

MARKETING

DESERT

GRAPEFRUIT



ORGANIZATION

BOARD OF REGENTS

DAN E. GARVEY (ex officio)	Governor of Arizona
MARION L. BROOKS, B.S., M.A., (ex officio)	State Superintendent of Public Instruction
W. R. ELLSWORTH, President	Term expires Jan., 1951
SAMUEL H. MORRIS, A.B., J.D.	Term expires Jan., 1951
CLEON T. KNAPP, LL.B.	Term expires Jan., 1953
JOHN M. SCOTT	Term expires Jan., 1953
WALTER R. BIMSON, Treasurer	Term expires Jan., 1955
LYNN M. LANEY, B.S., J.D., Secretary	Term expires Jan., 1955
JOHN G. BABBITT, B.S.	Term expires Jan., 1957
MICHAEL B. HODGES	Term expires Jan., 1957
JAMES BYRON MCCORMICK, S.J.D., LL.D.	President of the University
ROBERT L. NUGENT, Ph.D.	Vice-President of the University

EXPERIMENT STATION STAFF

PAUL S. BURGESS, Ph.D.	Director
RALPH S. HAWKINS, Ph.D.	Vice-Director

AGRICULTURAL ECONOMICS DEPARTMENT

GEORGE W. BARR, Ed.D.	Agricultural Economist
RAYMOND E. SELTZER, M.S.	Associate Agricultural Economist
SCOTT HATHORN, JR., Ph.D.	Associate Agricultural Economist
CHARLES E. ROBERTSON, B.S.	Assistant Agricultural Economist
RICHARD A. SHERBURNE, B.S.	Assistant Agricultural Economist
VIRGINIA FOSTER, B.S.	Statistical Clerk

TABLE OF CONTENTS

	PAGE
ACREAGE	3
YIELDS	5
PRODUCTION	6
SEASONAL VARIATIONS IN SHIPMENTS	8
PROCESSING	11
MARKETS	12
MARKET OUTLETS	14
PRICES	16
COST OF MARKETING	22
CONCLUSIONS AND RECOMMENDATIONS	26
OTHER DESERT GRAPEFRUIT MARKETING PUBLICATIONS AVAILABLE.....	29

ILLUSTRATIONS

FIGURE 1.—GRAPEFRUIT PRODUCTION BY STATES AND DESERT "ON TREE" PRICE, 1930-31 THROUGH 1947-48	7
FIGURE 2.—GRAPEFRUIT SHIPMENTS BY STATES BY MONTHS.....	9
FIGURE 3.—MOVEMENT OF FRESH DESERT GRAPEFRUIT BY WEEKS, 1941-42 THROUGH 1947-48	10
FIGURE 4.—MOVEMENT OF DESERT GRAPEFRUIT TO CANNERIES BY WEEKS, 1941-42 THROUGH 1947-48	11
FIGURE 5.—DESTINATION OF SHIPMENTS OF DESERT GRAPEFRUIT	13
FIGURE 6.—MARKETS FOR DESERT GRAPEFRUIT	15
FIGURE 7.—F.O.B. CAR AND "ON TREE" PRICE OF FRESH DESERT GRAPEFRUIT, 1930-31 THROUGH 1947-48	18
FIGURE 8.—AVERAGE F.O.B. PRICE FOR FRESH DESERT GRAPEFRUIT BY WEEKS, 1941-42 THROUGH 1947-48	20
FIGURE 9.—"ON TREE" PRICE, NUMBER OF BOXES SOLD, AND GROSS FARM INCOME FROM DESERT GRAPEFRUIT, 1930-31 THROUGH 1947-48..	21
FIGURE 10.—DIVISION OF THE CONSUMER'S GRAPEFRUIT DOLLAR	24

MARKETING DESERT GRAPEFRUIT

BY R. E. SELTZER

There are four principal grapefruit-producing areas in the United States. Florida, Texas, and the California-Arizona desert area produce winter grapefruit. A small area in Southern California produces summer grapefruit.

In Arizona, grapefruit production is concentrated in Maricopa and Yuma counties, with a small amount of production in Pima County. In California, the desert grapefruit area includes the Imperial Valley, in Imperial County, and the Coachella Valley lying in that part of Riverside County south and east of the San Gorgonio Pass.

The desert grapefruit industry is of comparatively recent origin. Although grapefruit have been grown in the United States since about 1809, when plantings were made in Florida, it was not until 1890 that trees were set out in the desert. In that year a grove was started at Riverside, California, by Twogood and Cutter, pioneer nurserymen. Two years later the first grapefruit was planted in Arizona at the Clayson ranch just outside Phoenix. About the same time, H. W. Blaisdell planted citrus at Yuma. Grapefruit entered a new Southern California region when R. Gregg Whitney planted a grove at Oasis in the Coachella Valley in 1916. The success of this grove led many others in the Coachella and Imperial valleys into the growing of grapefruit. Rootstock from this grove was planted in Arizona.

ACREAGE

Acreage bearing grapefruit in the United States and in the desert has more than doubled since 1930. During the same period, acreage increased by 50 per cent in Florida and 500 per cent in Texas.

The bearing acreage of grapefruit in the United States has more than doubled since 1930. In that year there were 88,000 acres in bearing. In 1948 there were 200,000 acres. Table 1 shows the bearing grapefruit acreage in the principal producing areas.

The desert grapefruit industry has developed since World War I. In 1919 there were about 500 acres in bearing. Five years later there were 1,000 acres, 10,000 acres in 1931, and the peak of 22,000 acres was reached in 1938. Since 1938, acreage has declined until in 1947-48 there were approximately 13,700 acres in bearing. Most of the commercial plantings occurred during the six-year period 1929-1933.

The grapefruit industry of Texas has developed over the same period as the desert industry, but at a more rapid rate. In 1919 there were just about 100 acres of grapefruit in Texas. Five

TABLE 1.—ESTIMATED BEARING GRAPEFRUIT ACREAGE,
1930-31—1947-48¹

Crop year	Arizona California Desert	Florida	Texas	United States
	(1000)	(1000)	(1000)	(1000)
1930-31	9.1	60.0	15.3	88.6
1931-32	10.0	67.8	21.9	104.0
1932-33	11.0	72.0	34.0	121.9
1933-34	12.5	75.9	47.4	141.3
1934-35	14.9	78.3	57.9	157.1
1935-36	18.9	82.4	64.4	172.2
1936-37	20.2	84.1	70.0	182.5
1937-38	21.7	85.8	71.0	187.3
1938-39	21.9	87.0	72.0	189.4
1939-40	21.7	87.5	73.1	190.8
1940-41	20.1	88.0	74.1	190.9
1941-42	19.4	88.2	75.1	191.7
1942-43	19.1	89.0	76.0	193.0
1943-44	18.3	89.5	76.8	194.1
1944-45	18.3	90.0	77.0	194.6
1945-46	17.6	90.5	78.6	196.6
1946-47	17.0	91.0	80.0	198.5
1947-48	13.7	93.0	80.5	200.0

¹Source: "Citrus Fruits, Production, Farm Disposition, Value and Utilization of Sales," U.S.D.A., B.A.E.

years later there were 2,500 acres, 15,000 acres in 1930, and since that time acreage has continued to expand. The most rapid expansion occurred during the period 1930-38 when acreage increased from 15,000 to 72,000. Low prices then retarded further expansion until World War II. Considerable new acreage was added during the war, with most of the expansion being in Texas and a lesser amount in Florida. There was no expansion in the desert during this period.

At the time when Texas and the desert were just getting started in grapefruit, Florida was already well established as a producer of this fruit, having in 1919, 26,000 acres in bearing. Bearing acreage in Florida has expanded gradually to a peak of 93,000 in 1947-48.

Planting of grapefruit has practically ceased in all producing areas except Texas. After three years of low returns, growers are reducing grapefruit acreage as rapidly as possible. Top-working to oranges and lemons, abandonment and pulling up of groves, and the sale of citrus land near cities for residential purposes have all resulted in a decrease in grapefruit acreage. Texas is the only state likely to have a substantial increase in bearing acreage during the next few years. New acreage planted in recent years has consisted mostly of pinks, Ruby Blush, and other specialty items.

Within the desert there has been a general reduction in grapefruit acreage during the past seven years. Prices during the war

TABLE 2.—DESERT GRAPEFRUIT ACREAGE, BY DISTRICTS¹

Year	Phoenix	Yuma	Imperial	Coachella
1941-42	12,000	1,000	3,500	2,400
1942-43	12,000	1,160	3,500	2,384
1943-44	11,500	1,160	3,300	2,375
1944-45	11,500	1,160	3,200	2,410
1945-46	11,400	1,160	3,100	1,969
1946-47	11,200	1,160	3,000	1,960
1947-48 ²	9,600	1,160	2,000	2,080

¹Source: Desert Grapefruit Administrative Committee.

²Estimate, Department of Agricultural Economics, University of Arizona.

were very good and the growers made money. Since the war a combination of low prices and high costs has resulted in returns so unprofitable that growers have been forced to make a reduction in acreage. This reduction has been most pronounced in the Phoenix and Imperial areas where high labor and water costs combined with a relatively low yield have made costs of production and marketing per packed box higher than in the other three areas. Acreage at Yuma has been maintained. In the California desert the greater part of the acreage reduction has taken place in the Imperial Valley with only a slight amount in the Coachella area.

YIELDS

No general producing area has an apparent advantage in yield over the others. Within the desert, Yuma and Coachella have decidedly higher yields than does Phoenix or the Imperial Valley.

Among the three areas producing winter grapefruit in the United States there appears to be very little difference in yield. In recent years yields in all areas have been around 8 to 10 tons per acre. Yields in all areas have increased to a point where current figures are among the highest on record. In attaining the high level of yield now prevailing in all producing areas, Texas and the desert have increased their production per acre to a point where it is now almost three times as great as it was in 1930. This increase in yield is due to trees coming to full bearing age. Actual yield in Texas for trees in full bearing is greater than the yield in Florida or the desert. Yields in Florida are only slightly higher than they were in 1930.

The value of a high yield lies in the reduction in the cost of production per box. Within the desert area there exists a wide variation in yield among the four producing districts. During the period 1941-42 through 1947-48, the average production in tons per acre for the desert by districts was: Salt River Valley, 8.5; Yuma, 15.8; Imperial, 5.7; and Coachella, 10.8. This variation in yield will be a major factor in determining whether or not a particular area will continue in production if abandonment of grapefruit acreage due to low returns becomes general.

PRODUCTION

Grapefruit production in the United States is now over seven times as great as it was in 1925-26. Over the same period, Texas production has increased by 125 times.

Production of grapefruit in the United States has increased from 8,500,000 boxes in 1925-26 to 63,000,000 boxes in 1945-46, an increase of 750 per cent (Table 3). While the trend in production has been generally upward, there have been four definite upward steps. During the years 1925-26 through 1927-28, United States production of grapefruit averaged 9,000,000 boxes. In 1928-29 there was a sharp increase in production, followed by a period of eight years when production fluctuated around an average of about 16,000,000 boxes. In the year 1936-37 the second definite upward step occurred, and during the six-year period beginning with 1936-37 production averaged about 37,000,000 boxes per year. The third increase occurred in 1942-43 and continued through 1944-45, United States grapefruit production averaging 53,000,000 boxes. During the season 1945-46, production increased 10,000,000 boxes over the 1942-44 average, and with the 1947-48 crop of over 61,000,000 boxes, this appears to be the fourth step in the series of production increases.

TABLE 3.—UNITED STATES GRAPEFRUIT PRODUCTION,
1925-26—1947-48¹

Crop year	Florida	Texas	Calif.-Ariz. desert	United States total
	(thousands) packed boxes	(thousands) packed boxes	(thousands) packed boxes	(thousands) packed boxes
1925-26	7,600	200		8,550
1926-27	8,600	361		9,753
1927-28	6,500	524		8,920
1928-29	11,300	753		13,236
1929-30	8,300	1,550		11,215
1930-31	15,800	1,200	900	18,690
1931-32	10,700	2,600	1,150	15,181
1932-33	11,600	1,440	1,114	15,004
1933-34	10,900	1,200	1,500	14,672
1934-35	15,200	2,740	1,940	21,347
1935-36	11,500	2,780	2,900	18,347
1936-37	18,100	9,630	2,200	30,670
1937-38	14,600	11,840	3,650	31,133
1938-39	23,300	15,670	3,600	43,594
1939-40	15,900	14,400	3,900	35,200
1940-41	24,600	13,650	3,610	43,400
1941-42	19,200	14,500	4,600	40,261
1942-43	27,300	17,500	3,800	50,481
1943-44	31,000	17,710	5,240	56,090
1944-45	22,300	22,300	5,370	52,180
1945-46	32,000	24,000	5,370	63,450
1946-47	29,000	23,300	5,270	59,520
1947-48	33,000	23,200	4,170	61,630

¹Source: "Production, Farm Disposition, Value and Utilization of Sales of Citrus Fruits," U.S.D.A., B.A.E.

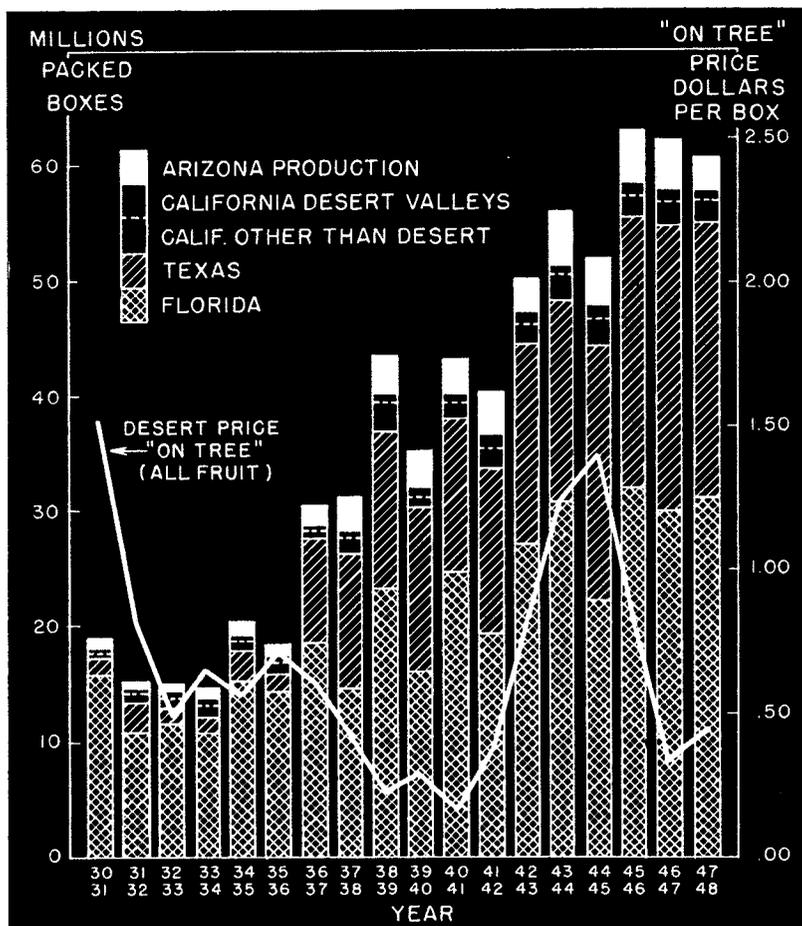


Figure 1.—Grapefruit production by states and desert "on tree" price, 1930-31 through 1947-48.

Florida is the leading state in the production of grapefruit, followed closely by Texas, with Arizona and California producing the remainder of the commercial crop. Florida produces about 50 per cent of the total crop, Texas 35 to 40 per cent, the desert about 9 per cent and the California summer grapefruit area the remainder.

While the increase in production for the United States as a whole has been very rapid, the increase in Texas' production has been at a phenomenal rate. In 1925, Texas produced 200,000 boxes—in 1946, 24,000,000 boxes, 120 times as much as in 1925. The major part of any further increase in production will come from Texas. There is a considerable acreage of grapefruit in Texas not yet in bearing, and the trees now bearing are relatively young.

According to the 1946-47 citrus tree census in Texas, almost 25 per cent of all grapefruit trees were less than six years old. Thirteen per cent were less than one year old. Of these young trees, 96 per cent were of the pink or Ruby Blush variety. There was more freeze damage to these young trees and to all pink and red-type grapefruit than to white grapefruit.

In the desert area, 67 per cent of the total production is grown in the Salt River Valley, about 10 per cent at Yuma, 9 per cent in the Imperial Valley and 14 per cent in the Coachella Valley. Since 1930, grapefruit production in the desert has increased more rapidly than did production in the United States as a whole. From a total of 900,000 boxes in 1930, production steadily increased to 5,370,000 boxes in 1945-46. In 1947-48, production dropped to about 4,100,000 boxes because of frost damage and reduction in commercial grapefruit acreage. Unless some new development results in a substantial increase in the demand for grapefruit, it is doubtful that the desert peak production of 5,370,000 boxes will ever again be reached. Accompanying the expected reduction in desert acreage will be a shift in the relative importance of the four producing districts. Yuma and Coachella Valley appear to have an advantage over the Salt River Valley and Imperial areas. Yuma has the highest yields and the lowest f.o.b. costs in the desert. Coachella also has a high yield, but gains most of its advantage from the premium which it receives for its fruit. Such advantages, resulting in higher returns, should enable these two producing areas to maintain production at a time when low "on tree" prices are forcing acreage out of production in the Salt River and Imperial valleys.

World grapefruit production statistics are significant only in that they show that there are no countries other than the United States which can be considered as important producers of grapefruit. On the average, the United States produces over 95 per cent of the world's supply.

SEASONAL VARIATION IN SHIPMENTS

The shipping season for winter grapefruit normally begins in October and ends early in July. Shipments from Texas usually stop about the last of May. Florida is out early in June, and the desert lasts until the first week or two of July.

The marketing season for winter grapefruit normally runs from October to July. Florida, Texas, and the desert all begin shipments in October of most years. From Figure 2 it is seen that Florida and Texas begin shipments at a relatively high level in October, increase gradually to a maximum in March and April and then drop off sharply until the end of their season. Texas usually is out of the market by the middle or latter part of May at which time their fruit has passed its peak in quality, while Florida may in some years ship throughout the month of June. California and Arizona (the desert) begin at a much lower level in October. Shipments normally reach an early-season

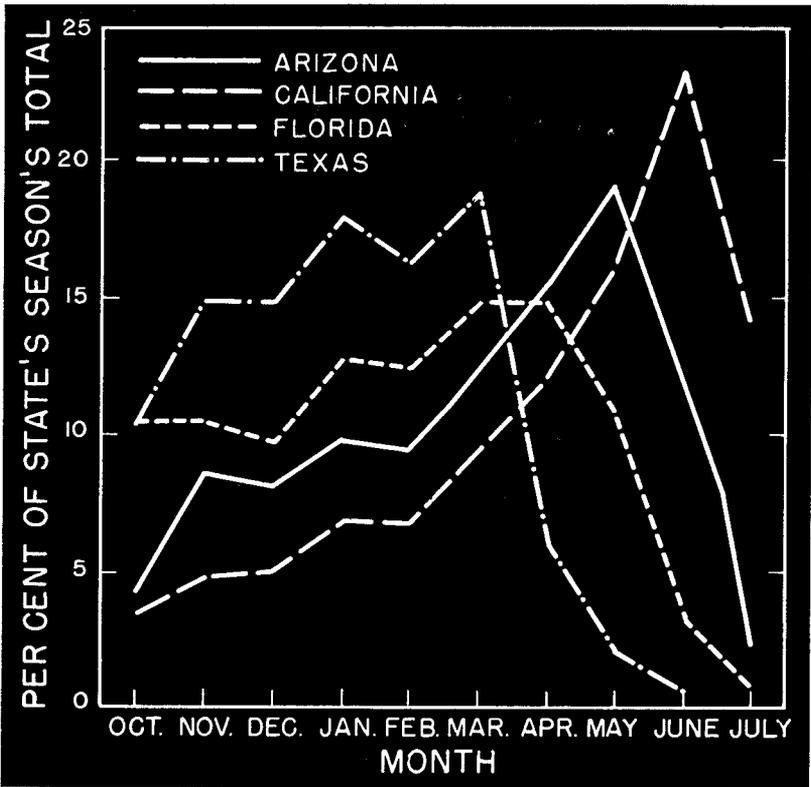


Figure 2.—Grapefruit shipments by states by months. Per cent of season's total shipped each month. Average of years 1930-31 through 1944-45.

peak early in November, then decline and continue at a low rate until February when they begin to increase rapidly, reaching a peak in April and May. They continue in volume in June but decline sharply throughout the month and usually come to an end during the first or second week of July. California summer grapefruit then takes over and is the only source of fresh grapefruit until the next October.

Because of the advantage in location of Florida and Texas in regard to Eastern and Midwestern markets, it is difficult for the desert to move any appreciable volume of fruit into those markets except at times when there is little fruit being shipped from either Florida or Texas. Desert shipments continue in volume later in the year than do shipments from Florida or Texas. It is only during the months of May, June, and July that the desert has any opportunity to move its fruit into areas fully supplied by Florida and Texas during the major part of the year. During these months desert grapefruit is at its best and is superior to any other grapefruit available.

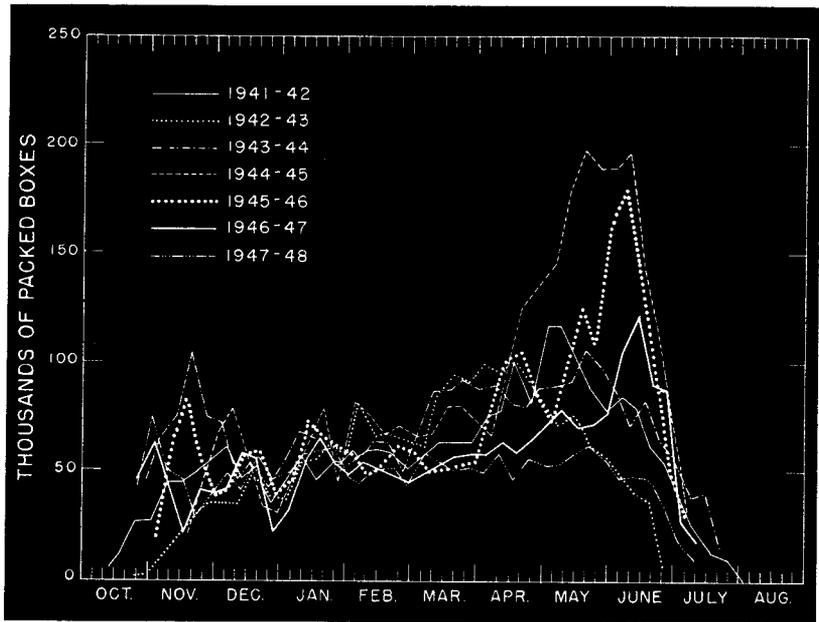


Figure 3.—Movement of fresh desert grapefruit, by weeks, 1941-42 through 1947-48.

Among the four producing districts within the desert, there exists some variation in regard to the time during which their fruit moves to market in the greatest volume. Fruit in the Yuma area matures early and shipments begin in October, reach a peak in November, continue in volume through March and then fall off rapidly, the season ending in May. The Salt River Valley is the next to start, beginning shipments later in October. Volume builds up steadily until March, when a sharp increase in shipments occurs. The greatest volume is reached in May and shipments fall off in June, ending about the second week in July. The Imperial Valley begins shipments early in November, increases steadily to a maximum in April and then falls off rapidly, the season ending early in June. The Coachella Valley is the last to start shipments, usually late in November or early in December. Shipments increase steadily until a peak is reached in April. The season ends about June 1.

The seasonal movement of grapefruit to the canneries begins later in most years (Figure 4). Yuma again is early, the greatest volume going to the processing plant in January and February. The other areas begin movement into processing channels in volume in March and continue through May. There is some variation in this pattern depending on the condition of the fruit in a particular year and also on the demand for canned products.

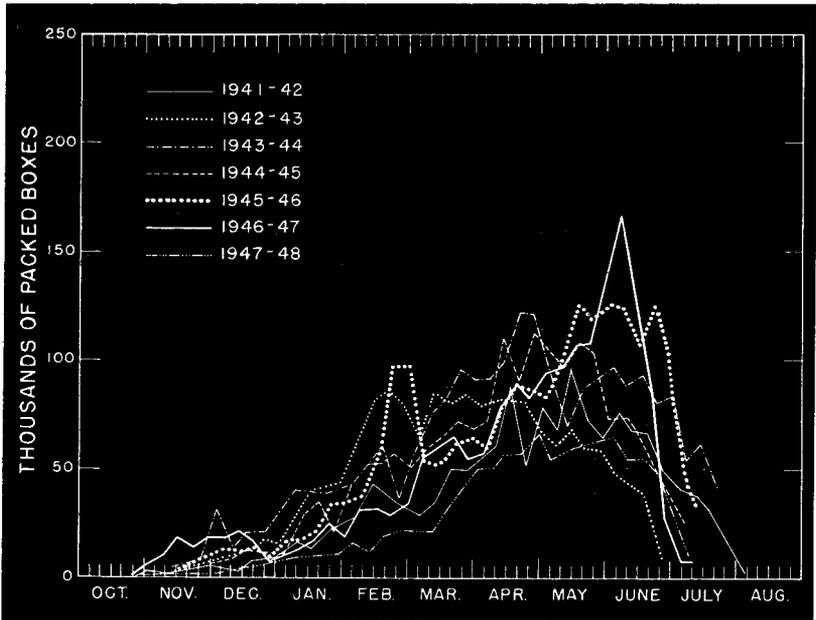


Figure 4.—Movement of desert grapefruit to canneries, by weeks, 1941-42 through 1947-48.

PROCESSING

The amount of grapefruit processed in the United States has increased from 15 per cent of the total production in 1930-31 to 55 per cent in 1943-44. Florida normally processes about 65 per cent of her grapefruit crop, Texas 40 per cent, and the desert about 35 per cent.

Grapefruit is produced primarily for the fresh fruit trade. However, the processing of grapefruit has grown over the past twenty years until it now takes as much fruit as is sold fresh. The percentage of the total grapefruit production that goes into processing increased from 15 per cent in 1930 to 55 per cent in 1943-44. Florida normally processes about 65 per cent of her grapefruit crop, Texas 40 per cent and the desert about 35 per cent.

In 1946-47 the equivalent of 440,000,000 No. 2 cans of grapefruit juice and 280,000,000 No. 2 cans of grapefruit-orange blend were canned, enough for over five cans for every person in the United States, and the pack that year was almost 25 per cent smaller than that of the year previous. In addition, there were over 48,000,000 cans of segments processed. Frozen segments are another grapefruit product generally available. The production of dried grapefruit peel for use as livestock feed is becoming of considerable importance. Feeding tests have shown that this dried peel may be used to replace 25 to 50 per cent of the grain

ration for cattle.¹ Other less important by-products which offer commercial possibilities are: frozen juice, concentrated juice, frozen concentrate, citrus molasses, alcohol, grapefruit peel oil, seed oil, ascorbic acid, citric acid, yeast, enzymes, pectins, marmalades, jellies, bland syrup, candied peel, brined peel, and a base for carbonated soft drinks.

Very little desert grapefruit has been canned in segment form. Desert grapefruit canned as segments does not maintain its original condition. The canned segments become soft and tend toward a mushy condition. This undesirable characteristic effectively prevents the canning of desert grapefruit segments. Industry research is now in progress directed at overcoming this difficulty.

MARKETS

The market for desert grapefruit exists primarily in the West. It is only after May 1 that the desert can effectively compete in eastern and midwestern markets with Florida and Texas.

During the past few years, desert grapefruit has been shipped into forty-five states, the District of Columbia, Canada, Hawaii, Europe, and the Orient. However, the market for desert grapefruit lies primarily in the West. Approximately 75 per cent of all shipments go to the eleven western states. Outside of the western states, desert grapefruit loses its location advantage and competes at a disadvantage with Florida and Texas in eastern and midwestern markets. The long harvesting season of desert grapefruit makes possible the shipment of some fruit East early in the year and again after May 1, when Florida and Texas are nearing the end of their crop.

The general market for desert grapefruit can be divided into four zones; zone "A," California and Arizona, the primary market for desert grapefruit; zone "B," Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming, the market area in which desert grapefruit has a location advantage; zone "C," the remaining thirty-eight states into which Florida and Texas can ship more advantageously than the desert; and zone "D," Canada and other foreign countries. Figure 5 shows that zones "B" and "C" are both relatively important markets in the early part of the season, with correspondingly less fruit being shipped into "A" or "D." Then as more Florida and Texas fruit comes on the market in November, shipments of desert grapefruit into these zones drop off and the bulk of the fruit moves into zone "A," with export shipments increasing and remaining at a higher level through April. In April, Texas and Florida approach the end of their season and move less fruit into midwestern and eastern markets. This provides the opportunity for the desert to again enter these markets and during May, June, and July, zone "C" constitutes the most important market for the desert fruit.

¹"Dried Citrus By-Products as Feeds in the Rations of Dairy Cows and Calves," University of Arizona, Agricultural Experiment Station General Bulletin 218, September, 1948.

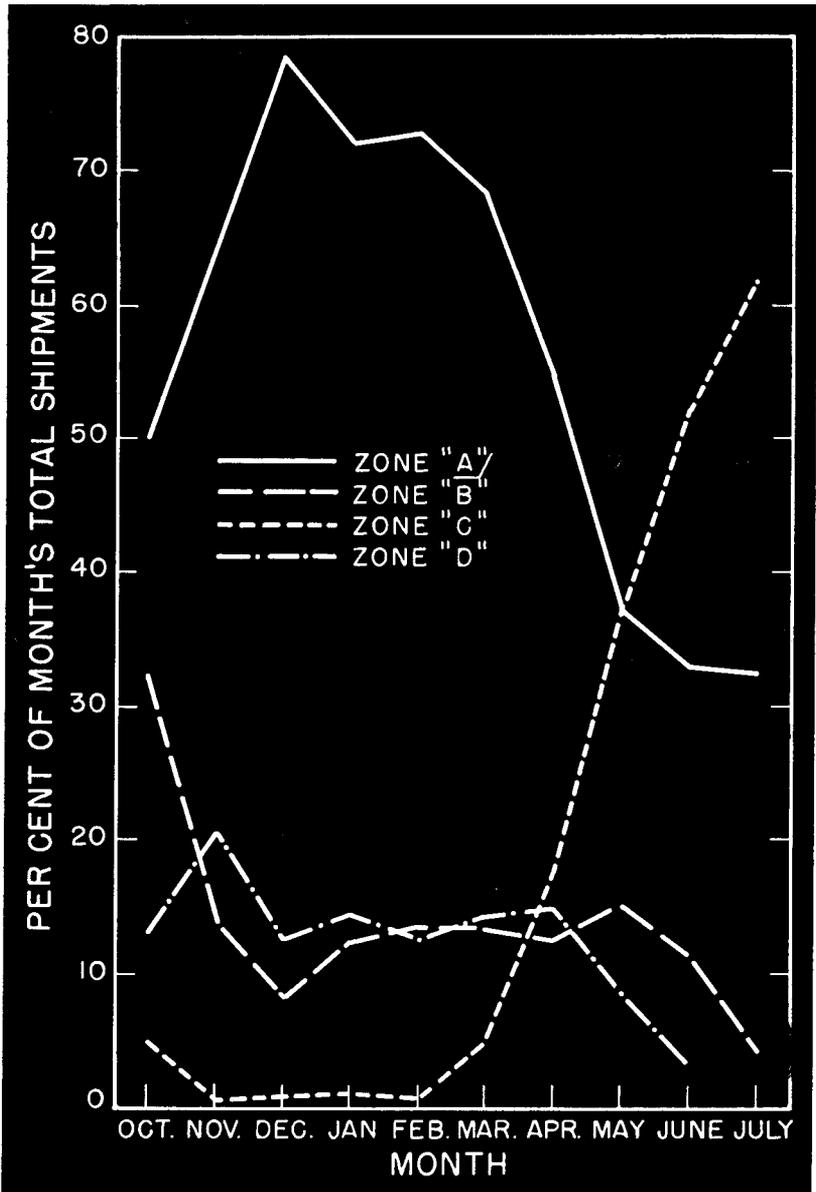


Figure 5.—Destination of shipments of desert grapefruit. Per cent of each month's total shipments going to each prorate zone.¹

¹Zone "A"—Calif. & Ariz.; zone "B"—Colo., Ida., Mont., Nev., Ore., Utah, Wash., & Wyo.; zone "C"—remaining thirty-eight states; zone "D"—Canada and other exports.

California is by far the most important market for desert grapefruit, taking 60 per cent of all fresh shipments (Figure 6). There are two primary reasons for the importance of California as a market; first, because of its large population and location immediately adjacent to the desert area; and second, the restrictions which California places on shipments of Texas grapefruit into the state. Florida cannot compete effectively in California markets because of the distance which its fruit would have to be shipped. Prior to 1947-48 California prohibited the shipment of Texas citrus into the state to prevent the spread of citrus canker root disease. It was proven that this disease no longer exists in Texas, so Texas fruit is now permitted to enter, but must secure special permits and be subjected to sterilization and fumigation treatments to eliminate danger from Mexican fruit fly and surface pests and plant diseases. This decision to admit Texas fruit brought to an end the virtual monopoly on winter fresh grapefruit sales within California which the desert area had previously enjoyed. The competition from Texas fruit may become of considerable importance in California. The only factors that hinder the movement of Texas fruit into California are the cost of transportation and the rigid sanitary provisions with which Texas must comply.

An example of what could happen were all restrictions removed is found in the Portland, Oregon, market. In 1936 Portland received 224 cars of grapefruit from Arizona and California, or 91 per cent of its total receipts, no carload lots being received from Texas. In 1946, Portland received 164 cars from Arizona and California, or 41 per cent of the total, and 188 cars from Texas, or 47 per cent of the total. A similar situation exists in Seattle.

MARKET OUTLETS

Co-operative packing houses handle two-thirds of all desert grapefruit.

The grower of grapefruit has a choice of several agencies through which he may market his crop. He may be a member of a co-operative packing association or he may choose to sell to or through an independent packer. He may pack and sell the fruit himself through a central wholesale market or direct to the retailer or the consumer. From a questionnaire answered by 400 out of a total of 1,100 desert growers, it was found that the co-operative marketing associations in the desert handle about 66 per cent of all the fruit, and the independent packers about 25 per cent. About 5 per cent is packed by the grower and the remainder is distributed among sales through roadside stands, sales to truckers, retailers and canners, and mail-order sales. Roadside stands may constitute an important outlet for individual growers, but since in the desert the population adjacent to the areas of production is relatively small, it follows that the total amount of fruit that can be sold through these stands is necessarily small.

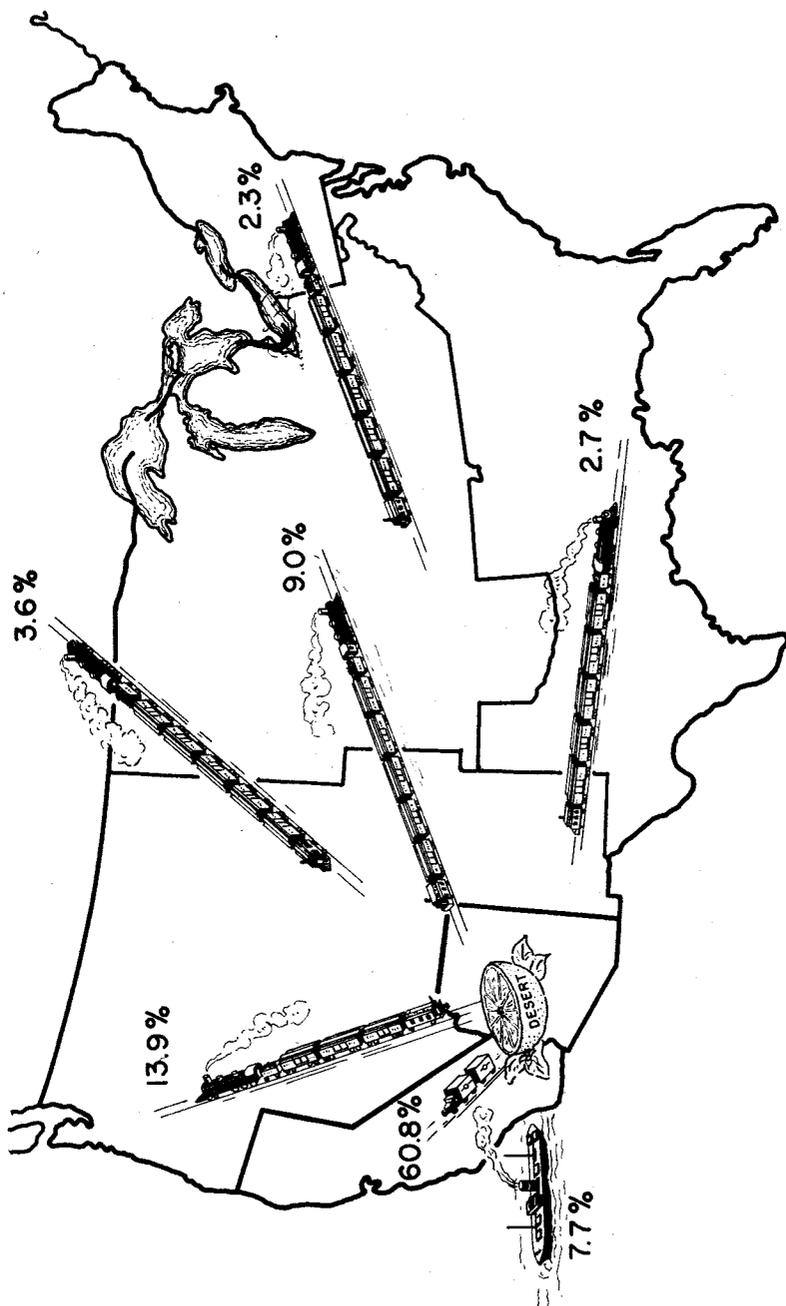


Figure 6.—Markets for desert grapefruit. Per cent of total desert shipments that went to each market area. Average of years 1943-44 through 1947-48.

PRICES

Trends. In reviewing the history of prices of desert grapefruit it becomes apparent that this industry has never had what might be termed "normal" prices.

Prices have always been either high or low; the average has never occurred. There are reasonable explanations of this lack of normality in the price of desert grapefruit. Table 4 presents "on tree" prices of desert grapefruit. By "on tree" prices is meant the price the grower receives after picking, hauling, packing, selling, and advertising costs and assessments have been deducted. The years prior to 1930 were marked by high "on tree" prices for desert grapefruit, rising to \$2.49 per packed box in 1929. During these years there was an undersupply of grapefruit in the western states. The desert grapefruit industry was still very small,

TABLE 4.—DESERT GRAPEFRUIT, "ON TREE" PRICE FOR FRESH FRUIT, PROCESS FRUIT, AND ALL FRUIT, 1919-20—1947-48

Bloom year	Fresh fruit "on tree" price ¹	Process fruit "on tree" price ²	All fruit "on tree" price ³
	Per packed box	Per packed box	Per packed box
1919-20	\$1.72		
1920-21	1.58		
1921-22	2.23		
1922-23	2.16		
1923-24	1.60		
1924-25	1.80		
1925-26	1.97		
1926-27	1.76		
1927-28	2.37		
1928-29	2.14		
1929-30	2.49		
1930-31	1.51		1.51
1931-32	.83		.83
1932-33	.48		.48
1933-34	.67	.20	.66
1934-35	.60	.17	.54
1935-36	.78	.28	.73
1936-37	.81	.13	.61
1937-38	.44	.17	.39
1938-39	.25	.01	.22
1939-40	.34	.11	.30
1940-41	.16	.04	.13
1941-42	.45	.18	.36
1942-43	.90	.61	.78
1943-44	1.52	.84	1.23
1944-45	1.82	.64	1.42
1945-46	1.08	.48	.84
1946-47	.60	-.10	.30
1947-48	.69	-.02	.30

¹Source: Desert Grapefruit Administrative Committee.

²U.S.D.A., B.A.E., "Prices Received by Growers for Fruit and Nut Crops by Type of Sale and Utilization Groups." 1946-47 estimated.

³Calculated from data in first two columns. Weighted by number of boxes utilized as fresh or processed, includes fruit left on tree for lack of a profitable market.

and Texas had not come into the market. The small supply and relatively high demand resulted in high f.o.b. prices, while relatively low costs made it possible for the grower to receive a high "on tree" price.

With the collapse of our economy which occurred in 1929, grapefruit prices dropped sharply and entered into a period of low returns which lasted until World War II demand raised prices to more satisfactory levels. For most people, 1932-34 were considered as the worst years of the depression. At that time, it looked as though desert grapefruit prices were recovering, having risen from 48c per packed box "on tree" for all fruit in 1932 to 73c in 1935. This recovery might have continued but in 1936 a sharp increase in production reversed the trend and "on tree" prices fell rapidly, reaching an all-time low of 13c per packed box in 1940-41. During the war the general level of prices rose, and grapefruit prices increased accordingly to \$1.42 per packed box "on tree" in 1944-45. The sharp curtailment of grapefruit purchased by the armed forces, cessation of civilian wartime demand, further increases in production, and rapidly rising costs soon forced "on tree" prices to prewar levels, 30c per packed box "on tree" being received for all desert grapefruit in 1946-47 and Arizona growers realizing but 13c for their fruit.

F.O.B. Prices.—*F.O.B. prices (Table 5) have followed the same general pattern as was found for prices "on tree," but the fluctuations were much less severe. F.O.B. prices dropped sharply in 1931 and continued fairly steady until 1936 when the substantial production increase forced the second price break. After the out-*

TABLE 5.—F.O.B. CAR AND "ON TREE" PRICE PER PACKED BOX OF FRESH DESERT GRAPEFRUIT, 1930-31 THROUGH 1947-48

Year	Price per packed box fresh fruit ¹ f.o.b. car	Price per packed box fresh fruit ¹ "on tree"	Spread between f.o.b. and "on tree" price
1930-31	\$2.25	\$1.51	\$.74
1931-32	1.56	.83	.73
1932-33	1.18	.48	.70
1933-34	1.28	.67	.61
1934-35	1.13	.60	.53
1935-36	1.36	.78	.58
1936-37	1.38	.81	.57
1937-38	.94	.44	.50
1938-39	.81	.25	.56
1939-40	.89	.34	.55
1940-41	.71	.16	.55
1941-42	1.15	.45	.70
1942-43	2.18	.90	1.28
1943-44	2.57	1.52	1.05
1944-45	2.87	1.82	1.05
1945-46	2.13	1.08	1.05
1946-47	1.83	.60	1.23
1947-48	2.11	.69	1.42

¹Source: Data from Desert Grapefruit Administrative Committee.

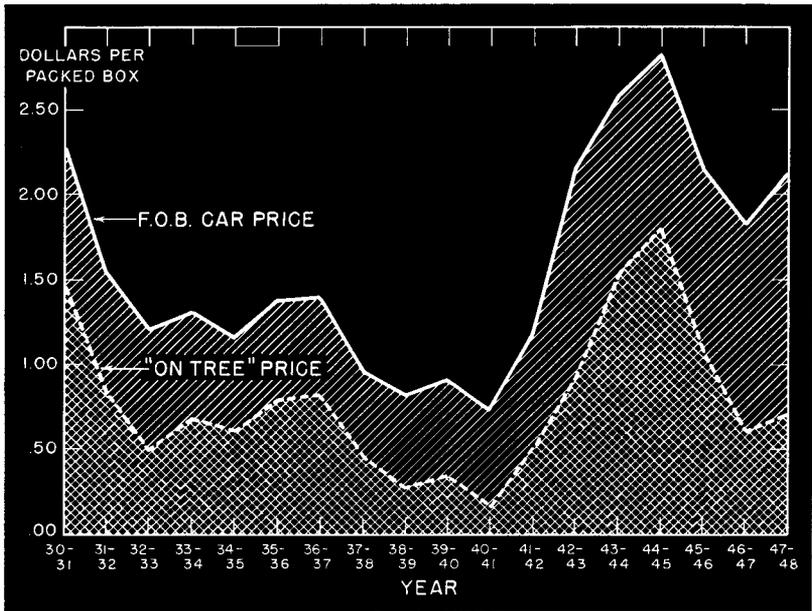


Figure 7.—F.O.B. car and "on tree" price of fresh desert grapefruit, 1930-31 through 1947-48.

break of the war, prices recovered rapidly, reaching a peak in 1944. The principal difference between the trends in f.o.b. and "on tree" prices has occurred since the war. F.O.B. prices have decreased only moderately from their wartime high, while "on tree" prices have broken sharply. The cause of the difference between these two price series lies in the increase in the cost of picking, hauling, packing, selling, and advertising. While there has been but a moderate decline in f.o.b. price since the war, there has occurred a substantial increase in the cost of marketing. Since these costs are deducted from the f.o.b. price in arriving at the "on tree" returns, the result has been sharply lower "on tree" prices.

Column 3, Table 5, shows how these costs have increased. From a low of 50 cents per packed box in 1937, the cost of picking, hauling, packing, selling, and advertising, as reflected in the f.o.b.-"on tree" price spread, has increased to \$1.42 for the year 1947-48.

Price differentials among producing areas. There exists a consistent price differential among the four desert grapefruit producing areas. The Coachella Valley receives a premium for its grapefruit. Yuma normally receives the lowest season's average price. The Salt River Valley and the Imperial Valley realize a price that falls between the high and the low. Over the period 1940-48, the season's average f.o.b. fresh fruit price for each of the

desert areas of production has been: Coachella, \$2.40; Imperial, \$2.01; Salt River Valley, \$2.01; and Yuma, \$1.80 per packed box.

There are definite reasons which can be given to account for these differences. Prices for Coachella fruit are high because Coachella growers leave their fruit on the tree until it has developed to a stage of maturity that will provide a grapefruit of desirable flavor characteristics, and also because growing conditions in the Coachella Valley are such that they are able to produce a smoother, thinner-skinned grapefruit than can be grown elsewhere in the desert. For these two reasons Coachella fruit has consistently sold at a premium.

The season's average price for Yuma grapefruit has been the lowest in the desert. The low price received by Yuma growers for their fruit is not a result of poor quality nor of poor marketing, but rather is caused by the timing of the harvest. Shipments from Yuma begin early and reach their greatest volume during November, December, and January. It is during these months that desert grapefruit prices normally reach their seasonal low. The fact that the greatest volume of Yuma fruit must be moved during these months of low prices undoubtedly is the cause of the low season's average price received by Yuma growers.

Variation in price between the desert, Florida and Texas. The desert grapefruit area operates at a slight, but important, price disadvantage when compared with Florida and Texas. Insofar as grower returns are reflected by "on tree" prices, no producing area has any significant advantage over the others. Average prices per packed box "on tree" for the period 1930-31 through 1947-48 were: Desert, 77.4c; Florida, 78.6c; and Texas, 77.3c. While no area has an apparent advantage when average prices for the entire period are compared, a consideration of the individual years leads to the conclusion that the desert grower is producing at a slight price disadvantage when compared to Florida and Texas. Desert "on tree" prices were low among the three areas in nine out of eighteen years. Thus the desert grower operated at a price disadvantage half of the time. Desert prices were high in six out of the eighteen years. The fact that the desert price was either high or low in all but three of the years might in itself be a disadvantage since it indicates a price which fluctuates to a greater extent than does the price in Florida or Texas.

F.O.B. prices appear to place the desert area at a price disadvantage when compared with Florida and Texas. For the period 1930-31 through 1946-47, desert prices averaged \$1.54 per packed box f.o.b. shipping point as compared to \$1.76 for Florida and \$1.69 for Texas. Desert prices were the lowest among the three areas in twelve out of seventeen years.

Desert grapefruit, seasonal price variation. Desert grapefruit has a pronounced and consistent seasonal price variation. Because of the seasonal nature of grapefruit production, alternate periods of scarcity and surplus occur within each year. There is little grapefruit available during the summer and early fall

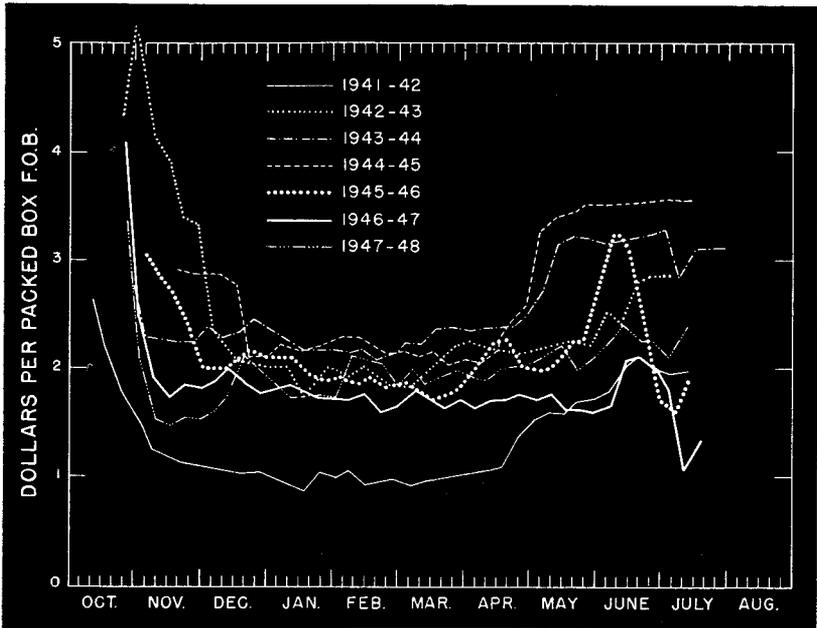


Figure 8.—Average f.o.b. price for fresh desert grapefruit, by weeks 1941-42 through 1947-48.

and as a consequence, prices are high. There is a surplus of grapefruit available during the winter and prices are low.

Figure 8 shows the pattern of this seasonal price variation for the desert area. Prices start at a high level in October. As more fruit becomes available the price breaks rapidly, usually about the second week in November, and by December is only about half as high as it was in October. Prices then continue at this lower level until about April. At that time, Texas is nearing the end of her marketing season and markets formerly supplied almost entirely by Texas fruit then become available to shipments from the desert. In May and June the desert makes further gains as Texas and Florida both have less fruit to ship and mid-western and eastern markets are opened to desert grapefruit. Prices usually reach a summer peak in June and then because of a reduction in quality, fall off somewhat during July.

Grower income from desert grapefruit. Grower income is the product of salable production times "on tree" price. During the ten years prior to World War II, income to growers of desert grapefruit varied from \$500,000 to about \$2,000,000 per year. Volume sold increased during this period, but prices decreased, thus holding the income figure relatively steady. During the war volume sold increased and the price received increased far more. As a result incomes increased to a peak of \$7,500,000 in 1944-45. Since the war volume sold has decreased, but because

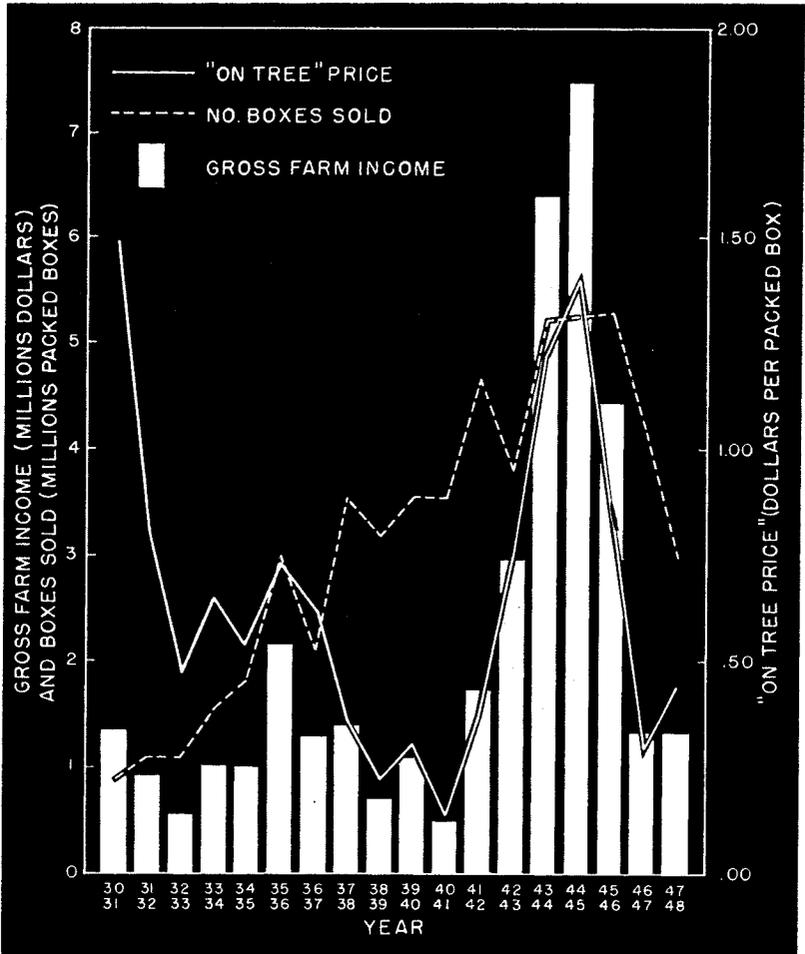


Figure 9.—“On tree” price, number of boxes sold, and gross farm income from desert grapefruit, 1930-31 through 1947-48.

of steadily mounting marketing costs, “on tree” prices have decreased even more until grower income in 1947-48 was only \$1,300,000.

Income is commonly expressed in dollars, but the real value lies only in the amount of goods and services which that income will purchase. Real income, not money income, should be used to evaluate the financial status of the desert grapefruit grower. To determine real income, it is necessary to deflate current prices on the basis of their purchasing power when compared to a base period. When we use the period 1935-39 as an average or base of 100, we find that for the year 1947-48 the price of wholesale com-

TABLE 6.—“ON TREE” PRICE PER BOX OF ALL DESERT GRAPEFRUIT AND VALUE PER BOX IN PURCHASING POWER, 1930-31 THROUGH 1947-48¹

Year	“On tree” price per packed box	Index price of wholesale commodities B. L. S. Index ²	Value “on tree” per packed box in terms of purchasing power
1930-31	\$1.51	96	\$1.57
1931-32	.83	83	1.00
1932-33	.48	77	.62
1933-34	.66	90	.73
1934-35	.54	98	.55
1935-36	.73	100	.73
1936-37	.61	100	.61
1937-38	.39	107	.36
1938-39	.22	95	.23
1939-40	.30	98	.31
1940-41	.13	102	.14
1941-42	.36	119	.30
1942-43	.78	127	.61
1943-44	1.23	128	.96
1944-45	1.42	130	1.09
1945-46	.84	134	.63
1946-47	.30	176	.17
1947-48	.30	199	.15

¹Source: Calculated by Department of Agricultural Economics, University of Arizona.

²1935-39 Average=100.

modities was 199 per cent of the price existing during the base period. In other words, the dollar would purchase only about half as much as it would during the 1935-39 period. Table 6 shows “on tree” prices adjusted on this basis. Considering the last column of this table, it is seen that with the exception of 1940-41, the last two years were the lowest on record. The low price in 1940-41 was due in part to a crop of very low quality, so it is reasonable to say that for comparable quality, the last two years have seen the lowest “real prices” in history.

One method of measuring the purchasing power of a given unit of farm product is through the use of “parity price.” Parity for most farm products is calculated on a 1910-14 base. However, grapefruit production was so small during that early period that for this fruit the period 1919-29 is used as a base. The purpose of parity is to establish a price which gives the farm dollar equal buying power with that of industry. During the past eighteen years, desert grapefruit prices have reached parity but four times: 1930-31, 1942-43, 1943-44, and 1944-45. In 1947-48, the f.o.b. price of desert grapefruit was \$1.36 below parity.

COST OF MARKETING

The cost of marketing is second only to price in determining grower income. The depressed condition of the desert grapefruit industry is the direct result of the high cost of marketing and distribution. Prices are above prewar levels, but high costs leave

TABLE 7.—THE CONSUMER'S DESERT GRAPEFRUIT DOLLAR,
1946-47¹

Cost item	Cost per packed box	Per cent of total price
Grower's return	\$0.47	13.0%
Picking and hauling	0.19	5.0
Packing	0.81	23.0
Selling and advertising	0.14	4.0
F.O.B. desert price	1.61	45.0
Transportation and refrigeration	0.61	17.0
Jobber's margin	0.18	5.0
Wholesale price	2.40	67.0
Retailer's margin	1.20	33.0
Consumer pays	\$3.60	100.0%

¹Data not applicable to fruit from Coachella Valley.

little return for the grower. The consumer pays a fair price for grapefruit, but very little of her purchase price is returned to the grower. Table 7 and Figure 10 indicate the distribution of the money paid by the consumer for the grapefruit which she buys.

Three-quarters of the selling price of desert grapefruit is accounted for by three items: retailing, transportation, and packing. If any substantial reduction in marketing cost is to be made, it must come from reductions in one or more of these three items.

Retailing.—The retailer's margin amounts to approximately one-third of the total selling price. Out of this margin, the retailer must pay for clerk hire, rent, spoilage, licenses, taxes, and other overhead expense. While this item seems large, there are many expenses involved in the retailing of this fruit. The Bureau of Agricultural Economics, United States Department of Agriculture, is now making a detailed study of the cost of retailing citrus fruit. The University of Arizona is making a study of the retail mark-up of grapefruit and comparing this with the mark-up of other fresh fruit. There exists a wide range in retail prices for fresh grapefruit and for grapefruit products. In a study conducted by the University of Arizona in April, 1948, prices of fresh grapefruit of comparable size and grade ranged from 3c to 9c per pound. The same brand of canned grapefruit juice was found at prices ranging from 18c to 38c for the 46-ounce can. It is realized that the lowest prices are only possible in large stores where volume permits lower margins, but it is certain that prices in the upper end of the range do represent excessive retail mark-up, and it is against this group of stores that the industry should direct its efforts.

Transportation.—In recent years the cost of transportation has risen to the point where it has become one of the largest single cost items in the marketing of desert grapefruit. The cost of freight to western, midwestern and eastern points is shown in the accompanying table.

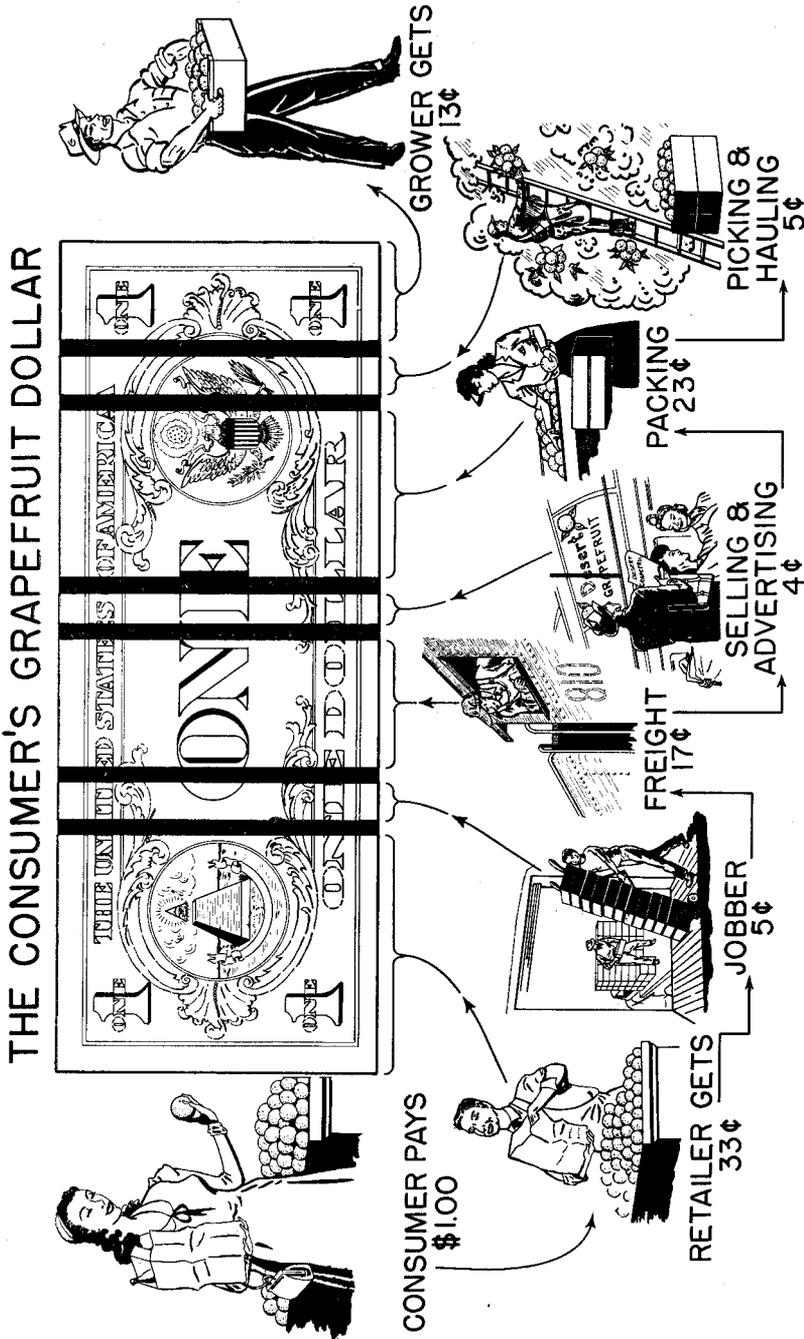


Figure 10.—Division of the consumer's grapefruit dollar. Proportion of consumer's dollar spent for grapefruit that went to the grower and each marketing agency, 1948.

TABLE 8.—RAILROAD FREIGHT RATES FOR GRAPEFRUIT, 1949*

Point of origin	Destination†				
	Los Angeles	San Francisco	Seattle	Chicago	New York
	(per cwt.)				
Phoenix, Arizona	\$.35	\$.55	\$1.10	\$1.70	\$1.74
Yuma, Arizona .....	.23	.51	1.10	1.70	1.74
Brawley, California..	.20‡	.53‡	1.10	1.70	1.74
Indio, California .....	.20‡	.43‡	1.10	1.70	1.74
Harlingen, Texas	1.72	1.72	1.72	1.26	1.55
Orlando, Florida.....	1.88	1.88	1.88	1.17	1.06

*Source: Santa Fe Railroad, District Freight Agent, Phoenix, Arizona.

†All rates are subject to a 3% Federal Transportation Tax.

‡As of present date 4% increase under Ex Parte 168 has not been granted by the California Public Utilities Commission.

This table shows the advantage which each producing area has in relation to the nearest and most important market. The fact that Texas can effectively compete with the desert area in western markets is due to the lower cost of production, harvesting, and packing which prevails in the lower Rio Grande Valley.

The increased cost of freight can be determined by comparing present rates with those in effect eleven years ago.

TABLE 9.—FREIGHT RATES, DESERT GRAPEFRUIT, 1938 AND 1949

From Phoenix	To Los Angeles per cwt.	To San Francisco per cwt.	To New York per cwt.
1949	\$.35	\$.55	\$1.74
1938	.22	.32	.97
Increase	\$.13	\$.23	\$.77
Per cent increase over 1938	59%	72%	79%

During the war, most of the desert grapefruit moved by rail. Now that the wartime shortage in gasoline and tires has come to an end, an increasingly large amount is going by truck. This is especially true in the California desert valleys as they are close to their major markets, Los Angeles and San Francisco. During the 1947-48 season the California desert valleys shipped 89 per cent of their grapefruit by truck, and Arizona 58 per cent. The remainder moved by rail. The increases in freight costs have caused many of the packing houses to give serious consideration to the purchase of trucks and the trucking of their own fruit.

F.O.B. packing house costs.—In 1946-47 the f.o.b. cost of marketing per packed box for desert grapefruit averaged about \$1.20 as compared with \$.66 in 1938-39. In 1947-48 costs were higher because of the freeze and the added expense of sorting out the frozen fruit, marketing costs averaging near \$1.40. In 1948-49 it appears that costs will be equal to or above 1947-48.

Within the four producing districts in the desert, Yuma consistently has the lowest marketing costs with the other three areas

TABLE 10.—F.O.B. PACKING HOUSE MARKETING COST FOR DESERT GRAPEFRUIT, 1938-39 AND 1946-47 (COST PER PACKED BOX)

Cost item	1938-39	1946-47
Picking	\$.05	\$.12
Hauling .....	.03	.07
Packing .....	.48	.81
Selling and Advertising.....	.10	.14
Assessments ¹	0	.06
Total F.O.B. marketing cost	\$.66	\$1.20

¹Grade and size proration and desert industry advertising program.

averaging about the same. The lower costs at Yuma are accounted for mainly by lower labor costs, lower overhead, and lower repair costs. The cost of marketing in 1938-39 and 1946-47 is shown in Table 10.

These higher costs come principally from an increase in the cost of packing and the increase in packing expense is due mainly to higher material and labor costs. The largest single item of expense is the box. In 1938-39 the price of the standard nailed citrus box with lid was around 20 to 25 cents. In 1947-48 the cost of the same box was 40 to 50 cents.

CONCLUSIONS AND RECOMMENDATIONS

1. A shift in grapefruit production among the four desert areas is occurring. Yuma and the Coachella Valley are becoming relatively more important as producing areas, while production in the Salt River Valley and the Imperial Valley is being reduced. This trend will continue as long as grower returns continue at their present unprofitable levels.

The high yield per acre at Yuma and lower marketing costs will tend to permit Yuma growers to remain in production at a time when groves in other areas are being abandoned because of low grower returns.

The Coachella Valley, while nominally a part of the desert grapefruit area, produces a fruit which differs from that grown in the other three producing areas. The Coachella fruit has a smoother and thinner skin than fruit found in the rest of the desert. It has been the policy of the industry in the Coachella Valley to hold fruit on the tree until it has reached a sufficient degree of maturity to render it more palatable than the relatively sour, early-season fruit. The smooth, thin-skinned fruit, marketed at a reasonable stage of maturity has created a demand for Coachella fruit which has resulted in a premium price. For this reason, the Coachella Valley will continue as an important grapefruit producing area.

The Salt River Valley is reducing its production of grapefruit. High marketing costs and low yields are forcing many groves out of production. Subdividing grapefruit acreage for residential purposes near Phoenix is also an important factor in reducing commercial production.

The Imperial Valley produces at a disadvantage because of low yields and small fruit. A substantial reduction in grapefruit acreage in this area appears probable.

2. There is little chance of any substantial curtailment of grapefruit production for the United States as a whole. New acreage, planted during the war, in Florida and Texas has yet to come into bearing. Texas is rapidly overtaking Florida as the largest producing area. In each of the past four years, Texas has marketed more fresh grapefruit than Florida. The relative importance of pink-type grapefruit will increase as nearly all new plantings in recent years have been of pink or red types.
3. The processing of desert grapefruit can be regarded only as a salvage operation. The expansion in bearing acreage has resulted in an over-abundance of fruit, only a part of which can be sold in fresh form. As a result, an increasingly large amount of fruit has been processed. This has resulted in an oversupply of the canned product, and prices have dropped to the point where fruit diverted to processing channels has brought practically no return to the grower.
4. From the start of the marketing season in October until April, the market for desert grapefruit is restricted to the western states. From late April until July, the desert can move fruit east. This midwestern and eastern market normally pays the most attractive prices of the year. Desert packers might consider the developing of this market in an attempt to place a larger part of their total crop in this section of the country.
5. There is no prospect for an increase in f.o.b. prices over the next few years. Prices may temporarily increase due to freeze damage, but in the long run, f.o.b. prices will decline from their present level. The readjustment now taking place from the war-time inflationary period can only result in lower f.o.b. prices.

It is doubtful that there will be any significant reduction in "on tree" prices. Further reduction would force many growers out of production. A general decrease in the price level would cause a corresponding decrease in f.o.b. costs. Since the price of grapefruit is already low when compared with other products, it would be expected that the decline in marketing costs might even be greater than the decline in f.o.b. price. If such were the case, "on tree" prices might actually increase.

6. The critical condition of the desert grapefruit industry is in part the result of high marketing costs. The consumer is paying good prices for the fruit, but the producer receives little or nothing for his labor and investment. The cost of marketing desert grapefruit will decrease as wages and the cost of materials decrease.

The cost of retailing takes 33 cents out of every dollar spent for desert grapefruit. A study of retail margins for grapefruit and grapefruit products is being conducted by the University

of Arizona in approximately 500 retail grocery stores in Los Angeles. This study will determine the mark-up for grapefruit and grapefruit products and compare this mark-up with that of other fresh fruits and canned products. Information on certain retailing practices is also being collected. The desert grapefruit industry should see that the public is adequately informed in regard to retail mark-up of grapefruit and should use every opportunity to bring to the public information concerning grapefruit marketing costs and margins.

The cost of transportation has increased since the war to a point where it has become a major marketing cost. Some packers are giving serious consideration to the trucking of their own fruit in an effort to reduce this cost. Freight on desert grapefruit is calculated on the basis of a 76-pound packed box. It is of the opinion of the industry that a packed box of desert grapefruit did not weigh 76 pounds. In order to settle this question, a study of the weight per packed box has been undertaken by the University of Arizona as a part of a regional research project concerning the marketing of desert grapefruit. During the past year and a half, approximately 15,000 boxes have been weighed, and weights to date indicate an actual weight of around 70 pounds. If the estimated 76-pound weight can be reduced to 70 pounds, a substantial saving in freight is possible.

The increase in the cost of packing has been principally an increase in the cost of the box and in the cost of labor. A detailed study of the over-all cost of packing is now in progress at the University of Arizona. The cost of the box is the largest single item in the packing operation. Tests with a new paperboard citrus box developed by the Container Corporation of America and the University of Arizona, indicate that this box has definite possibilities as a substitute for the standard wooden box which has been used for the past seventy years. The paperboard box can be produced at a cost considerably below that of the wooden box. Further tests with this new container are now in progress.

Hauling costs from the grove to the packing house have been reduced by some packing houses through the use of a bulk-handling system and the elimination of the use of field boxes. A study just completed indicates that substantial savings are possible through the use of the bulk-handling system, and that in most cases first-year savings will pay for the equipment and installation of the bulk system.

**OTHER DESERT GRAPEFRUIT MARKETING PUBLICATIONS
AVAILABLE**

1. "A Statistical Handbook for the Desert Grapefruit Industry," University of Arizona, Agricultural Experiment Station, Mimeographed Report No. 87, March, 1949.
2. "Bulk-Handling Compared with the Use of Field Boxes in the Harvesting of Desert Grapefruit," University of Arizona, Agricultural Experiment Station, Mimeographed Report No. 89, March, 1949.
3. "Possibilities of Paperboard Containers for Fresh Grapefruit," University of Arizona, Agricultural Experiment Station, Mimeographed Report No. 84, September, 1948.
4. "Retailing Grapefruit and Grapefruit Products in a Sample Area," April, 1948.
5. "Consumer Preference for the Yellow Grapefruit Bag," May, 1948.

Copies of these publications may be secured by writing to:
Department of Agricultural Economics
University of Arizona
Tucson, Arizona