequently cannot. The end result is that fewer trucks may be available to haul watermelons. The number of available truckers is already decreasing because of stiffer Federal regulations on the trucking industry (16).

Receivers are not the whole problem, however, as shippers give truckers rolling loads - loads that leave the shipper for a certain destination, but are then diverted to other receivers in other areas en route. This results in added miles and costs for truckers, lower quality product due to the extra time en route, and more claims and problems in going into areas where the trucker is not licensed to operate (16).

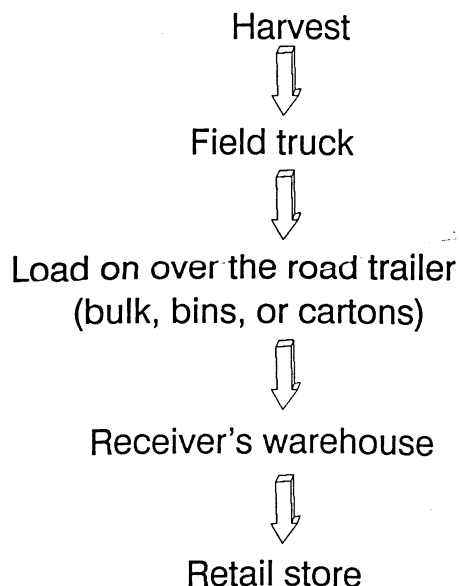
Storage Conditions

Watermelons are more perishable than other types of produce, apples and storage onions, for example, and generally cannot be held for long periods of time. The marketing process is usually kept as continuous as possible from field to consumer to assure a high-quality product. At temperatures between 32- and 50-degrees F, watermelons are subject to chill injury. After 1 week at 32 degrees F they will develop an off-flavor and become pitted. At 50 degrees F or lower they lose color, and at higher temperatures they tend to decay. Holding watermelons at room temperature for short periods of time (about 7 days) can improve flavor and coloring. However, after 6 weeks, melons held at room temperatures have very poor flavor (10). If necessary, watermelons can be held for 2 to 3 weeks at 40- to 50-degrees F (18). Optimum shipping conditions for watermelons include transit temperatures of 55- to 70-degrees F, 80- to 85-percent humidity, and good ventilation (10).

Packaging

Watermelon handling can be broken down into six segments: harvesting, field truck unloading, loading of over-the-road trailer, transportation from growing area to the receiving warehouse, unloading at the warehouse, and movement from warehouse to the retail store (fig. 13).

Figure 13
U.S. watermelon distribution chain



Watermelons are harvested by hand and then are either transported by field truck to a central location where they are loaded on over-the-road trailers for transport to destination or loaded directly from the field onto over-the-road trailers (6). Watermelons are transported in three ways: bulk, bin, and carton. In the past, watermelons have not been shipped in containers but have been directly loaded onto railcars or trucks (10).

Although bulk has been used the most, bin and carton packaging are becoming more popular. Receivers have expressed more interest in receiving melons loaded in bins and cartons. Bins can be unloaded faster than bulk loads, thus, truck dock space is not tied up as long. Also, bin and carton loads require less handling, hence, loss due to handling damage is usually lower (10). There has been some resistance to using bins or cartons by some growers since bulk has been used over the years, and there is still a larger demand for bulk melons due to f.o.b. pricing (4). Also, a drawback to the bins from the receiver standpoint is that each melon cannot be inspected for quality or damage as can be done with bulk shipments where each watermelon is handled. Receivers are concerned that watermelons in the bottom of the bins might be of lower quality than those in view on the top (16).

Carton shipments now are coming primarily from foreign suppliers, such as Mexico and the Caribbean. As with bin shipments, most of these shipments arrive during the winter season, when domestic supplies are not available and prices are comparatively high.

In bulk loads, watermelons are stacked five to seven layers high with a cushioning of packing material (usually straw) on the floor and against the front and rear walls of the trailers to prevent melon damage (7). With bins or cartons, melons are pre-graded and sorted by weight prior to being loaded for the packinghouse. Once at the packinghouse, melons are regraded and passed along a weight belt which further narrows the weight range to create a more uniform, quality pack. Watermelons are then packed into cartons or bins and are stacked on pallets and loaded on a transport trailer (4).

Most bins and cartons are fiberboard. Wirebound bins were used in the past but are virtually never used now since fiberboard is now much stronger than in the past, easier to handle and reusable. When melons reach the retailer they are unloaded with a forklift or pallet jack. Often watermelons are put on display in retail stores in the same bulk bins they were shipped in, greatly reducing labor time in unloading and setting up retail displays. Cartons are often unloaded onto pallets, usually seven cartons high, although sometimes they are shipped floor loaded into cars or trucks (10).

Bulk bins, made of wood or fiberboard, are frequently collapsible and reusable. They generally hold from 800 to 2,000 pounds of watermelons. The basic fiberboard carton holds 3 to 5 watermelons, with the net weight of each carton ranging from 55 to 80 pounds (10). Cost of cartons (70 to 80 pounds each) is a

few cents more per pound than both bulk delivery and for watermelons delivered in bins. However, packed melons are generally spared the splits and bruises that bulk loads tend to accumulate. Packed melons are also more uniform in weight. In a study conducted by the USDA and the Florida Department of Agriculture, losses due to rough handling of watermelons shipped noncontainerized in bulk from the field to the retail store were 11.3 percent, while losses of watermelons packed in cartons and shipped palletized were 0.2 percent. In addition, researchers found that the unloading time for palletized loads was cut greatly. Reduction of losses and unloading time generally offset the cost of cartons (10). This would seem to suggest that many shippers, receivers, and retailers would welcome containerized watermelons.

Marketing

Watermelons can be marketed through a variety of outlets including roadside stands, farmers' markets, local markets, or wholesale shippers. In most States, the majority of the crop is sold out of State. Also, because July 4 is when most supplies are on the market, it is usually feasible for some States to get melons on the market early in May or in late-August to obtain better prices. After Labor Day, interest in watermelons rapidly decreases. Although earliness usually results in higher prices, high quality through maturity and uniformity of size are key variables in promoting strong sales (10).

More and more retailers are supplementing bulk watermelon sales by adding value through sliced and wrapped watermelons which are tailored more to today's convenience-oriented consumer. Watermelon is materializing in more supermarket salad bars nationwide, and in some cases they are becoming the focal point for watermelon sales. Turned off by the sheer size and awkwardness of the traditional 25-pound to 30-pound watermelon, consumers are finding favor with sliced or quartered watermelon for convenience and savings. In addition to being a more convenient way to purchase watermelons, offering cut watermelon in the produce department gives consumers a chance to sample the many new melon varieties coming on the market.

Cut and wrapped watermelons likely account for a significant percentage of watermelon sales (10). Some grocery chains are adding melon bars, free samples, custom orders for melon boats, and also chilled watermelons for an additional charge. Retailers are also offering prewrapped variety packs that contain slices of watermelon, cantaloupe, and honeydew, along with a fork and salt for quick and easy eating (16). Because watermelons are generally too large for creative displays, point-of-purchase (POP) advertising materials such as nutritional display posters are especially important (18).

Although in grocery chains convenience is key, in the food service area bigger is better. Since all watermelon used in food service is sliced or otherwise portioned, yield is a top concern for users. Consequently, food service customers tend to favor

large watermelons that are shaped to produce the greatest number of useable portions. Buying watermelon in the winter months from the Caribbean, Central America, and Mexico has been a recent trend in the food service industry. Seedless melons are a natural for the food service industry, but the higher cost likely will encourage continued demand for larger watermelons.

Grades for watermelons are U.S. Fancy, U.S. No. 1, and U.S. No. 2. These grades conform to the USDA policy of establishing uniform grade names for fresh fruits and vegetables (table 21) (13).

Present Promotion Activities

Presently, most of the larger watermelon-producing States conduct watermelon promotions on their own. Although the NWA provides POP material, it does not promote watermelons from any particular State. The NWA planned \$95,000 for watermelon promotion in 1988, using mostly POP material and the watermelon queen activities (16). NWA also sponsors an annual Watermelon Day on Capitol Hill in Washington, DC as a public relations activity.

Table 21--Grades and characteristics of U.S. watermelons

U.S. Fancy
Mature
Similar varietal characteristics
Fairly well formed
Not overripe
Free from anthracnose, decay, sunscald, and whiteheart
Free from damage by any means (other diseases, sunburn, hail, scars, insects, hollow heart, whiteheart, mechanical, or other means)
U.S. No. 1
Mature
Similar varietal characteristics
Fairly well formed
Not overripe
Free from anthracnose, decay, and sunscald
Free from damage by any means
U.S. No. 2
Mature
Similar varietal characteristics
Not badly misshapen
Not overripe
Free from anthracnose, decay, and sunscald
Free from serious damage by any means

Source: USDA, Agricultural Marketing Service, "U.S. Standards for Grades of Watermelons."

Because a number of States produce watermelons, many have strong promotion programs. Florida continues to have one of the strongest promotion and advertising programs, sponsoring radio advertisements in Florida and major eastern markets. In 1988, the Florida Agriculture Department distributed approximately 20,000 pieces of POP material.

South Carolina's promotion campaign is carried out primarily through the State's own marketing order, with the funds used to distribute POP material at roadside stands and welcome centers as well as through the State's watermelon queen, recipe books, brochures, T-shirts, and tennis visors. In the past, South Carolina has also supported generic promotion by providing the National Watermelon Association with POP material.

Missouri receives matching funds from the State's Agriculture Department to pay for brochures and bumper stickers. Texas-Oklahoma producers promote their local product with a brochure for retailers and handlers emphasizing their State's quality and availability. On the flip side, Delaware's State Agriculture Department feels a generic approach works better for their region (Delaware, Maryland, and Virginia) so they place more emphasis on the Delmarva region rather than solely on Delaware (16).

Research and Promotion Program

The outlook for watermelon use will largely depend on efforts to adapt to a changing market environment and to effectively promote the product. Because of concern over the sluggish per capita use trend, the watermelon industry has focused on reviving interest in watermelon by initiating and approving a national promotion and research program. Broad initial goals will likely include assessing consumer attitudes toward watermelon and discovering methods to effectively increase per capita use.

Title XVI of the 1985 Food Security Act authorized the Secretary of Agriculture to establish an orderly process for developing and underwriting a program of research and promotion to strengthen and expand the market for watermelons. Title XVI provided for the issuance of a research and promotion plan (after notice and hearings) if approved by producers and handlers voting in a referendum. In a referendum held February 6-21, 1989, watermelon producers and handlers voted to approve a national promotion and research program, NWA officials were hoping producers and handlers would pass the referendum because no central marketing or promotion plan was designed to pull all facets of the industry together in sharing the costs and benefits of a national promotion plan.

The program provides for an assessment of not more than 2 cents per 100 pounds of watermelons sold for human consumption, paid by first handlers and producers who grow 5 or more acres of watermelons. Anyone who serves as both a producer and a handler will pay assessments for each function. The plan is expected to

raise about \$1 million annually. Because the assessment can be refunded to growers who do not want to participate, the amount may not reach this goal (11, 20).

The promotion and research program, submitted by the National Watermelon Association, Inc. represents an attempt to improve the perception of watermelons in the marketplace through coordinated research and promotion activities. Administration of the research and promotion program will be through a 29-member board composed of watermelon producers, handlers, and a representative of the general public (8). The first members of this board were appointed by the Secretary of the U.S. Department of Agriculture in November 1989.

The general goals of the program and the board are to carry out effective, continuous, and coordinated research, development, advertising, and promotion activities aimed at strengthening watermelon's competitive position in the marketplace, maintaining and expanding existing domestic and foreign markets, and developing new or improved markets. The program contains no provisions for quality standards, production controls, or any other controls that limit the right of individual watermelon producers to raise watermelons (8).

South Carolina watermelon producers passed a State marketing order in 1982. Their goal has been to use advertising and sales promotion to promote the sale of watermelons in domestic and foreign markets for maintaining existing markets or creating new or larger markets for watermelons grown or sold in the South Carolina. The South Carolina Marketing Order is financed by an assessment on watermelon producers of 1 cent per cwt on watermelons produced or sold in South Carolina. Although any producer may be refunded the full amount of the assessment, very few refunds have been requested (11).

Cash Receipts and Costs of Production

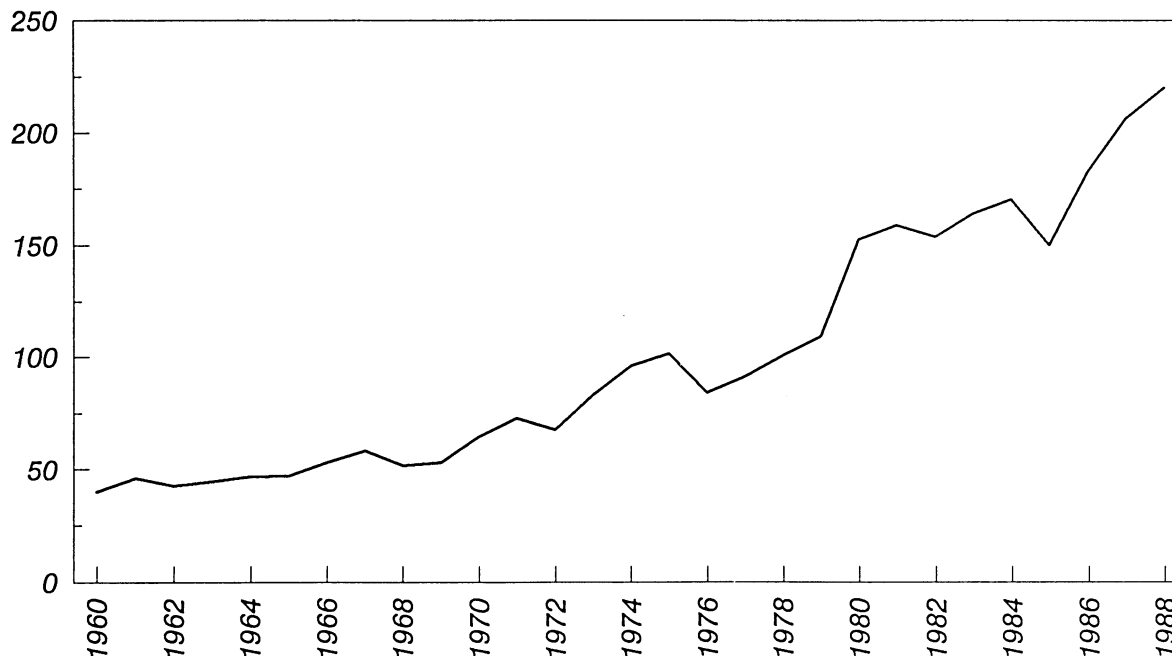
Among vegetables, watermelons are the 17th leading item in terms of cash receipts.⁸ Their receipts top important vegetables such as cabbage, fresh and processing green peas, and honeydew melons (table 22). Although accounting for just over 1 percent of total vegetable cash receipts, watermelons are an important component of gross vegetable receipts for many States.

In many States, watermelons are important contributors to the vegetable sectors. In South Carolina and Missouri, watermelons account for roughly a sixth of all vegetable cash receipts. Florida, the second most important vegetable-producing State, is

⁸ Cash receipts and value of production are equal for fresh watermelon, since they are not storable and the crop year falls entirely within the calendar year. Watermelons and other melons are grouped with vegetables by USDA.

Figure 14 U.S. watermelon cash receipts

Million dollars



Source: Economic Research Service.
Data for 1982-88 are adjusted using data for
States continuing to report receipts.

the leader in U.S. watermelon production with watermelon typically accounting for 5 percent of all vegetable receipts. Texas, also known as an important vegetable-producing State, counts on watermelon for a tenth of its vegetable receipts.

Watermelon receipts (unadjusted for inflation) were trending upward at a \$5 million-a-year pace during the 1960-81 period (fig. 14). When USDA's Statistical Reporting Service (now the National Agricultural Statistics Service) cut the national watermelon estimates program in 1982, the decline in States reporting watermelon cash receipts caused a plunge in the national estimates. Thus, with fewer States now estimating receipts, the published national series is not continuous or comparable with the pre-1982 series. However, substituting the U.S. crop value series estimated using data for the nine reporting States (see appendix 2 for methodology) provides a smoother and more realistic approximation of the underlying actual cash receipts series for 1982-88.

Data from watermelon-producing States still estimating receipts (including top States such as Florida and South Carolina) suggest that industry gross receipts peaked in 1984 before falling back slightly the next 2 years. In 1987, the limited receipts data suggest the industry had a good year financially with receipts for reporting States rising 21 percent to \$120 million. This was the strongest year-over-year increase and the highest gross

Table 22--Vegetables: U.S. cash receipts

Year	Potatoes	Tomatoes	Lettuce	Onions	Dry beans	Sweet corn	Broccoli	All peppers	Carrots	Celery	Cucumbers
1,000 dollars											
1970	666,154	399,828	226,366	113,986	147,988	119,571	31,389	53,133	70,246	85,413	87,577
1971	558,758	466,047	312,909	107,348	177,766	134,933	36,563	58,076	101,768	89,043	89,035
1972	618,151	520,902	293,701	161,162	165,688	151,222	37,341	67,758	108,977	104,255	94,951
1973	1,080,461	584,690	384,125	221,757	345,967	170,629	43,739	75,177	114,705	104,249	103,519
1974	1,509,793	833,442	363,425	168,437	419,423	236,915	57,052	87,649	127,844	96,268	134,726
1975	1,133,136	957,051	371,504	260,441	405,227	259,156	61,664	99,056	141,661	120,044	145,733
1976	1,267,957	792,603	462,262	183,952	279,587	226,973	68,204	88,284	113,069	133,336	129,711
1977	1,195,524	907,600	416,001	257,864	327,384	234,154	68,748	88,047	138,944	140,978	156,114
1978	1,149,064	808,813	596,908	269,551	297,299	245,685	151,169	100,899	138,695	238,798	159,481
1979	1,061,800	1,020,320	564,090	354,293	390,630	265,170	120,913	115,696	124,044	161,042	182,229
1980	1,386,309	903,874	565,148	322,762	608,157	269,031	144,613	126,706	149,520	169,896	176,728
1981	1,856,639	941,068	681,612	532,169	813,451	315,904	175,132	142,360	197,218	200,622	188,127
1982	1,504,029	1,124,848	740,682	384,232	418,577	341,883	211,085	90,610	226,887	194,280	56,870
1983	1,688,551	1,137,016	711,898	362,618	378,994	318,516	210,105	125,596	215,431	250,239	62,062
1984	1,920,908	1,239,586	706,271	522,572	344,900	367,155	237,884	154,404	247,920	228,457	160,137
1985	1,603,986	1,198,246	675,237	371,798	439,058	367,529	239,345	149,399	206,429	189,527	181,476
1986	1,375,783	1,264,914	757,970	414,544	436,621	359,742	239,739	163,132	334,617	211,065	170,072
1987	1,688,116	1,284,741	1,002,379	537,007	442,857	368,261	238,846	229,489	351,162	198,617	187,594
1988	1,649,638	1,407,880	1,045,161	476,549	419,720	360,914	292,264	151,534	344,466	219,249	195,804

Year	Cauliflower	Cantaloupe	Snap beans	Sweet potatoes	Asparagus	Watermelons 2/	Cabbage	Green peas	Honeydews	All others 1/	All vegetables
1,000 dollars											
1970	24,443	89,046	100,316	50,371	56,816	64,452	83,504	51,888	10,984	280,050	2,813,521
1971	27,514	89,035	104,635	55,589	65,511	73,061	80,268	55,924	12,738	314,312	3,010,833
1972	33,470	100,455	112,447	66,309	69,548	67,907	78,272	57,500	14,406	361,017	3,285,439
1973	36,536	99,304	136,486	77,417	68,088	83,335	124,801	59,694	18,350	417,767	4,350,796
1974	43,006	104,463	178,770	87,136	76,157	96,345	87,422	112,166	18,056	497,018	5,335,513
1975	50,499	109,508	171,212	89,910	62,286	101,678	109,194	124,606	22,358	550,192	5,346,116
1976	51,714	111,040	145,231	87,943	72,122	84,421	95,800	101,982	24,916	709,716	5,230,823
1977	64,434	115,377	160,622	97,179	81,396	91,440	178,061	100,533	25,561	783,353	5,609,314
1978	87,905	128,387	180,586	116,575	124,573	100,816	178,196	94,859	36,499	922,703	6,127,461
1979	81,121	139,847	197,365	107,630	96,612	109,541	181,840	129,096	37,761	1,038,970	6,480,010
1980	95,762	166,800	193,038	114,234	88,246	152,800	147,227	101,628	42,864	1,381,218	7,306,561
1981	125,811	188,070	216,854	139,393	99,797	159,097	150,157	99,059	52,581	1,496,792	8,771,913
1982	133,701	36,795	158,469	118,902	52,191	88,482	122,888	112,541	53,111	1,892,432	8,063,495
1983	139,989	163,467	153,297	161,525	85,034	93,919	92,831	92,190	51,540	1,963,833	8,458,651
1984	174,931	189,306	165,943	166,354	116,462	100,034	172,665	117,265	55,894	1,748,666	9,137,714
1985	169,133	189,745	166,723	142,656	137,476	89,794	120,767	137,857	58,055	1,723,516	8,557,752
1986	191,863	232,100	150,309	141,638	136,969	99,002	105,736	93,781	69,132	1,876,792	8,825,521
1987	187,555	187,026	169,410	135,435	135,704	120,325	104,132	98,614	69,293	1,981,142	9,717,705
1988	202,378	136,112	166,442	157,029	146,435	112,227	70,147	73,204	75,341	2,077,452	9,819,393

1/ Includes eggplant, escarole, dry peas, casaba melons, crenshaw melons, spinach, squash, radishes, taro, beets, brussels sprouts, and other miscellaneous vegetables. 2/ This is the series as published by ERS. Original data for 1988 are adjusted to account for Texas, which dropped its watermelon estimates program following the 1987 season. The published value for 1988 U.S. watermelon receipts is \$72.780 million.

Source: Economic Research Service, USDA.

receipts for the reporting States since 1981. In 1988, the hot, dry weather caused production losses in some areas of the country. This fueled price increases in many areas, suggesting that 1988 may have been another overall financial success for the industry.

Costs of Production

Like all commodities, the cost of production for watermelons varies among States, within States, and among farms. Dissimilarity in variables such as soils, climates, varieties, cultural techniques, and management abilities leads to the inevitable variations in farm enterprise cost structures. Although some States generate cost of production budgets, varying methodologies and data collection methods make absolute cost comparisons across States almost impossible. However, a few elemental generalizations based on several State budgets can be made. Cost differences among States are generally based on such items as:

- o Irrigated production versus dryland,
- o Use of plastic mulch versus no mulching,
- o Direct seeding versus transplanting, and
- o The level of post-harvest services performed on farm such as packing or hauling.

In States, where irrigation is used, like California, both capital and labor costs were higher. However, as is often the case in irrigated production, average yields tended to be higher compared with dryland yields with the added revenue more than making up for the added costs. The use of black plastic mulch is common in budgets for both traditional watermelon States such as Florida and minor producing States such as Kansas. Plastic mulch and hot caps are being used in conjunction with transplants by some producers in an attempt to establish an early market and take advantage of stronger early season prices. However, because of the additional costs associated with plastic, growers have more to lose if they do not receive higher early season prices. Another added cost which is expended to bring watermelon to market earlier involves the use of transplants. These can more than double seed costs with the advantage again primarily focused on coming to market a couple of weeks earlier than with direct seeded melons.

Harvest costs seem to run from 30 to 45 percent of total costs, depending on marketing techniques and services rendered onfarm. The average for important producing States like Texas and California seems to be about 40 percent. Florida, the major producer, averages just under 40 percent of total costs, with three in-State producing regions under 40 percent and two regions over 40 percent. The major considerations in harvest costs center on whether the farm 1) contracts all harvest activities, 2) harvests and sells directly to truckers, 3) harvests, hauls,

and packs, or 4) harvests (utilizing a belt harvesting machine to sort and pack into bins) and markets through brokers. Many other permutations with various costs are possible regarding harvest activities. Whatever marketing technique is used, one constant is that the actual harvest activity tends to be the largest cost in raising watermelon.

The operating capital requirements for raising watermelons appear to be lower, on average, than for many other high-value produce items. In Florida, for example, on average only sweet corn and potatoes had lower per acre total costs than watermelons out of 11 commodities budgeted. In fact, when presented by an individual region of the State, the total costs of producing watermelons in the Alachua and Levy and North Central areas were the lowest of all commodities budgeted (12).

Florida Cost of Production Budgets

Florida has the most complete cost of production data available for watermelons. Florida's cost of production budgets allow for a fairly complete understanding of the various cost of production items and how important each component is relative to total enterprise costs. The five Florida producing areas for which watermelon cost of production was estimated for the 1987/88 season show two distinct groupings. The first group, using transplants and selling through brokers, produces primarily for the early season market when prices are highest beginning in late April. Meanwhile, the second group, utilizing direct seeding and largely direct selling to truckers, produced for harvest beginning in late May and early June, still well before the early July U.S. price slump.

The early group, consisting of the southwest Florida (table 23) and Manatee and Ruskin areas, had total costs of \$6.25 and \$6.09 per cwt, respectively, in the 1987/88 season. This contrasts with the second group which had total costs of production between \$3.68 and \$4.03 per cwt. The first group incurred high costs due to the nature of their marketing goals (to capture the early market when prices are strongest). Thus, the use of transplants and plastic mulch to speed crop development was essential to these goals but added to the total cost. Since early markets are immature, selling through brokers, which added \$0.75 to \$1.00 per cwt to costs, likely helps to match the early supply with early demand and assure the best possible returns.

Labor

Like many produce items, watermelon is a fairly labor-intensive commodity. According to Florida watermelon cost of production budgets, pre-harvest hired labor accounts for about 9 percent of total production costs. However, labor also accounts for a substantial portion of harvest and packing costs which account for 30 to 40 percent of total production costs (12).

Table 23--Cost of producing watermelons, north and southwest Florida

Item	North Florida			Southwest Florida		
	1986/87	1987/88	1988/89	1986/87	1987/88	1988/89
Dollars per acre						
Operating costs:						
Transplants	-	-	-	39.00	39.00	111.00
Seed	15.63	6.69	65.06	-	-	-
Fertilizer and lime	125.13	134.09	128.50	185.80	213.70	189.00
Fungicide	51.25	75.57	85.98	82.73	72.40	74.83
Insecticide	8.20	13.97	-	66.84	67.08	75.18
Nematicide	4.95	4.23	6.96	-	-	-
Labor	85.78	87.00	84.98	138.11	161.15	153.41
Machinery	56.42	55.83	86.90	88.65	85.25	116.61
Interest	18.08	53.75	67.21	28.26	34.58	39.73
Miscellaneous 1/	100.95	170.51	190.90	221.10	221.10	276.00
Total operating costs	466.39	601.64	716.49	850.49	894.26	1,035.76
Fixed costs:						
Land rent	55.00	55.00	50.00	250.00	250.00	250.00
Machinery	77.38	79.80	101.06	92.05	89.92	113.52
Overhead	75.23	34.13	80.03	58.21	119.96	135.92
Total fixed cost	207.61	168.93	231.09	400.26	459.88	499.44
Total preharvest cost	674.00	770.57	947.58	1,250.75	1,354.14	1,535.20
Harvest and marketing costs 2/	399.00	612.50	659.75	771.80	771.80	771.80
Total costs:						
Per acre	1,073.00	1,383.07	1,607.33	2,022.55	2,125.94	2,307.00
Per 100 pounds (cwt) 3/	3.07	3.95	4.95	5.95	6.25	6.79

- = not applicable.

1/ Includes such items as irrigation, bees, plastic mulch, ditch cleaning, frost protection, and others. 2/ Includes any harvesting, packing, hauling, and selling costs.

3/ Based on average yields of 350 cwt/acre in the North in 1986/87 and 1987/88 and 325 cwt in 1988/89. An average of 340 cwt/acre was used in the Southwest for all 3 years.

Source: (12).

There are many operations, both cultural and marketing, which require labor hours in the production of watermelon. Some of these include turning and training of vines, hoeing, irrigating (especially with mobile units), thinning, setting plastic mulch, operating machinery (plows, harrows, spreaders, and sprayers) harvesting, sorting, and packing.

Harvesting and handling the heavy, bulky fruit must be undertaken using hand labor since, aside from a belt harvester which is essentially a mobile sorting and packing machine, there is currently no practical fully mechanized harvesting equipment

available. Harvesting requires considerable amounts of stoop labor which has become increasingly unattractive to local area labor forces which have alternative employment available. This requires many growers to bring in or contract for seasonal agricultural workers. Hiring migrant workers thrusts growers into the realm of strict regulatory requirements for seasonal labor. The Immigration Reform and Control Act (IRCA) of 1986 forces growers to shoulder a larger clerical and legal responsibility regarding those who labor on their operations. It seems likely that over time, growers who have not already done so, will turn increasingly to farm labor contractors and custom harvest services to secure labor needed for harvest.

An informal ERS survey of State watermelon associations found that a majority of responding areas rely on migrant labor. However, the associations also indicated that some of the minor producing areas have adequate local labor available to produce and harvest watermelon in their region. If labor costs rise due to reform or some other reason, it could imply that 1) some growers will refrain from raising labor-intensive commodities like watermelons, 2) technological changes in harvesting and handling melons will result, 3) production will move to regions with competitive advantages in watermelon production, or 4) the cost of production and the farm-level price of watermelon will eventually increase.

Conclusions

After many years of steady decline, the U.S. watermelon industry appears ready for an economic revival. Based on trends indicated by the nine States still reporting watermelon data, acreage, yields, production, and per capita use have likely trended upward since 1980. Florida and Texas, the top two producing States, accounted for nearly half of U.S. production in 1981, the last year USDA collected national statistics. Although the trade picture still favors imports, most watermelons enter the country from Mexico during the off-season when U.S. production is low or nonexistent. Imports offer consumers a broader window of watermelon availability. Inflation-adjusted grower prices, which had been trending upward through 1980, flattened during the 1980's, likely due to minimal national marketing efforts and a poor quality image among consumers. National marketing efforts have been minimal in the past due partly to poor industry cohesiveness and sense of purpose. However, growers voted for a national watermelon research, advertising, and sales promotion program in February 1989. This program, which was the first of its kind for the industry, will attempt to bring the industry closer together and improve the image and sales of U.S. watermelons.

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Appendix table 1--World watermelon production, 1980-1987

Country	1980	1981	1982	1983	1984	1985	1986	1987
	Metric tons							
CHINA (PRC)	3,900,000	4,000,000	4,100,000	4,300,000	4,500,000	5,000,000	5,250,000	5,400,000
TURKEY	4,450,000	4,500,000	4,500,000	4,610,000	4,800,000	5,500,000	5,000,000	5,350,000
USSR	3,788,000	3,917,000	4,051,000	4,292,000	4,003,000	3,800,000	3,807,000	4,751,000
EGYPT	1,157,370	1,210,961	1,082,722	965,000	1,183,000	1,318,000	1,324,000	1,385,000
UNITED STATES	1,030,375	1,182,781	1,184,000	1,186,000	1,195,000	1,200,000	1,220,000	1,230,000
IRAN	930,000	950,000	950,000	950,000	950,000	960,000	960,000	960,000
JAPAN	975,700	963,000	932,600	865,900	876,100	820,400	840,400	851,800
ITALY	712,100	705,610	798,720	798,090	796,600	782,980	740,430	714,490
SPAIN	527,400	556,600	552,800	572,400	558,325	568,572	539,600	607,000
GREECE	630,250	643,960	544,785	609,343	595,769	618,500	572,155	591,477
IRAQ	473,300	491,100	578,900	583,000	571,300	756,800	550,800	588,300
SYRIA	906,083	968,934	868,586	678,200	285,500	684,100	631,000	517,500
THAILAND	512,500	512,500	512,500	525,000	525,000	500,000	500,000	503,700
YUGOSLAVIA	594,000	630,000	607,000	493,549	452,957	451,314	465,447	465,000
MEXICO	446,598	325,823	430,948	361,537	493,478	421,753	450,000	460,000
REPUBLIC OF KOREA	334,598	290,690	369,907	303,437	389,221	472,684	483,097	419,000
SAUDI ARABIA	332,063	193,352	456,512	446,742	332,620	366,104	431,908	400,000
BRAZIL	294,810	284,478	339,630	330,504	354,462	334,911	360,000	360,000
ALGERIA	172,450	179,222	193,222	206,941	242,976	252,000	350,000	360,000
BULGARIA	290,298	315,133	361,626	219,909	273,857	259,858	315,251	315,300
TAIWAN	341,410	310,822	284,379	224,594	240,100	284,521	353,206	278,000
TUNISIA	195,000	210,000	200,000	240,000	225,000	230,000	250,000	260,000
YEMEN, ARAB REPUBL	0	111,908	117,279	125,098	133,054	142,274	166,014	174,733
CHILE	167,000	168,000	168,000	170,000	172,000	172,000	174,000	174,000
HUNGARY	141,783	181,784	188,361	162,860	119,639	140,013	149,352	149,400
LIBYA	170,920	157,000	124,545	118,340	125,120	140,000	142,000	145,000
MOROCCO	134,000	136,000	137,000	138,000	140,000	143,000	144,000	145,000
VIET NAM	95,000	97,000	100,000	110,000	115,000	125,000	135,000	142,000
ARGENTINA	172,000	112,500	138,000	121,500	110,600	130,000	130,000	130,000
SUDAN	104,832	108,466	119,336	120,000	112,000	125,000	130,000	126,500
PHILIPPINES	213,700	196,908	250,456	75,652	55,650	93,490	113,480	115,000
ISRAEL	75,100	87,000	76,200	78,200	90,000	91,200	94,100	108,700
AUSTRALIA	37,036	42,640	68,340	65,904	76,078	80,110	90,057	95,700
ECUADOR	31,678	33,554	14,708	14,094	26,669	35,266	33,921	92,369
KOREA (DPR)	55,000	60,000	62,000	65,000	70,000	75,000	82,000	87,000
EL SALVADOR	40,480	39,744	39,744	62,376	78,826	83,720	87,547	86,100
PARAGUAY	72,000	73,000	73,000	73,500	74,000	74,000	75,000	76,200
UNITED ARAB EMIR	25,502	27,793	62,378	71,070	51,887	70,000	72,000	72,000
VENEZUELA	53,476	51,837	53,688	57,511	64,263	61,904	64,798	64,000
YEMEN (DEMOCR)	55,600	55,800	56,000	56,200	56,400	56,600	55,000	56,000
SOUTH AFRICA	22,255	21,199	27,687	37,742	38,645	38,305	50,000	50,000
PERU	38,000	40,000	44,230	40,000	40,000	40,000	40,000	40,000
AFGHANISTAN	30,000	31,000	31,000	31,000	34,000	34,000	34,000	34,600
MALAYSIA	121,000	93,000	89,500	56,000	54,400	49,300	40,900	33,900
LEBANON	30,000	32,000	31,450	32,000	30,000	30,000	30,500	31,000
CYPRUS	18,288	20,320	21,336	18,600	25,800	32,000	30,000	30,000
JORDAN	33,179	34,271	32,947	35,000	13,985	23,000	20,000	20,000
COLOMBIA	7,420	7,450	7,500	7,600	7,700	19,500	18,915	19,520
URUGUAY	16,361	16,500	17,000	17,000	18,000	18,000	18,600	19,100
OMAN	1,500	1,500	1,500	1,500	9,750	10,000	10,500	10,500
HONDURAS	14,247	15,450	17,780	5,093	6,100	6,300	6,600	6,600
FRANCE	2,500	2,200	2,500	4,200	5,100	6,000	7,000	6,000
MAURITANIA	4,500	4,500	4,600	4,700	5,100	5,100	5,100	5,300
PANAMA	1,470	1,662	1,878	2,156	2,564	3,672	4,721	4,800
PAKISTAN	1,000	1,500	3,000	4,500	4,500	4,500	4,600	4,800
JAMAICA	3,002	4,866	2,905	3,491	5,518	2,476	2,567	3,860
PORTUGAL	2,000	2,100	2,000	2,000	2,000	2,000	2,000	2,000
FRENCH POLYNESIA	1,140	1,450	1,553	1,360	1,644	2,489	2,447	1,820
QATAR	990	1,533	1,766	598	879	912	1,515	1,600
NEW ZEALAND	2,500	4,386	3,916	3,300	2,600	2,000	1,600	1,600
TONGA	950	1,000	1,100	1,170	1,200	1,250	1,300	1,400
GUADELOUPE	420	355	355	740	935	1,084	910	1,100
BAHRAIN	600	600	600	600	600	600	600	600
SOLOMON ISLANDS	450	460	470	480	500	510	520	531
KUWAIT	184	288	300	285	930	529	476	300
GAZA STRIP	3,800	1,950	925	1,470	500	300	200	200
DJIBOUTI	20	30	40	55	60	60	65	69
INDONESIA	0	0	0	0	50	50	50	50
GUAM	405	952	847	1,684	1,263	0	0	0
WORLD	24,997,584	25,425,408	25,995,552	25,761,760	25,829,760	27,755,008	27,668,240	29,138,512

Source: Food and Agriculture Organization, United Nations.

Appendix table 2--Alabama watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---		Cwt	1,000 cwt	\$/cwt	\$ 1,000
1950	13,600	13,600	90	1,224	1.10	1,346
1951	14,100	14,000	99	1,386	1.35	1,871
1952	16,500	16,500	96	1,584	1.70	2,693
1953	18,500	18,500	93	1,720	1.40	2,408
1954	23,000	22,500	78	1,755	1.15	2,018
1955	19,000	19,000	95	1,805	1.20	2,166
1956	17,000	17,000	85	1,445	1.05	1,517
1957	15,000	15,000	85	1,275	1.60	2,040
1958	20,000	20,000	115	2,300	1.10	2,530
1959	16,000	16,000	95	1,520	1.10	1,672
1960	15,000	15,000	100	1,500	0.95	1,425
1961	14,000	14,000	95	1,330	1.15	1,530
1962	14,000	14,000	90	1,260	1.00	1,260
1963	13,500	13,500	95	1,282	1.30	1,667
1964	13,500	13,500	90	1,215	1.60	1,944
1965	13,700	13,700	95	1,302	1.40	1,823
1966	13,000	13,000	95	1,235	1.75	2,161
1967	13,000	13,000	100	1,300	2.00	2,600
1968	15,200	14,500	90	1,305	1.80	2,349
1969	15,000	13,500	85	1,148	1.71	1,963
1970	14,000	14,000	87	1,218	1.83	2,229
1971	13,500	13,500	85	1,148	2.29	2,629
1972	14,500	14,500	80	1,160	2.37	2,749
1973	14,400	14,400	74	1,066	3.32	3,539
1974	14,400	14,400	72	1,037	3.58	3,717
1975	13,700	13,700	74	1,016	3.99	4,051
1976	15,000	15,000	75	1,126	3.54	3,989
1977	13,000	12,500	66	831	3.51	2,913
1978	11,000	11,000	68	750	3.15	2,365
1979	12,000	12,000	64	767	5.49	4,208
1980	12,000	11,800	63	747	6.42	4,798
1981	14,000	13,300	79	1,055	6.44	6,793
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 3--Arizona watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---		Cwt	1,000 cwt	\$/cwt	\$ 1,000
1950	5,000	5,000	155	775	2.20	1,705
1951	5,200	5,200	155	806	1.80	1,451
1952	4,100	4,100	135	554	2.35	1,302
1953	5,000	5,000	160	800	2.70	2,160
1954	6,000	6,000	150	900	1.50	1,350
1955	4,900	4,900	125	612	2.25	1,377
1956	5,000	5,000	165	825	2.10	1,732
1957	5,800	5,800	175	1,015	3.25	3,299
1958	7,400	7,400	90	666	2.90	1,931
1959	6,500	6,200	160	992	1.85	1,835
1960	4,600	4,600	155	713	1.85	1,319
1961	4,600	4,600	155	713	2.60	1,854
1962	4,500	4,500	155	698	2.05	1,431
1963	4,600	4,400	165	726	2.20	1,597
1964	4,500	4,400	150	660	2.45	1,617
1965	4,500	4,500	140	630	1.90	1,197
1966	3,600	3,600	175	630	2.45	1,544
1967	3,400	3,400	175	595	3.35	1,993
1968	4,000	4,000	170	680	3.05	2,074
1969	5,100	5,100	150	765	1.82	1,392
1970	4,300	4,300	160	688	3.25	2,236
1971	3,900	3,900	175	683	3.63	2,479
1972	4,500	4,500	195	878	3.07	2,695
1973	4,300	4,300	135	581	3.43	1,993
1974	2,100	2,100	197	414	5.58	2,310
1975	2,900	2,900	165	479	4.27	2,047
1976	3,200	3,200	165	528	4.44	2,346
1977	3,800	3,800	157	596	5.14	3,064
1978	3,800	3,800	150	570	6.85	3,904
1979	6,300	6,300	134	841	4.24	3,568
1980	3,400	3,400	168	572	6.35	3,632
1981	3,600	3,600	189	679	7.98	5,418
1982	5,200	5,200	249	1,297	4.00	5,188
1983	4,300	4,200	227	952	5.85	5,569
1984	4,700	4,500	260	1,170	5.42	6,341
1985	5,300	5,200	245	1,274	5.27	6,714
1986	5,400	5,400	250	1,350	6.36	8,586
1987	5,200	5,200	295	1,534	5.13	7,869
1988	5,000	5,000	300	1,500	7.13	10,695

Sources: USDA, National Agricultural Statistics Service and the Arizona Agricultural Statistics Service.

Appendix table 4--Arkansas watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	7,200	7,200	86	619	1.15	712
1951	9,400	9,400	88	827	1.25	1,034
1952	10,600	10,600	80	848	1.70	1,442
1953	12,600	12,000	82	984	1.10	1,082
1954	10,600	10,600	78	827	1.10	910
1955	12,700	12,700	88	1,118	1.15	1,235
1956	10,200	10,200	90	918	1.10	1,010
1957	7,700	7,500	75	562	1.60	899
1958	7,600	7,500	85	638	0.80	466
1959	7,000	7,000	90	630	1.15	724
1960	7,900	7,600	90	684	1.10	752
1961	6,400	6,300	80	504	1.20	605
1962	6,300	6,200	85	527	1.05	553
1963	5,800	5,800	110	638	1.20	766
1964	6,100	6,100	85	518	1.35	699
1965	6,400	6,400	85	544	1.25	680
1966	6,000	6,000	80	480	1.65	792
1967	5,700	5,700	85	484	2.15	1,041
1968	5,800	5,800	85	493	1.50	740
1969	6,400	6,200	80	496	2.04	1,012
1970	6,800	6,800	80	544	1.82	990
1971	7,000	6,500	77	501	2.01	1,007
1972	6,000	6,000	85	510	2.15	1,097
1973	5,000	4,800	90	432	1.58	683
1974	4,500	4,300	75	323	3.75	1,211
1975	4,700	4,500	80	360	4.25	1,530
1976	4,500	4,400	65	286	3.80	1,087
1977	3,700	3,600	71	256	3.70	947
1978	3,800	3,600	100	360	3.50	1,260
1979	3,400	3,300	95	314	3.30	1,036
1980	3,000	2,000	40	80	4.52	362
1981	3,500	3,200	100	320	4.44	1,421
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 5--California watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	19,500	19,500	122	2,370	1.95	4,629
1951	19,800	19,800	129	2,553	2.12	5,418
1952	16,300	16,300	148	2,415	2.60	6,276
1953	19,100	18,800	131	2,465	2.34	5,776
1954	20,200	20,200	133	2,687	1.76	4,731
1955	18,200	18,200	148	2,688	2.14	5,749
1956	19,900	19,900	146	2,897	2.04	5,919
1957	18,700	18,700	149	2,792	2.62	7,319
1958	18,700	18,700	141	2,646	2.52	6,667
1959	21,600	21,600	156	3,372	2.83	9,543
1960	21,400	21,400	168	3,596	1.83	6,582
1961	17,500	17,500	180	3,150	2.29	7,228
1962	16,800	16,800	147	2,472	2.00	4,932
1963	16,000	16,000	191	3,052	2.12	6,469
1964	13,200	13,200	152	2,008	2.34	4,705
1965	13,400	13,400	186	2,490	2.09	5,215
1966	13,700	13,700	177	2,420	2.44	5,894
1967	12,900	12,900	172	2,222	2.98	6,630
1968	15,600	15,600	155	2,412	2.70	6,523
1969	16,100	16,100	157	2,531	2.20	5,561
1970	13,100	13,100	193	2,528	2.96	7,474
1971	12,500	12,500	200	2,502	3.29	8,228
1972	12,300	12,300	189	2,319	2.72	6,298
1973	13,500	13,500	186	2,512	3.42	8,591
1974	8,100	8,100	249	2,019	5.24	10,571
1975	9,600	9,600	227	2,178	4.79	10,436
1976	9,800	9,800	255	2,500	4.85	12,131
1977	10,100	10,100	236	2,380	5.25	12,492
1978	12,400	12,400	269	3,339	6.21	20,729
1979	13,200	13,200	258	3,410	5.23	17,841
1980	11,100	11,100	272	3,018	8.58	25,909
1981	10,700	10,700	236	2,526	8.85	22,363
1982	*	13,653	286	3,909	4.15	16,227
1983	*	13,351	258	3,446	5.20	17,844
1984	*	14,840	257	3,600	4.90	17,559
1985	*	16,727	239	3,994	4.10	16,380
1986	*	15,279	309	3,726	5.85	27,785
1987	*	14,873	293	4,359	5.10	22,302
1988	*	13,618	292	3,971	6.71	26,665

* = Unavailable.

Sources: USDA, National Agricultural Statistics Service (1960-81) and the California County Agricultural Commissioners (1982-88).

Appendix table 6--Delaware watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	Acres	Acres			\$/cwt	\$ 1,000
1950	1,400	1,400	106	148	1.25	185
1951	1,100	1,100	125	138	1.90	262
1952	1,200	1,200	138	166	1.50	249
1953	1,400	1,400	150	210	1.35	284
1954	1,800	1,800	125	225	1.05	236
1955	1,500	1,500	130	195	0.85	166
1956	1,400	1,400	140	196	1.25	245
1957	1,300	1,300	135	176	1.50	264
1958	1,100	1,100	140	154	0.85	131
1959	1,100	1,100	160	176	2.25	396
1960	1,200	1,200	155	186	1.10	205
1961	1,400	1,400	165	231	1.60	370
1962	1,500	1,500	155	232	1.40	325
1963	1,500	1,400	165	231	1.20	277
1964	1,500	1,500	155	232	1.20	278
1965	1,600	1,600	165	264	1.10	290
1966	1,500	1,500	150	225	1.75	394
1967	1,500	1,000	165	165	1.45	239
1968	1,100	1,100	200	220	2.50	550
1969	1,900	1,900	170	323	1.97	636
1970	2,000	2,000	200	400	1.84	736
1971	2,200	2,200	175	385	1.49	574
1972	2,100	2,100	130	273	2.72	743
1973	1,900	1,900	190	361	2.32	838
1974	1,500	1,400	180	252	4.52	1,139
1975	1,600	1,600	175	280	3.55	994
1976	1,900	1,900	160	304	3.48	1,058
1977	1,900	1,900	150	285	3.59	1,023
1978	1,900	1,900	165	314	3.88	1,218
1979	2,000	1,900	140	266	5.19	1,381
1980	2,000	2,000	160	320	7.44	2,381
1981	2,100	2,100	165	347	3.84	1,332
1982	2,200	2,100	170	357	4.00	1,428
1983	980	920	239	220	4.00	880
1984	1,170	1,100	284	312	5.40	1,685
1985	1,200	1,070	277	296	5.15	1,524
1986	1,220	1,190	300	357	5.70	2,035
1987	1,240	1,230	248	305	6.30	1,922
1988	1,240	1,230	300	372	6.15	2,288

* 1989 planting intentions were 1,220 acres.

Sources: USDA, National Agricultural Statistics Service and the Delaware Agricultural Statistics Service.

Appendix table 7--Florida watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	Acres	Acres			\$/cwt	\$ 1,000
1950	70,000	68,000	75	5,100	1.55	5,763
1951	60,000	57,000	79	4,503	1.80	8,105
1952	75,000	72,000	76	5,472	2.15	11,765
1953	100,000	93,000	74	6,882	1.85	12,732
1954	105,000	98,000	84	8,232	1.30	9,738
1955	91,000	88,000	92	8,096	2.00	14,428
1956	96,000	91,000	95	8,645	1.75	14,332
1957	105,000	95,000	68	6,460	2.05	13,243
1958	100,000	95,000	100	9,500	1.00	7,744
1959	77,000	72,000	68	4,896	2.50	12,240
1960	75,000	73,000	115	8,395	1.55	11,262
1961	67,000	65,000	130	8,450	1.65	13,942
1962	64,000	61,000	140	8,540	1.95	12,457
1963	61,000	58,000	180	10,440	1.40	12,576
1964	59,000	56,000	150	8,400	2.10	17,640
1965	63,000	60,000	155	9,300	2.05	19,065
1966	62,000	59,000	170	10,030	1.90	19,057
1967	60,000	57,000	145	8,265	2.10	17,356
1968	61,000	56,000	135	7,560	2.10	15,876
1969	59,000	53,500	130	6,955	2.49	17,318
1970	50,000	47,500	145	6,888	2.55	17,564
1971	52,200	50,100	150	7,515	2.72	20,441
1972	61,200	56,100	120	6,732	2.42	16,291
1973	54,700	48,700	160	7,792	3.07	23,921
1974	50,000	44,500	150	6,675	3.28	21,894
1975	47,000	43,600	185	8,066	4.36	35,168
1976	65,000	55,000	180	9,900	2.61	25,839
1977	65,000	51,000	175	8,925	2.97	26,507
1978	59,000	50,000	160	8,000	3.35	26,800
1979	50,000	43,000	150	6,450	5.00	32,250
1980	45,000	42,500	185	7,863	5.92	46,549
1981	54,000	49,000	165	8,085	6.52	52,714
1982	56,000	48,000	165	7,920	6.90	54,648
1983	59,000	49,000	165	8,085	7.20	58,212
1984	64,000	60,000	167	10,020	6.20	62,124
1985	59,000	54,000	166	8,964	5.95	53,336
1986	53,550	47,550	184	8,749	6.23	54,506
1987	54,900	46,100	157	7,238	9.64	69,774
1988	57,500	49,800	185	9,213	6.79	62,556
1989	58,000	50,000	170	8,500	5.30	45,050

Sources: USDA, National Agricultural Statistics Service and the Florida Agricultural Statistics Service.

Appendix table 8--Georgia watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	55,000	55,000	77	4,235	0.89	3,769
1951	45,000	45,000	83	3,735	1.20	4,482
1952	45,000	45,000	77	3,465	1.80	6,237
1953	49,000	49,000	76	3,724	1.65	6,145
1954	60,000	60,000	74	4,440	0.86	3,578
1955	59,000	59,000	80	4,720	0.90	3,888
1956	48,000	48,000	75	3,600	1.10	3,630
1957	49,000	49,000	70	3,430	1.30	4,459
1958	49,000	49,000	85	4,165	0.55	1,796
1959	37,000	35,000	75	2,625	1.15	3,019
1960	34,000	34,000	85	2,890	0.90	2,601
1961	30,000	30,000	90	2,700	1.40	3,780
1962	33,000	32,000	90	2,880	0.85	1,972
1963	33,000	33,000	90	2,970	1.15	2,956
1964	34,000	33,000	90	2,970	1.45	4,306
1965	35,000	34,000	80	2,720	1.40	3,808
1966	35,000	33,500	80	2,680	1.90	5,092
1967	36,000	36,000	95	3,420	1.95	6,669
1968	40,000	39,500	90	3,555	1.60	5,688
1969	40,000	37,500	80	3,000	1.51	4,530
1970	37,000	33,000	85	2,805	1.90	5,330
1971	38,000	33,000	80	2,640	1.87	4,937
1972	38,000	33,000	70	2,310	1.60	3,696
1973	33,500	28,400	85	2,408	2.54	6,110
1974	31,000	29,200	93	2,724	2.89	7,879
1975	32,200	29,400	87	2,550	2.85	7,269
1976	37,500	32,800	74	2,414	2.66	6,417
1977	34,000	28,600	79	2,273	2.61	5,938
1978	32,000	28,500	95	2,700	2.84	7,667
1979	30,400	27,400	98	2,693	2.86	7,710
1980	31,400	27,400	95	2,590	6.04	15,640
1981	28,000	26,400	110	2,904	3.68	10,686
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 9--Hawaii watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	-	-	-	-	-	-
1951	-	-	-	-	-	-
1952	-	-	-	-	-	-
1953	-	-	-	-	-	-
1954	-	-	-	-	-	-
1955	-	-	-	-	-	-
1956	-	-	-	-	-	-
1957	-	-	-	-	-	-
1958	-	-	-	-	-	-
1959	290	290	107	31	7.90	246
1960	340	340	79	27	9.30	250
1961	280	280	89	25	9.90	247
1962	280	280	107	30	8.40	252
1963	320	260	92	24	7.30	175
1964	180	150	107	16	8.60	138
1965	230	170	118	20	8.00	160
1966	450	390	97	38	7.80	296
1967	240	160	81	13	12.70	165
1968	220	180	100	18	11.70	210
1969	*	170	122	21	10.67	224
1970	*	190	149	28	10.00	280
1971	*	200	130	26	11.15	290
1972	*	175	126	22	11.68	257
1973	*	240	177	42	10.19	428
1974	*	175	93	16	18.81	301
1975	*	202	119	24	17.88	429
1976	*	180	85	15	18.87	283
1977	*	210	99	21	19.38	407
1978	*	190	98	19	18.89	359
1979	*	125	90	11	24.36	268
1980	*	130	104	14	22.36	313
1981	*	150	107	16	25.88	414
1982	*	165	133	22	24.91	548
1983	*	310	125	39	19.69	768
1984	*	400	152	61	18.48	1,127
1985	*	480	183	88	17.00	1,496
1986	*	620	231	143	12.60	1,802
1987	*	740	186	138	11.90	1,642
1988	*	790	239	189	11.70	2,211

* = Not available. - = Not applicable.

Sources: USDA, National Agricultural Statistics Service and the Hawaii Agricultural Statistics Service.

Appendix table 10--Indiana watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---	--- Acres ---			\$/cwt	\$ 1,000
1950	5,500	5,500	125	688	1.30	894
1951	5,800	5,500	131	720	1.25	900
1952	6,000	6,000	138	828	1.35	1,118
1953	6,800	6,800	131	891	1.30	1,158
1954	8,900	8,900	138	1,228	1.00	1,228
1955	8,300	8,300	144	1,195	1.00	1,195
1956	8,000	8,000	130	1,040	0.80	832
1957	7,800	7,800	130	1,014	1.55	1,572
1958	8,500	8,200	100	820	0.95	589
1959	6,700	6,700	130	871	1.60	1,394
1960	7,400	7,300	140	1,022	1.00	1,022
1961	7,000	7,000	120	840	1.15	966
1962	6,500	6,500	140	910	1.15	1,046
1963	5,900	5,900	130	767	1.20	920
1964	5,200	5,200	150	780	1.20	936
1965	4,900	4,900	170	833	1.35	1,125
1966	5,500	5,500	150	825	1.75	1,444
1967	5,200	5,200	155	806	2.20	1,773
1968	5,100	5,100	135	688	1.90	1,307
1969	5,900	5,900	155	915	2.35	2,150
1970	6,100	6,100	170	1,037	2.20	2,281
1971	6,600	6,600	150	990	2.43	2,406
1972	6,600	6,600	145	957	3.32	3,177
1973	7,000	7,000	155	1,085	2.81	3,049
1974	5,400	5,000	140	700	5.03	3,521
1975	5,100	5,000	160	800	4.53	3,624
1976	5,200	5,100	135	689	4.04	2,784
1977	5,100	5,000	150	750	5.00	3,750
1978	5,100	5,000	145	725	5.34	3,872
1979	5,200	5,000	150	750	4.50	3,375
1980	5,600	5,500	140	770	5.35	4,120
1981	6,200	5,900	160	944	4.62	4,361
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 11--Illinois watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---	--- Acres ---			\$/cwt	\$ 1,000
1950	2,800	2,800	80	224	0.86	193
1951	1,900	1,900	75	142	1.25	178
1952	1,800	1,800	88	158	1.65	261
1953	2,000	2,000	75	150	1.20	180
1954	2,400	2,400	90	216	1.15	248
1955	2,200	2,200	85	187	1.20	224
1956	2,200	2,200	90	198	0.95	188
1957	2,100	2,100	85	178	1.35	240
1958	1,800	1,800	75	135	1.45	196
1959	1,900	1,900	100	190	1.95	370
1960	1,800	1,800	100	180	1.45	261
1961	1,700	1,700	100	170	1.50	255
1962	1,700	1,700	85	144	2.00	288
1963	1,800	1,700	110	187	1.65	309
1964	1,700	1,600	105	168	1.95	328
1965	1,900	1,800	100	180	1.75	315
1966	1,700	1,700	110	187	1.95	365
1967	1,700	1,700	105	178	2.40	427
1968	1,700	1,700	100	170	2.55	434
1969	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1968.

Source: USDA, National Agricultural Statistics Service.

Appendix table 12--Iowa watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt \$/cwt	Total \$ 1,000
	--- Acres ---					
1950	1,200	1,200	75	90	1.50	135
1951	900	900	75	68	2.00	136
1952	1,000	1,000	94	94	2.00	188
1953	1,000	1,000	88	88	1.40	123
1954	1,000	1,000	94	94	1.50	141
1955	950	950	90	86	1.55	133
1956	900	900	80	72	1.10	79
1957	900	900	85	76	1.80	137
1958	950	950	85	81	1.40	113
1959	1,000	1,000	100	100	2.05	205
1960	1,000	1,000	80	80	1.80	144
1961	1,000	1,000	90	90	1.65	148
1962	1,000	1,000	90	90	1.75	158
1963	1,000	1,000	85	85	1.70	144
1964	1,000	1,000	85	85	2.20	187
1965	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1964.

Source: USDA, National Agricultural Statistics Service.

Appendix table 13--Louisiana watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt \$/cwt	Total \$ 1,000
	--- Acres ---					
1950	4,800	4,800	75	360	1.60	576
1951	4,700	4,700	78	367	1.60	587
1952	4,800	4,800	75	360	1.40	504
1953	5,200	4,500	75	338	1.60	541
1954	5,100	4,000	60	240	1.40	336
1955	4,700	4,100	85	348	1.10	306
1956	3,400	3,400	85	289	1.40	405
1957	3,500	3,400	80	272	1.50	408
1958	3,200	3,100	80	248	1.30	322
1959	2,700	2,600	80	208	1.20	250
1960	2,600	2,500	90	225	1.25	281
1961	2,600	2,500	80	200	1.75	350
1962	2,600	2,500	90	225	1.00	225
1963	2,600	2,500	95	238	1.30	309
1964	3,300	3,100	80	248	1.45	360
1965	4,000	3,600	80	288	1.05	302
1966	3,300	3,000	90	270	1.40	378
1967	3,300	3,100	80	248	1.60	397
1968	3,500	3,300	90	297	1.80	535
1969	3,700	3,400	70	238	1.89	450
1970	4,100	3,600	80	288	1.50	432
1971	3,800	3,300	66	218	2.32	506
1972	3,500	3,300	77	254	2.25	572
1973	3,200	3,000	90	270	2.35	635
1974	2,800	2,600	85	221	3.84	849
1975	2,900	2,600	82	213	4.73	1,007
1976	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1975.

Source: USDA, National Agricultural Statistics Service.

Appendix table 14--Maryland watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	3,400	3,400	81	275	1.20	330
1951	2,800	2,800	100	280	1.90	532
1952	3,200	3,200	112	358	1.50	537
1953	3,700	3,700	125	462	1.35	624
1954	3,500	3,500	125	438	1.10	482
1955	3,500	3,500	130	455	1.00	455
1956	2,900	2,900	140	406	1.25	508
1957	3,200	3,200	135	432	1.55	670
1958	3,200	3,200	140	448	0.85	381
1959	3,800	3,800	160	608	2.10	1,277
1960	3,800	3,800	155	589	1.05	618
1961	4,100	4,100	165	676	1.50	1,014
1962	4,600	4,600	155	713	1.40	998
1963	4,600	4,500	165	742	1.20	890
1964	4,600	4,600	155	713	1.20	856
1965	4,600	4,600	165	759	1.10	835
1966	4,400	4,300	150	645	1.75	1,129
1967	4,400	3,000	180	540	1.30	702
1968	3,300	3,300	200	660	2.50	1,650
1969	3,600	3,600	170	612	1.97	1,206
1970	3,600	3,600	210	756	1.84	1,391
1971	3,700	3,700	175	648	1.49	966
1972	3,400	3,400	130	442	2.72	1,202
1973	3,000	3,000	190	570	2.32	1,322
1974	2,400	2,200	180	396	4.52	1,790
1975	2,500	2,500	175	438	3.55	1,555
1976	2,700	2,600	170	442	3.48	1,538
1977	2,600	2,500	165	413	3.59	1,483
1978	2,400	2,400	165	396	3.88	1,536
1979	2,800	2,700	140	378	5.19	1,962
1980	2,900	2,900	155	450	7.44	3,348
1981	2,900	2,900	165	479	3.84	1,839
1982	3,400	3,200	170	544	4.00	2,176
1983	3,900	3,700	175	650	4.00	2,600
1984	4,100	4,000	195	780	5.40	4,212
1985	4,000	3,900	240	936	5.15	4,820
1986	4,600	4,500	220	990	5.70	5,643
1987	5,000	4,900	240	1,176	6.30	7,409
1988	4,850	4,730	196	927	7.05	6,535

* 1989 planting intentions were 4,400 acres.

Sources: USDA, National Agricultural Statistics Service and the Maryland Agricultural Statistics Service.

Appendix table 15--Mississippi watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	7,400	7,400	77	570	0.94	536
1951	8,000	8,000	72	576	0.98	564
1952	9,600	9,600	64	614	1.30	798
1953	11,300	11,300	60	678	1.40	949
1954	13,500	13,000	61	793	1.05	833
1955	17,500	16,500	86	1,419	0.73	691
1956	13,500	13,000	65	845	1.15	777
1957	12,000	11,500	75	862	1.35	1,164
1958	14,000	13,500	65	878	0.80	640
1959	8,500	8,000	65	520	1.25	650
1960	9,500	9,000	55	495	1.25	619
1961	8,000	7,500	60	450	1.30	585
1962	7,000	7,000	75	525	1.25	656
1963	6,900	6,700	75	502	1.20	602
1964	6,700	6,500	85	552	1.35	745
1965	7,700	7,500	75	562	1.25	702
1966	7,000	6,800	60	408	1.50	612
1967	8,500	8,300	80	664	1.80	1,195
1968	9,000	8,500	78	663	1.40	928
1969	10,500	10,000	68	680	1.49	1,013
1970	10,500	9,500	70	665	1.44	958
1971	11,000	10,000	60	600	1.87	1,122
1972	11,500	10,500	60	630	1.90	1,197
1973	9,800	9,000	55	495	2.30	1,139
1974	10,000	9,400	60	564	2.75	1,551
1975	10,400	9,500	57	542	2.62	1,420
1976	14,000	11,400	80	912	2.50	2,280
1977	14,000	12,000	67	804	2.12	1,704
1978	13,000	12,000	95	1,140	3.21	3,659
1979	13,300	11,500	90	1,035	3.92	4,057
1980	11,500	10,500	70	735	4.14	3,043
1981	15,000	12,000	85	1,020	3.30	3,366
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 16--Missouri watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---	Acres			Cwt	1,000 cwt
1950	4,200	4,200	75	315	0.60	189
1951	3,400	3,400	40	136	1.00	136
1952	3,200	3,200	60	192	2.75	528
1953	3,800	3,800	45	171	1.50	256
1954	5,000	5,000	80	400	0.82	328
1955	6,000	6,000	90	540	2.15	1,161
1956	6,000	6,000	110	660	2.45	1,617
1957	5,800	5,800	90	522	2.40	1,253
1958	8,200	8,200	100	820	1.10	902
1959	7,800	7,800	110	858	0.90	772
1960	9,000	9,000	110	990	1.00	990
1961	9,000	9,000	110	990	0.90	891
1962	9,500	9,500	110	1,045	0.75	784
1963	9,200	9,200	105	966	1.10	1,063
1964	9,100	9,100	80	728	1.10	801
1965	9,200	9,000	115	1,035	1.25	1,294
1966	8,000	8,000	85	680	2.95	2,006
1967	7,500	7,100	80	568	3.10	1,761
1968	7,100	7,100	100	710	2.40	1,704
1969	7,100	7,100	105	746	2.55	1,902
1970	8,200	8,200	90	738	2.39	1,764
1971	8,100	8,100	95	770	2.00	1,540
1972	8,000	8,000	100	800	2.33	1,864
1973	6,700	6,000	100	600	3.10	1,860
1974	3,700	3,500	115	403	4.47	1,801
1975	4,500	4,300	115	495	3.33	1,648
1976	4,000	3,700	94	348	2.20	766
1977	4,400	4,200	125	525	3.00	1,575
1978	4,700	4,400	110	484	3.00	1,452
1979	4,500	4,100	140	574	3.25	1,866
1980	2,900	2,400	120	288	3.40	979
1981	4,000	3,700	130	481	3.40	1,635
1982	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1981.

Source: USDA, National Agricultural Statistics Service.

Appendix table 17--New Jersey watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---	Acres			Cwt	1,000 cwt
1950	500	500	88	44	0.86	38
1951	400	400	112	45	0.80	36
1952	400	400	150	60	0.79	47
1953	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1952.

Source: USDA, National Agricultural Statistics Service.

Appendix table 18--North Carolina watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---		Cwt	1,000 cwt	\$/cwt	\$ 1,000
1950	10,900	10,900	42	458	1.15	527
1951	9,200	9,200	50	460	1.15	529
1952	9,200	9,200	50	460	1.80	828
1953	10,600	10,600	54	572	1.70	972
1954	11,800	11,800	51	602	1.50	903
1955	15,000	15,000	52	780	1.05	689
1956	12,000	12,000	55	660	1.00	630
1957	11,200	11,200	60	672	1.35	907
1958	13,800	13,800	65	897	0.80	660
1959	12,000	12,000	60	720	1.25	812
1960	11,800	11,800	70	826	0.65	507
1961	10,500	10,500	48	504	1.25	630
1962	9,500	9,500	61	580	1.15	667
1963	8,700	8,700	60	522	1.30	598
1964	8,100	8,100	60	486	1.31	637
1965	7,900	7,900	63	498	1.15	573
1966	7,400	6,500	54	351	1.80	632
1967	6,500	6,500	70	455	1.65	751
1968	6,000	6,000	65	390	1.85	722
1969	7,100	7,100	75	533	1.71	911
1970	7,500	7,500	62	465	1.80	837
1971	7,500	7,500	72	540	2.21	1,193
1972	7,000	7,000	68	476	1.92	914
1973	7,400	7,400	77	570	2.20	1,254
1974	7,000	7,000	70	490	3.30	1,617
1975	8,400	8,000	60	480	2.85	1,368
1976	8,500	8,000	56	448	3.25	1,456
1977	8,900	7,000	55	385	3.34	1,286
1978	8,400	7,400	57	422	3.17	1,338
1979	8,400	7,400	56	414	4.00	1,656
1980	8,200	8,000	75	600	4.30	2,580
1981	9,000	8,400	66	554	3.35	1,856
1982	*	8,000	58	464	*	*
1983	*	7,500	60	450	*	*
1984	*	8,000	61	488	*	*
1985	*	7,500	63	473	*	*
1986	7,800	7,600	60	456	*	*
1987	9,200	8,800	74	651	*	*
1988	*	*	*	714	*	*

* = Unavailable.

Sources: USDA, National Agricultural Statistics Service and the North Carolina Agricultural Statistics Service.

Appendix table 19--Oklahoma watermelon acreage, yield, production, and value

Year	Acreage		Yield	Production	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---		Cwt	1,000 cwt	\$/cwt	\$ 1,000
1950	24,500	13,500	50	675	0.94	634
1951	19,500	16,200	80	1,296	1.25	1,620
1952	21,000	16,500	60	990	1.10	1,089
1953	21,500	17,500	65	1,138	0.82	933
1954	18,000	12,500	45	562	1.15	646
1955	18,000	13,000	70	910	0.89	810
1956	17,000	11,500	60	690	1.30	897
1957	13,500	11,000	75	825	1.00	825
1958	14,000	11,000	65	715	0.90	554
1959	10,500	8,500	80	680	1.00	680
1960	10,000	8,500	75	638	1.00	513
1961	9,500	7,500	70	525	1.25	656
1962	8,600	7,400	70	518	1.30	673
1963	8,700	7,900	70	553	1.45	802
1964	10,500	9,000	60	540	1.30	702
1965	10,600	9,500	70	665	1.10	732
1966	10,000	8,600	70	602	1.67	1,005
1967	10,500	9,000	75	675	1.72	1,161
1968	10,500	8,700	70	609	1.30	792
1969	9,500	8,000	90	720	2.11	1,519
1970	10,500	9,000	80	720	1.93	1,390
1971	10,000	8,500	70	595	1.97	1,172
1972	10,000	9,000	90	810	1.94	1,571
1973	11,000	8,500	90	765	1.80	1,377
1974	7,000	6,400	85	544	3.71	2,018
1975	9,000	7,500	65	488	2.30	1,122
1976	9,000	8,200	100	820	2.64	2,165
1977	8,000	7,000	110	770	2.60	2,002
1978	8,000	7,000	65	455	4.68	2,129
1979	8,000	7,500	60	450	3.80	1,710
1980	8,000	7,000	30	210	6.53	1,371
1981	8,000	7,000	120	840	5.12	4,301
1982	1/	1/	1/	1/	1/	1/
1983	*	*	*	*	*	*
1984	8,500	7,500	110	825	4.12	3,400
1985	9,000	8,000	130	1,040	3.46	3,600
1986	8,500	7,500	140	1,050	4.05	4,250
1987	*	*	*	*	*	*
1988	*	*	*	*	*	*

* = Unavailable.

1/ USDA series discontinued after 1981.

Sources: USDA, National Agricultural Statistics Service (1960-81) and the Oklahoma Watermelon Association (1984-86).

Appendix table 20--Oregon watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	600	600	128	77	1.55	119
1951	800	800	115	92	1.60	147
1952	800	800	105	84	1.90	160
1953	1,000	900	160	144	1.95	281
1954	1,100	1,000	115	115	1.35	155
1955	1,000	900	180	162	1.90	308
1956	1,100	1,000	160	160	1.65	264
1957	1,100	1,000	150	150	1.80	270
1958	1,200	1,100	180	198	1.25	248
1959	1,600	1,500	130	195	1.55	302
1960	1,500	1,300	165	214	1.70	364
1961	1,500	1,400	190	266	1.90	505
1962	1,200	1,100	175	192	1.90	365
1963	1,000	900	200	180	1.85	333
1964	950	850	135	115	2.10	242
1965	1,000	900	180	162	2.25	364
1966	850	800	180	144	2.40	346
1967	1,300	1,200	170	204	2.35	479
1968	1,200	1,100	105	115	2.60	299
1969	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1968.

Source: USDA, National Agricultural Statistics Service.

Appendix table 21--South Carolina watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	48,000	48,000	45	2,160	0.94	1,598
1951	36,000	36,000	60	2,160	1.20	2,460
1952	36,000	36,000	58	2,088	1.60	3,341
1953	38,000	38,000	62	2,356	1.60	3,770
1954	42,000	42,000	52	2,184	1.20	2,621
1955	47,000	47,000	75	3,525	0.87	3,067
1956	40,000	40,000	55	2,200	1.10	2,420
1957	40,000	39,000	47	1,833	1.30	2,383
1958	38,000	36,000	70	2,520	0.75	1,612
1959	28,000	27,000	75	2,025	1.40	2,835
1960	29,000	28,000	77	2,156	1.05	2,264
1961	26,000	24,000	80	1,920	1.50	2,880
1962	26,000	25,000	75	1,875	1.00	1,875
1963	25,000	24,000	65	1,560	1.60	2,496
1964	24,000	23,000	70	1,610	1.50	2,415
1965	24,500	24,000	82	1,968	1.24	2,440
1966	24,000	23,500	75	1,763	1.87	3,297
1967	25,500	25,000	92	2,300	1.53	3,519
1968	25,000	24,500	75	1,838	1.45	2,665
1969	24,500	23,500	68	1,598	1.63	2,605
1970	23,000	23,000	71	1,633	1.82	2,972
1971	23,000	23,000	93	2,139	1.93	4,128
1972	22,000	21,300	76	1,619	2.08	3,368
1973	21,800	18,500	82	1,517	2.65	4,020
1974	23,100	21,600	89	1,922	2.55	4,901
1975	21,000	20,000	79	1,580	2.07	3,271
1976	25,000	23,000	54	1,242	2.53	3,142
1977	20,000	18,000	65	1,170	2.50	2,925
1978	17,000	14,000	85	1,190	2.35	2,797
1979	15,500	14,000	81	1,134	3.35	3,799
1980	14,000	12,000	89	1,068	3.98	4,251
1981	14,600	11,500	110	1,265	3.29	4,162
1982	14,600	11,500	140	1,610	3.00	4,830
1983	13,337	12,739	136	1,728	2.98	5,152
1984	12,409	11,742	162	1,907	5.42	10,334
1985	11,900	10,500	155	1,640	3.28	5,373
1986	11,100	9,200	155	1,417	5.74	8,136
1987	13,500	12,000	182	2,188	3.96	8,664
1988	13,700	12,200	115	1,402	5.02	7,038

Sources: USDA, National Agricultural Statistics Service and the South Carolina Agricultural Statistics Service.

Appendix table 22--Texas watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	98,000	98,000	45	4,410	0.96	4,234
1951	106,000	106,000	50	5,300	0.88	4,664
1952	110,000	97,000	51	4,947	1.05	5,194
1953	136,000	124,000	42	5,208	0.92	4,791
1954	146,000	116,000	45	5,220	0.78	4,072
1955	146,000	108,000	46	4,968	0.61	3,030
1956	135,000	100,000	44	4,400	1.20	5,280
1957	126,000	100,000	45	4,500	1.00	4,500
1958	120,000	93,000	60	5,580	0.80	4,092
1959	108,000	82,000	60	4,920	1.30	6,396
1960	105,000	83,000	55	4,565	1.20	5,478
1961	101,000	85,000	55	4,675	1.50	7,012
1962	94,000	80,000	60	4,800	1.45	6,960
1963	90,000	76,000	63	4,788	1.30	6,224
1964	79,000	75,000	65	4,875	1.35	6,581
1965	82,000	74,000	65	4,810	1.15	5,532
1966	78,000	72,000	60	4,320	1.35	5,832
1967	76,000	70,000	60	4,200	2.05	8,610
1968	80,000	74,000	65	4,810	1.25	6,012
1969	76,000	70,000	67	4,690	1.94	9,100
1970	80,000	75,000	80	6,000	1.97	11,820
1971	65,000	60,000	87	5,220	2.79	14,564
1972	75,000	70,000	73	5,110	3.08	15,739
1973	65,000	62,000	83	5,146	3.28	16,855
1974	55,000	51,000	94	4,782	4.85	23,173
1975	55,000	46,000	96	4,430	4.73	20,969
1976	55,000	50,000	90	4,500	4.37	19,653
1977	62,000	58,000	112	6,522	3.80	24,754
1978	55,000	49,000	90	4,425	4.54	20,090
1979	50,500	46,000	100	4,600	5.03	23,122
1980	40,200	36,000	95	3,405	9.04	30,794
1981	49,100	43,900	105	4,629	8.00	37,022
1982	47,500	43,100	101	4,360	7.76	33,834
1983	36,000	32,400	105	3,438	10.40	35,707
1984	60,000	55,000	110	6,090	5.18	31,569
1985	46,000	44,000	130	5,720	5.20	29,744
1986	42,000	38,000	140	5,320	6.75	35,910
1987	45,000	40,000	115	4,600	9.35	43,010
1988	1/	1/	1/	6,000	1/	1/

1/ Series discontinued after 1987. 1988 production estimated by ERS using USDA, Agricultural Marketing Service shipments.

Sources: USDA, National Agricultural Statistics Service and the Texas Agricultural Statistics Service.

Appendix table 23--Virginia watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	1,300	1,300	86	112	0.94	105
1951	1,300	1,300	82	107	1.35	144
1952	1,700	1,700	94	160	1.50	240
1953	2,600	2,600	101	263	1.15	302
1954	3,200	3,200	108	346	1.35	467
1955	4,200	4,200	73	307	0.80	246
1956	3,400	3,400	85	289	0.90	260
1957	3,100	3,100	110	341	1.25	426
1958	4,800	4,800	130	624	0.75	468
1959	4,800	4,800	150	720	1.40	1,008
1960	7,700	7,200	140	1,008	0.70	605
1961	6,300	6,300	80	504	0.65	328
1962	5,300	5,300	110	583	0.95	554
1963	4,100	4,100	120	492	1.00	492
1964	4,700	4,700	115	540	0.90	486
1965	4,500	4,000	105	420	1.00	420
1966	3,600	3,600	110	396	1.50	594
1967	3,600	3,200	105	336	1.10	370
1968	3,100	3,000	105	315	1.50	472
1969	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1968.

Source: USDA, National Agricultural Statistics Service.

Appendix table 24--Washington watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	600	600	110	66	1.40	92
1951	600	600	120	72	1.30	94
1952	700	700	100	70	2.00	140
1953	750	450	100	45	1.10	50
1954	550	550	115	63	1.05	66
1955	450	450	90	40	1.50	60
1956	500	500	120	60	1.50	90
1957	800	800	125	100	1.40	140
1958	1,200	1,200	135	162	1.35	219
1959	1,200	1,200	115	138	1.25	172
1960	950	950	140	133	0.90	120
1961	1,000	1,000	170	170	1.30	221
1962	900	900	135	122	1.30	159
1963	850	850	185	157	1.40	220
1964	800	800	145	116	2.55	296
1965	900	850	180	153	2.90	444
1966	700	650	165	107	2.85	305
1967	800	800	190	152	2.90	441
1968	1,000	900	120	108	2.85	308
1969	1/	1/	1/	1/	1/	1/

1/ Series discontinued after 1968.

Source: USDA, National Agricultural Statistics Service.

Appendix table 25--United States watermelon acreage, yield, production, and value

Year	Acreage		Yield Cwt	Production 1,000 cwt	Value	
	Planted	Harvested			Per cwt	Total
	--- Acres ---				\$/cwt	\$ 1,000
1950	385,400	372,400	67	24,995	1.22	28,309
1951	355,900	349,200	74	25,769	1.38	35,350
1952	378,100	357,600	73	25,967	1.73	44,937
1953	449,850	424,850	69	29,289	1.55	45,517
1954	488,650	443,950	71	31,567	1.15	35,087
1955	481,100	433,400	79	34,156	1.29	41,384
1956	443,400	397,300	77	30,495	1.44	42,632
1957	433,500	393,100	70	27,487	1.69	46,418
1958	436,650	398,550	86	34,195	1.07	32,261
1959	364,990	327,990	82	26,995	1.74	46,798
1960	360,490	332,290	94	31,112	1.29	38,182
1961	330,380	307,580	95	29,083	1.58	45,997
1962	318,780	298,280	97	28,961	1.47	38,590
1963	306,070	286,310	109	31,102	1.44	41,885
1964	291,630	280,400	98	27,575	1.70	46,899
1965	301,530	286,320	103	29,603	1.60	47,316
1966	289,700	275,640	103	28,436	1.87	53,175
1967	287,540	273,260	102	27,790	2.10	58,279
1968	299,420	283,880	97	27,616	1.88	51,838
1969	291,400	272,400	95	25,950	2.05	53,268
1970	280,700	266,200	103	27,373	2.21	60,404
1971	268,000	252,400	107	27,094	2.51	67,892
1972	285,600	267,600	94	25,280	2.50	63,173
1973	262,200	240,400	109	26,170	2.95	77,186
1974	228,000	212,700	110	23,466	3.83	89,942
1975	230,500	210,700	116	24,395	4.00	97,479
1976	260,300	234,100	113	26,459	3.27	86,651
1977	256,500	225,200	119	26,885	3.44	92,363
1978	237,500	212,400	119	25,270	3.99	100,816
1979	225,500	205,300	117	24,076	4.55	109,541
1980	201,200	184,500	123	22,716	6.59	149,757
1981	224,700	203,600	129	26,128	6.09	159,269
1982e	*	207,115	132	27,339	5.63	153,920
1983e	*	191,971	132	25,340	6.47	163,951
1984e	*	241,707	132	31,905	5.34	170,374
1985e	*	218,979	139	30,438	4.94	150,364
1986e	*	199,291	147	29,296	6.24	182,806
1987e	*	205,187	141	28,931	7.13	206,281
1988e	*	213,000	148	31,524	7.00	220,668

* = Data not available. e = estimated by ERS.

Sources: USDA, National Agricultural Statistics Service (1950-81) and ERS for 1982-88.

Appendix table 26--F.O.B. prices for fresh watermelons, 1988

Week	Kern D--CA	Imper-Coach	SA-WintG-TX	SE Missouri	Virginia	N.Carolina	S. Texas	C-W Arizona	Mississippi	Georgia	S Carolina	SW Florida	W. Mexico
	16-20 # Royal Swt & Peacock	16-20 # Royal Swt & Peacock	17-24 # various varieties	18-24 # Long Gray	18-24 # Long Gray	18-24 # Long Gray	Royal Sweet & Long Gray	16-20 # various varieties	18-24 # Long Gray	18-24 # Long Gray	18-24 # Long Gray	18-24 # Long Gray	Carton 3s 18-24 # Long Gray
April 29	-	-	-	-	-	-	-	-	-	-	-	-	0.19
May 6	-	-	-	-	-	-	-	-	-	-	-	0.11	0.12
May 13	-	-	-	-	-	-	-	-	-	-	-	0.11	0.14
May 20	-	0.14	-	-	-	-	0.12	-	-	-	-	0.10	0.12
May 27	-	0.12	-	-	-	-	0.12	-	-	-	-	0.10	0.13
June 3	-	0.08	-	-	-	-	0.10	-	-	-	-	0.10	0.09
June 10	-	0.08	-	-	-	-	0.08	-	-	-	-	0.06	0.09
June 17	-	0.09	-	-	-	-	0.06	-	-	-	-	0.06	0.09
June 24	-	0.10	0.08	-	-	-	0.08	0.07	-	0.06	-	0.06	-
July 1	-	0.07	-	-	-	-	0.08	0.07	-	0.07	-	0.06	-
July 8	-	-	-	-	-	-	0.07	0.06	-	0.06	-	0.06	-
July 15	-	-	-	0.07	-	-	0.07	0.05	0.07	0.07	0.07	0.06	-
July 22	0.08	-	-	0.07	-	0.07	0.08	0.07	0.07	0.07	0.06	0.07	-
July 29	0.10	-	-	0.07	0.06	0.06	0.07	0.10	0.07	-	-	-	-
August 5	0.06	-	-	0.07	0.07	0.07	-	-	-	-	-	-	-
August 12	0.05	-	-	0.05	0.06	0.06	-	-	-	-	-	-	-
August 19	0.04	-	-	0.04	0.05	-	-	-	-	-	-	-	-
August 26	0.05	-	-	0.04	-	-	-	-	-	-	-	-	-
September 2	0.06	-	-	0.04	-	-	-	-	-	-	-	-	-
September 9	0.06	-	-	-	-	-	-	-	-	-	-	-	-
September 16	-	-	-	-	-	-	-	-	-	-	-	-	-
September 23	-	-	-	-	-	-	-	-	-	-	-	-	-
Simple average	0.06	0.10	0.08	0.06	0.06	0.06	0.08	0.07	0.07	0.06	0.07	0.08	0.12

- = not available.

Source: USDA, Agricultural Marketing Service.

Appendix table 27--Average freight costs per truckload (42-45 ft) for hauling watermelons, 1986-88 1/

Year	Destination	Shipping point				
		Florida	Calif-Kern	Georgia	S. Carolina	N. Carolina
Dollars per truckload						
1986	New York	1,779 - 1,838	3,514 - 4,086	1,642 - 1,687	1,507 - 1,552	1,237 - 1,282
	Atlanta	821 - 866	2,557 - 3,200	-	-	-
	Chicago	1,676 - 1,746	2,386 - 3,071	1,575 - 1,620	1,485 - 1,530	1,485 - 1,530
	Dallas	--	1,743 - 2,286	--	--	--
	Denver	--	1,443 - 1,800	--	--	--
1987	New York	1,842 - 1,893	3,667 - 4,144	1,665 - 1,710	1,552 - 1,575	1,271 - 1,300
	Atlanta	893 - 958	2,589 - 3,211	-	-	--
	Chicago	1,764 - 1,808	2,500 - 3,044	1,575 - 1,620	1,485 - 1,530	--
	Dallas	--	1,722 - 2,222	--	--	--
	Denver	--	1,356 - 1,811	--	--	--
1988	New York	1,893 - 1,969	3,811 - 4,244	1,739 - 1,812	1,564 - 1,625	1,260 - 1,312
	Atlanta	1,000 - 1,125	2,711 - 3,256	-	-	-
	Chicago	1,825 - 1,896	2,533 - 3,044	1,648 - 1,716	1,581 - 1,643	1,530 - 1,575
	Dallas	--	1,822 - 2,278	--	--	--
	Denver	--	1,256 - 1,500	--	--	--

-- = not available.

1/ This data represents rates that shippers or receivers pay, depending on basis of sale, per load, including truck brokers fees, for shipments in truckload volume to a single destination. Extra charges for delivery to terminal markets, multipickup and multidrop shipments are not included. Rates are based on the most usual loads in 42-45 foot trailers from the shipping area to the destination city. In areas where rates are based on package rates, per load rates were calculated.

Source: Weekly issues of the "Fruit and Vegetable Truck Rate Report," USDA, Agricultural Marketing Service.

Appendix table 28--Ports of entry for U.S. watermelon imports, FY 1985-87

Port of entry	FY 1985		FY 1986		FY 1987	
	Pounds	Percent of total	Pounds	Percent of total	Pounds	Percent of total
Miami, FL	--	--	87,368	0.03	--	--
New York, NY	1,697,410	0.66	982,398	0.39	36,163	0.02
Port Everglades, FL	191,073	0.07	3,000,957	1.19	3,408,284	2.13
West Palm Beach, FL	2,405,428	0.94	9,969,472	3.96	507,991	0.32
San Juan, PR	51,784	0.02	--	--	--	--
Tampa, FL	--	--	1,281,023	0.51	285,119	0.18
Los Angeles & San Diego, CA	150,819	0.06	808,597	0.32	52,551	0.03
New Orleans, LA	116,839	0.05	204,622	0.08	--	--
Philadelphia, PA	--	--	82,889	0.03	440	0.00
Brownsville, TX	199,719	0.08	558,932	0.22	6,855,923	4.28
Calexico, CA	876,053	0.34	1,603,811	0.64	549,679	0.34
Eagle Pass, TX	16,885	0.01	48,501	0.02	762	0.00
El Paso, TX	611,552	0.24	788,901	0.31	681,209	0.43
Hidalgo, TX	125,805,043	49.19	103,495,798	41.09	61,646,159	38.50
Laredo, TX	949,098	0.37	689,508	0.27	51,742	0.03
Nogales, AZ	112,753,257	44.09	114,374,622	45.41	77,262,241	48.25
Presidio, TX	309	0.00	7,732	0.00	211	0.00
Progreso, TX	3,342,932	1.31	744,105	0.30	31,555	0.02
Roma, TX	719,846	0.28	202,162	0.08	3,045,654	1.90
Port Arthur, TX	--	--	--	--	10965	0.01
Douglas and San Luis, AZ	5,530,438	2.16	12,552,241	4.98	5,692,485	3.56
San Francisco, CA	313,053	0.12	237,378	0.09	--	--
Savannah, GA	--	--	164,093	0.07	--	--
Total	255,731,536	100.00	251,885,109	100.00	160,119,133	100.00

-- = not applicable.

Sources: Derived from data presented in Pearrow, Joan, "U.S. Imports of Fruits and Vegetables Under Plant Quarantine Regulations, FY 1986." ERS Staff Report No. AGES881107, Nov. 1988 and Wright, Mary "U.S. Imports of Fruits and Vegetables Under Plant Quarantine Regulations, Fiscal Year 1985." ERS Staff No. AGES860304. Data in this table is from USDA, Animal and Plant Health Inspection Service and should not be confused with official import statistics collected by the U.S. Dept of Commerce. This data is presented to illustrate the important entry ports for U.S. watermelon imports.

Appendix table 29--Number of farms reporting watermelon acreage, by States

State	1982	1987	Percent change
	-- Number --		Percent
Texas	1,244	1,314	5.6
North Carolina	1,021	886	-13.2
Florida	888	751	-15.4
Georgia	1,134	741	-34.7
Alabama	1,096	594	-45.8
South Carolina	751	547	-27.2
Mississippi	642	346	-46.1
Oklahoma	289	337	16.6
Virginia	389	335	-13.9
Missouri	255	330	29.4
California	360	304	-15.6
Indiana	266	300	12.8
Pennsylvania	233	296	27.0
Arkansas	361	290	-19.7
Maryland	263	283	7.6
Tennessee	403	263	-34.7
Louisiana	366	242	-33.9
Kentucky	187	219	17.1
New Jersey	192	212	10.4
Kansas	161	179	11.2
Ohio	138	164	18.8
Michigan	101	138	36.6
Illinois	113	134	18.6
Delaware	119	103	-13.4
Iowa	64	93	45.3
Arizona	112	89	-20.5
Colorado	85	87	2.4
Wisconsin	78	84	7.7
Nebraska	49	67	36.7
Minnesota	60	67	11.7
New York	48	66	37.5
Utah	67	62	-7.5
Washington	41	53	29.3
Oregon	38	51	34.2
New Mexico	77	48	-37.7
Hawaii	52	40	-23.1
South Dakota	48	31	-35.4
Idaho	20	20	0.0
West Virginia	20	15	-25.0
Massachusetts	23	13	-43.5
North Dakota	9	11	22.2
Vermont	3	8	166.7
New Hampshire	(d)	7	(d)
Connecticut	11	7	-36.4
Nevada	5	(d)	(d)
Montana	3	(d)	(d)
Others	3	7	133.3
Total U.S.	11,888	10,234	-13.9

(d) = Data not shown to avoid disclosure.

Source: U.S. Department of Commerce, Census Bureau.

Appendix 2—Sources of Statistics

Watermelon data originate in a variety of Federal and State agencies. The United States Department of Agriculture (USDA) reports information through its Agricultural Marketing Service (AMS) and until 1981, the USDA's Statistical Reporting Service also published statistics. Some State Statistical Offices (SSO), which are affiliated with both NASS and State Departments of Agriculture, still collect watermelon data. Other sources of watermelon data include the U.S. Department of Commerce (USDC), the California County Agricultural Commissioners, various universities (in cooperation with USDA's Extension Service), and the United Nations' Food and Agriculture Organization (FAO).

Acreage and Production

There are two basic sources of information concerning area and production, the USDC's Bureau of the Census and USDA's NASS. Census statistics are available in approximately 5-year intervals from 1909 to present. These statistics include State and county number of farms, acreage harvested, and acreage irrigated. USDA-SRS (now the National Agricultural Statistics Service) statistics, the primary source of information for this study, are available from 1939 to 1981. These statistics include acreage planted and harvested, yield, production, price, and value. During the 1939-81 period, seven States (Illinois, Iowa, Louisiana, New Jersey, Oregon, Virginia, and Washington) were dropped from the SRS estimates program. By the time Federal budget cuts and difficulties in data collection forced SRS to discontinue the watermelon estimates program in 1981, 16 States remained in the program.

From 1981 to 1987, eight SRS State offices and the California County Agricultural Commissioner (CAC) offices continued to collect and publish their State's watermelon estimates using local funds.¹ In addition to California, these States include Arizona, Delaware, Florida, Hawaii, Maryland, North Carolina, South Carolina, and Texas.² These nine States have accounted for the majority of U.S. production since 1960. For example, according to 1981 SRS data, the nine States accounted for about 70 percent of domestic watermelon production. These same States also accounted for 68 percent of harvested area reported by the 1987 Census of Agriculture.

¹California data from the CAC may not be totally comparable with NASS or SSO data series due to possible double counting of farms which lie in more than one country. Aside from graphical presentations, whenever CAC data is used in conjunction with NASS data, it is footnoted in this report.

²State budget limitations forced Texas to eliminate their watermelon estimates program following the 1987 season.

Other Statistics

Other important sources of watermelon data are as follows:

- o USDC's Bureau of the Census provides U.S. trade data.
- o USDA's AMS provides shipping point (f.o.b.) prices, volume of shipments, and volume of arrivals at major cities.
- o USDA's NASS and the State Statistical Offices provide grower-level values per unit and total crop values.
- o Various universities and State Extension Service offices throughout the United States estimate watermelon cost of production.
- o Cash receipt statistics come from USDA's Economic Research Service (ERS).
- o The United Nations' FAO provides world trade, acreage, and production data.

Methodology Used In Estimating 1982-87 Data

Because national watermelon data collection was abandoned due to funding cut-backs following the 1981 estimates, a method of estimating post-1981 data was required to illustrate current trends in the industry. Estimates for acreage harvested, yield per acre, and value per cwt were made to support the discussion of per capita utilization and price and production trends. Although based largely on State-level survey-based estimates, the U.S. data generated should in no way be construed as actual observed information. Rather, the extended information is presented to provide an idea of current trends in the industry. Watermelon data continued to be collected after 1981 by the State Statistical Offices of eight States and the County Agricultural Commissioners in California. Although budget limitations forced Texas to drop their watermelon estimates program following the 1987 season, this major watermelon-producing State collected data through 1987. In fact, these nine States accounted for about 70 percent of the watermelon produced during the 1979-81 period. Therefore, with the exception of Georgia and Oklahoma, only minor producing areas were absent from the collective 1982-87 State data set.

To represent these States in an estimate of U.S. statistics, simple equations were estimated utilizing ordinary least squares. These equations were estimated using official NASS data from 1950 to 1980 and included the U.S. statistic as the dependant variable and the nine State aggregation as the independent variable. The estimated equations are as follows (values in parentheses are t-statistics):

$$\text{USHACRES} = 17890.7 + 1.40251*(9\text{SHARV}) \quad (1A)$$

(5.0) (81.3)

Obs = 1950-80 R*R = .99 DW = .69 Mean Y = 297181

where: USHACRES = U.S. watermelon harvested acreage
 9SHARV = 9-State aggregate watermelon harvested area

$$\text{USYIELD} = 26.368 + 0.6925*(9\text{SYIELD}) \quad (2A)$$

(15.2) (41.7)

Obs = 1950-80 R*R = .98 DW = 1.42 Mean Y = 96.9

where: USYIELD = U.S. watermelon yield per acre
 9SYIELD = 9-State average yield weighted by acres harvested

$$\text{USPRICE} = 0.0246 + 0.96*(9\text{SPRICE}) \quad (3A)$$

(1.08) (113.3)

Obs = 1950-80 R*R = .99 DW = 2.20 Mean Y = 2.29

where: USPRICE = U.S. watermelon value per hundredweight
 9SPRICE = 9-State value per hundredweight weighted by production

$$\text{USPRODN} = \text{USHACRES} * \text{USYIELD} \quad (4A)$$

where: USPRODN = U.S. watermelon production

$$\text{USVALUE} = \text{USPRODN} * \text{USPRICE} \quad (5A)$$

where: USVALUE = U.S. watermelon value of production

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