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SOME ECONOMIC ASPECTS OF COMMERCIAL COOL SEASON VEGETABLE PRODUCTION IN THE TEXAS WINTER GARDEN

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SOME ECONOMIC ASPECTS OF COMMERCIAL COOL SEASON VEGETABLE PRODUCTION IN THE TEXAS WINTER GARDEN

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I wish to express a personal note of appreciation to my wife, Nancy, for her forbearance and assumption of numerous unpleasant but necessary tasks. In addition to typing the preliminary manuscripts, she served at various times during the preparation of this study as critic, proofreader, and chief cartographer.

To my wife, Nancy Triska Tiller, for her encouragement, sympathetic understanding, and personal sacrifice, I most respectfully dedicate this study.

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CHAPTER I

INTRODUCTION

The United States' expanding urban population creates an ever-increasing demand for fresh and processed vegetables. Despite the fact that each year processed vegetables make inroads into fresh market sales, the desire for "garden fresh" produce remains high. In the vast majority of the continental United States, vegetable production is possible only during the warmer months of the year. Only in portions of California, Arizona, Texas, and Florida do climatic conditions allow the production of vegetables during the winter season (Figure 1). Except for the relatively insignificant quantities of vegetables grown under glass, these four states supply the nation with the bulk of its vegetables during the cooler portion of the year.

Vegetables are usually classified into seasonal groups depending upon their period of most active harvest. According to the United States Department of Agriculture, winter vegetables are those whose period of most active

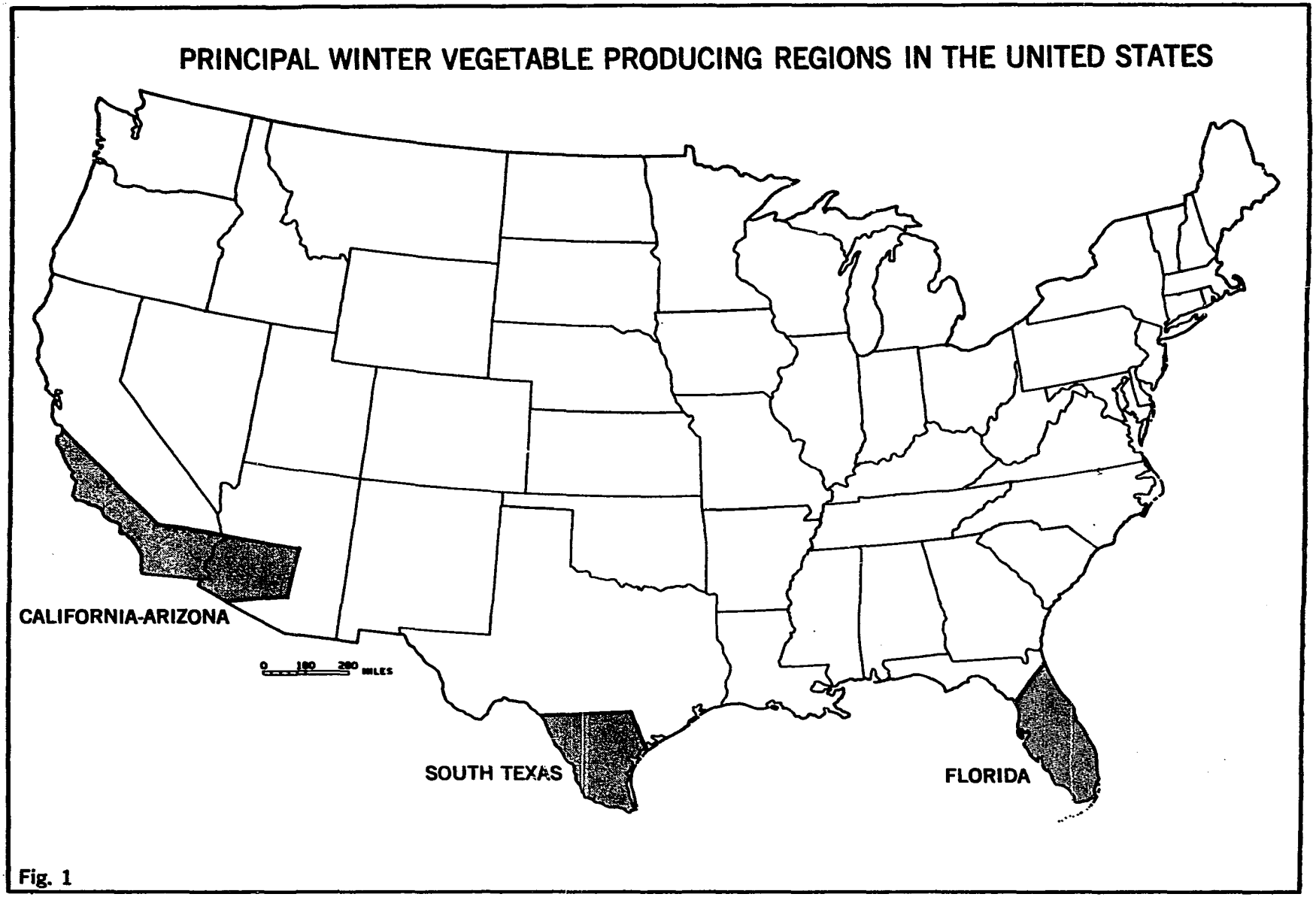
PRINCIPAL WINTER VEGETABLE PRODUCING REGIONS IN THE UNITED STATES
CALIFORNIA-ARIZONA
0 100 200 MILES
SOUTH TEXAS
FLORIDA

Fig. 1

harvest falls within the months of January, February, and March.[1] Beets, broccoli, cabbage, carrots, cauliflower, lettuce, and spinach are among the more prominent cool season vegetables according to this classification. For the purposes of this study, these seven vegetables, along with onions, are referred to as the winter vegetable crops. The onion, although recognized by the United States Department of Agriculture as an early spring crop, is included as a winter vegetable in this study for the following reasons: (1) its long growing season extends through the winter months, (2) the historical as well as contemporary economic importance of the vegetable to the Winter Garden area. Although numerous other vegetables are grown during the remainder of the year, the cool season crops as a group are by far the most important assemblage of vegetables produced in the Winter Garden.

Winter vegetable production varies from year to year depending upon demand, weather, and the whims of growers. Nationally, Texas accounted for 49.4 per cent of the winter vegetable acreage harvested during the 1961-1967 period, but low yields reduced state production to 36.8 per cent of the national total (Table 1).

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[1]U.S., Department of Agriculture, Agricultural Marketing Service, Commercial Vegetables for Fresh Market--Usual Planting Dates, Usual Harvesting Dates, Principal Producing Areas by Seasonal Groups and States, Agriculture Handbook No. 80 (Washington, D.C.: Government Printing Office, 1954), p. 1.

TABLE 1

WINTER VEGETABLE PRODUCTION IN THE UNITED STATES,
BY PRODUCING AREA, AVERAGE 1961-1967
(Winter Season Harvest)

Production Areas	Acres Harvested	Percentage	Production (1,000 cwt.)	Percentage
United States	188,870	100.0	27,775	100.0
Arizona	19,084	10.1	3,093	11.1
California	57,629	30.5	11,283	40.6
Florida	18,843	10.0	3,173	11.4
Texas	93,314	49.4	10,226	36.8

Calculated from: U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Vegetables-Fresh Market 1967 (Washington, D.C.: Government Printing Office, 1967), pp. 22-25, 30-33, 42-45, and 49-50.

Several winter vegetable producing areas are found in Texas (Figure 2). The sector of the state most frequently associated with cool season vegetables is that of the Lower Rio Grande Valley. The Valley accounted for approximately 70 per cent of Texas' winter vegetable production in 1964.[2] In the north central portion of the Gulf Coastal Plain lies Texas' second major cool season vegetable producing region--the Winter Garden. In 1964 the Winter Garden produced approximately 18 per cent of Texas' winter vegetables. In addition to the Lower Rio Grande Valley and the Winter Garden, winter vegetables are grown in and around Corpus Christi (4 per cent), Laredo (4 per cent), San Antonio (3 per cent), and Eagle Pass (1 per cent).

One of the concerns of geography is man's use of the environment. Ideally the geographer, once he has analyzed a man-made landscape, will have concrete suggestions to offer as to ways in which the area might be improved to better benefit the local population. Therefore, after a careful consideration of the conditions present in the Winter Garden, the problem of this study becomes twofold: (1) describing the development and present status of the Winter Garden's cool season vegetable industry, (2) the

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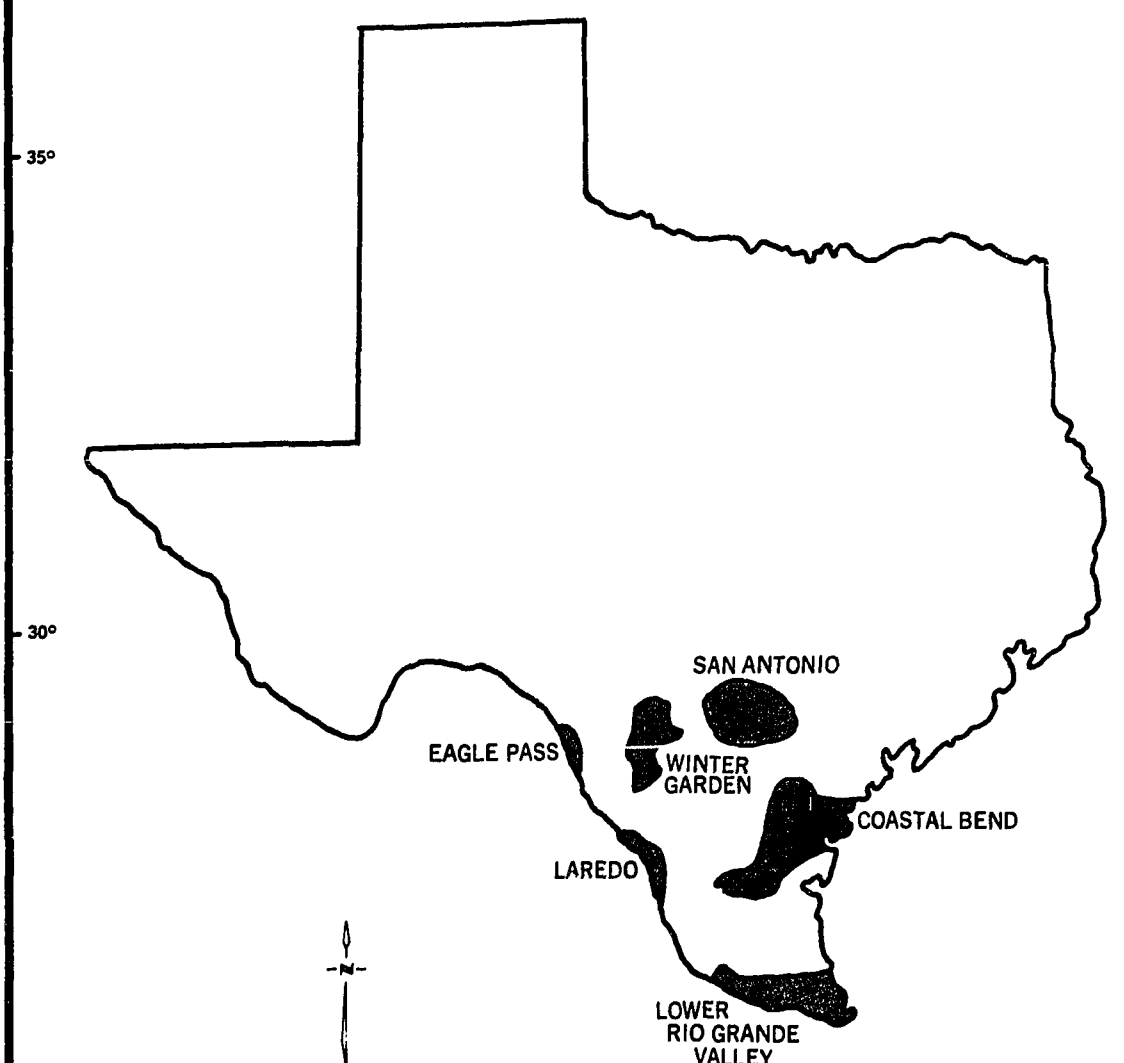
[2]Percentages computed from material presented in the U.S., Department of Commerce, Bureau of the Census, United States Census of Agriculture: 1964, Vol. 1, pt. 37, Texas, and Texas Crop and Livestock Reporting Service, Texas Vegetable Statistics, Bulletin 43 (Austin: n.p., 1967), pp. 16, 18, 28, 34, and 38.

PRINCIPAL WINTER VEGETABLE PRODUCING AREAS IN TEXAS



AFTER: TEXAS A&M UNIVERSITY MP 715

Fig. 2

submission of possible solutions to the problems facing area vegetable producers. Although some attention will be given to the development of the winter vegetable industry in the southwest Texas region, major emphasis will be placed on conditions as they existed in the Winter Garden during the 1967-1968 crop year, and on the contemporary economic problems of water, labor, and markets as they relate to the area's cool season vegetable industry.

In order to solve the problem under consideration, it was necessary to make extensive use of available textual and statistical literature, and to gather in the field first hand, information not elsewhere available. The bulk of the library work was done at the University of Texas at Austin, Texas A&M University, Texas Water Development Board (Austin), Oklahoma State University, and the University of Oklahoma. Some use was made of the local libraries and county newspaper files.

Field work was begun in late December, 1967, with a four day reconnaissance of the area. Additional trips of a more detailed nature took place in March and May, 1968. The great bulk of the field work was done from mid-September to the latter part of October, 1968. During this period numerous interviews were held with local residents, farmers, ranchers, and vegetable shippers, as well as with the representatives of such governmental agencies as the U.S. Department of Agriculture's Soil Conservation Service and Agricultural Stabilization and Conservation Service, and the Texas

Employment Commission. Field work was completed with a brief (one week) survey of the area in February, 1969. The remainder of the academic year was devoted to an analysis and evaluation of the collected material.

CHAPTER II

LOCATION AND PHYSICAL ENVIRONMENT

Location

Like most economic regions, the Texas Winter Garden is difficult to delimit with precision. The term has generally been applied, however, to those areas of concentrated winter vegetable production in Maverick, Uvalde, Zavala, Dimmit, La Salle, and Frio counties. Such a definition is no longer valid due to a variety of reasons to be discussed in the ensuing pages of this paper. The Winter Garden of today (1968), as defined by the author, includes the areas of concentrated cool season vegetable production within Uvalde, Zavala, Dimmit, and northwestern Frio counties (Figure 3). The Winter Garden region extends approximately sixty miles from north to south and forty miles from east to west at its widest points. Batesville, the most centrally positioned settlement, is located about seventy-five miles southwest of San Antonio.

The casual observer might question the validity of the author's regional definition, for in the study area one cannot see vegetable fields extending from horizon to horizon. During the 1967-1968 season winter vegetables

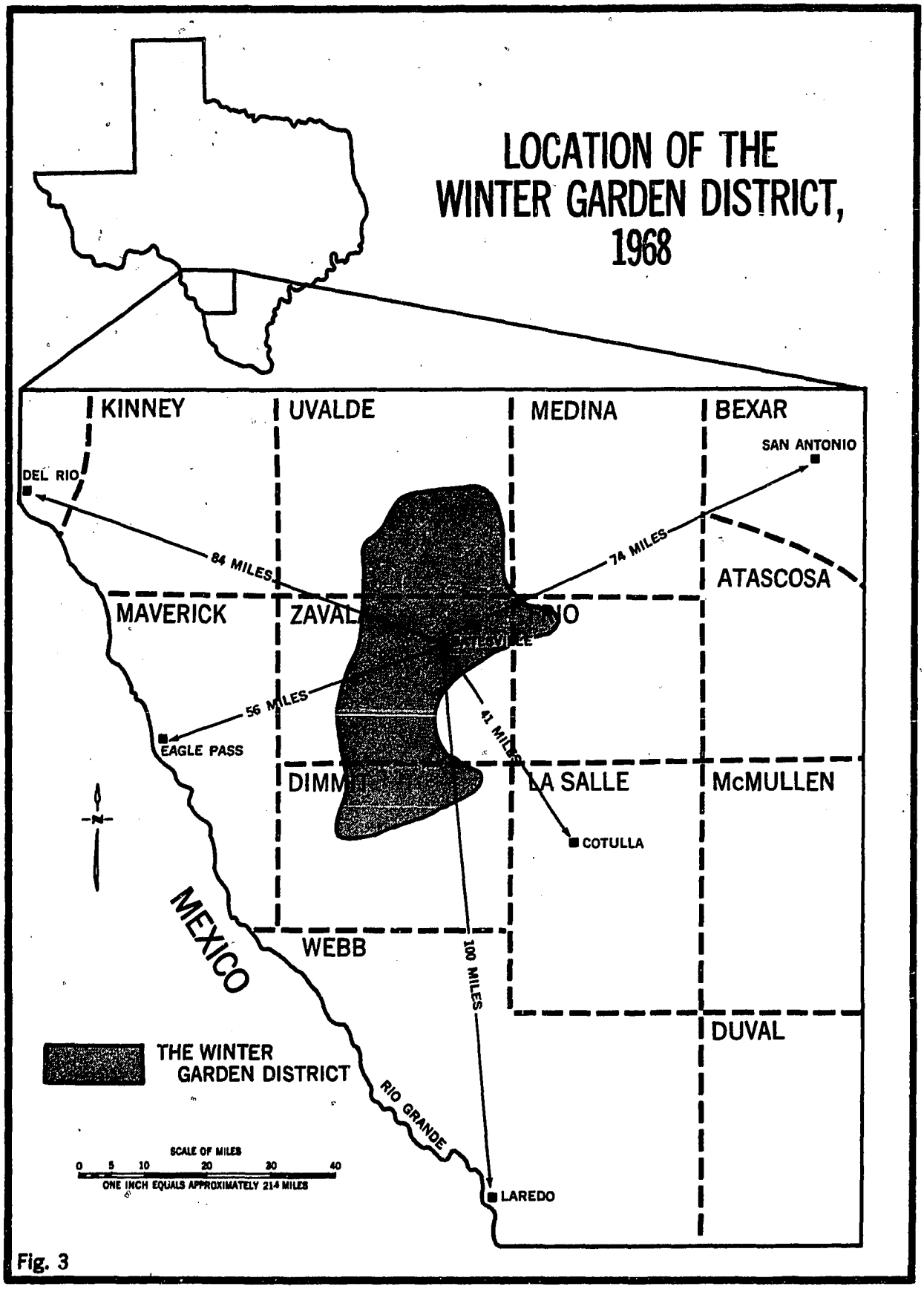

LOCATION OF THE WINTER GARDEN DISTRICT, 1968
KINNEY
UVALDE
MEDINA
BEXAR
SAN ANTONIO
DEL RIO
84 MILES
74 MILES
ATASCOSA
MAVERICK
56 MILES
41 MILES
EAGLE PASS
LA SALLE
McMULLEN
COTULLA
N
MEXICO
WEBB
100 MILES
DUVAL
THE WINTER GARDEN DISTRICT
RIO GRANDE
SCALE OF MILES
0 5 10 20 30 40
ONE INCH EQUALS APPROXIMATELY 21.4 MILES
LAREDO

Fig. 3

occupied approximately 8 per cent (thirty-four square miles) of the 432 square mile Winter Garden region. Vegetable fields, as a rule, are located adjacent to area towns and along major streams; however, even here the tendency is toward dispersion.

Geomorphology-Hydrology

Structurally the Winter Garden lies within the area of convergence of the eastward trending structures of the Balcones fault zone and the northward trending structures of northern Mexico.[1] The Balcones Escarpment, the most prominent topographic feature in the region, stands some 250 to 400 feet above the downthrown Gulf Coastal Plain to the south (Plate 1). Approximate elevations above sea level range from 450 feet where the Nueces River leaves the Winter Garden to 1,000 feet at the base of the Balcones Escarpment. The plain slopes gently toward the south-southeast with a mean gradient of approximately ten feet per mile (Figure 4).

The local sandstone, limestone, and shale formations of the Cretaceous period were initially deposited in a shallow embayment of a greater Gulf of Mexico. During the

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[1] U.S., Department of the Interior, Geological Survey, Geology and Ground-Water Resources of the Winter Garden District Texas, 1948, by Samuel F. Turner, Thomas W. Robinson and Walter N. White, revised by Donald E. Outlaw, W. O. George and others, Geological Survey Water-Supply Paper 1481, prepared in co-operation with the Texas Board of Water Engineers (Washington, D.C.: Government Printing Office, 1960), p. 27.

TOPOGRAPHIC MAP
OF THE WINTER GARDEN AND ADJACENT AREA

SCALE IN MILES

0 5 10 15 20

CONTOUR INTERVAL 100 FEET
DATUM IS MEAN SEA LEVEL

AFTER: GENERAL TOPOGRAPHIC MAPS OF THE UNITED STATES (1:250,000), 1964

Fig. 4

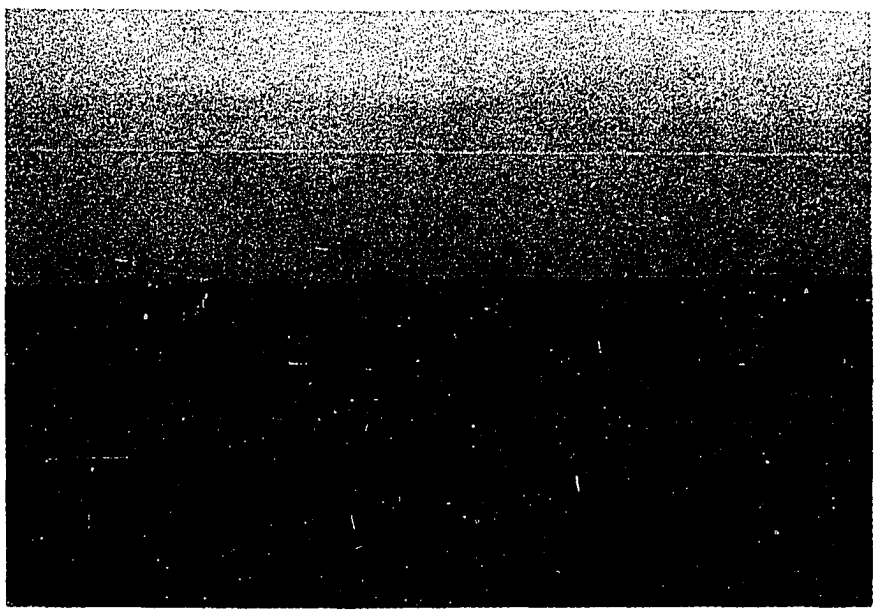

Plate 1--The Balcones Escarpment as viewed from atop the Southern Pacific Railroad tracks two miles west of Uvalde.

Grid north is indicated to the right of all plates where possible and/or when appropriate.

Tertiary and Quarternary periods, streams flowing south into the Gulf of Mexico intermittently deposited materials from the higher elevations to the north (Figure 5).[2] South of the Balcones Escarpment the smoothly undulating prairies of the Gulf Coastal Plain are occasionally interrupted by low knobs and rounded hills. These hillocks, the result of faulting, uplift, and/or igneous activity, are the most prominent topographic features in Uvalde County south of the escarpment (Plates 2 and 3). South of the Cretaceous exposures the topography becomes more rolling on the less

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[2] Ibid., p. 23.

SURFACE GEOLOGY OF THE WINTER GARDEN AREA

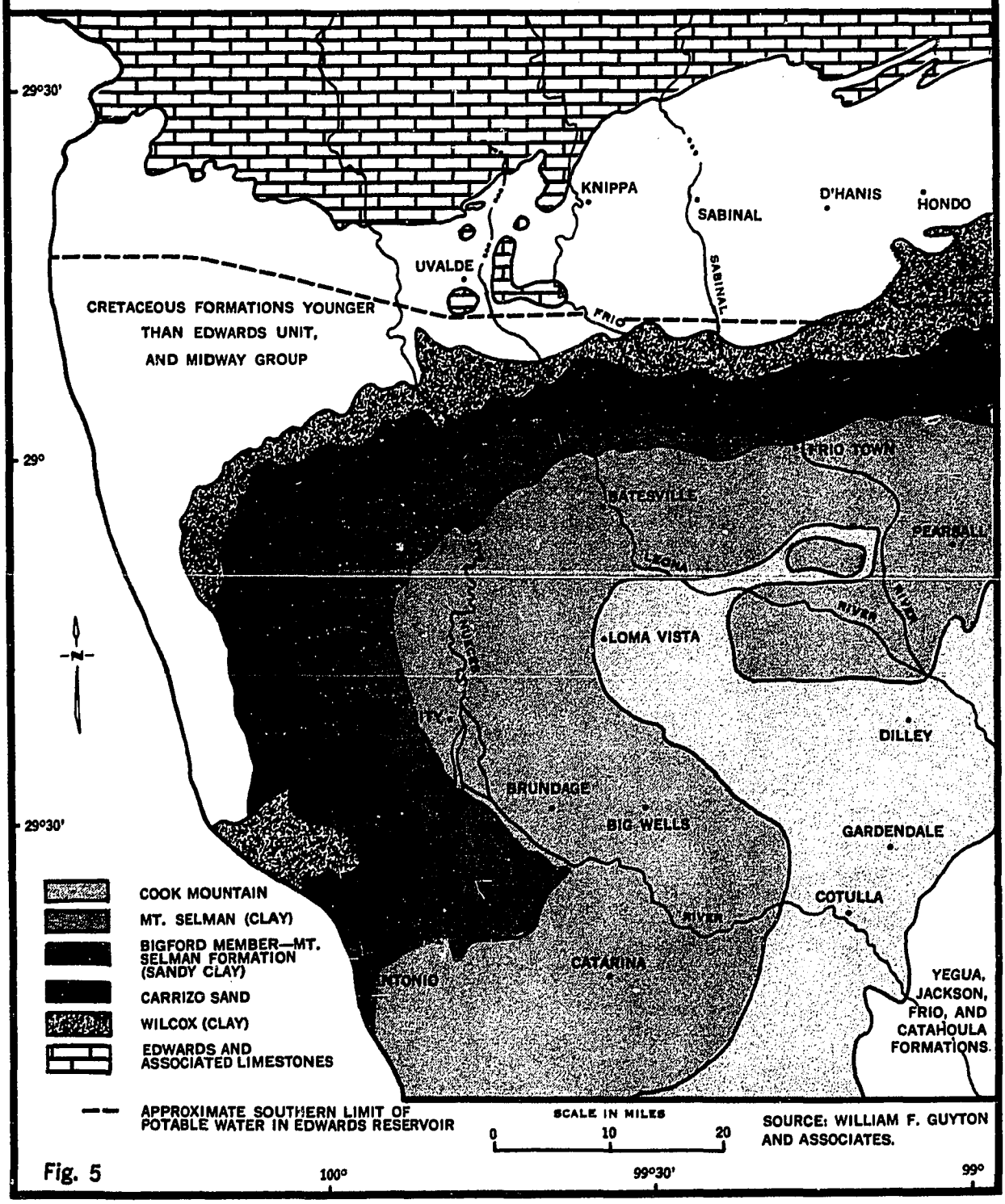

Fig. 5

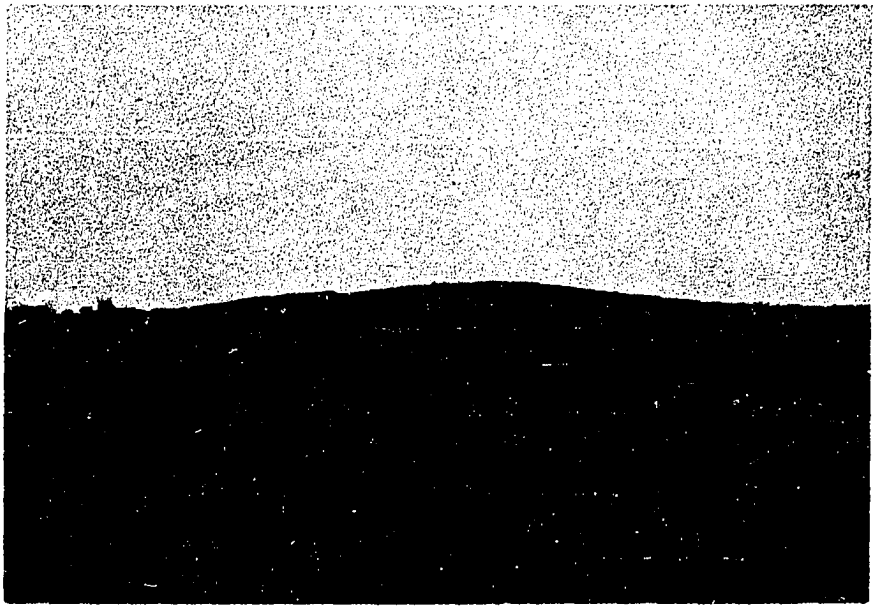

Plate 2--Basaltic intrusion approximately one-half mile west of Knippa.

Plate 3--A portion of White's Uvalde Mines mining operation at Knippa. (Processing plant may be seen to the left of the intrusion in Plate 2.) Basaltic materials quarried from this location are used in the production of Rockwool insulation.

resistant Tertiary deposits. Occasional remnants of north-northwest facing cuestas are noted where more resistant beds in the various Tertiary formations are exposed.

Two terraces are discernible in the Winter Garden region. The older and higher terrace, evidenced by scattered remnants of Uvalde gravel (Pliocene [?]), represents the surface of a Tertiary plain. The Leona formation (Pleistocene) coincides with the lower second terrace. This lower terrace, composed of materials deposited from overlying formations, is a prominent feature in the valleys of the Nueces and Leona rivers and their tributaries.[3]

The Winter Garden region, lying entirely within the Nueces River watershed, is drained by the Nueces, Leona, Frio, and Sabinal rivers. Flowing southward across the Tertiary deposits, these streams occupy broad, shallow valleys. With the exception of the Leona, which has its source in springs southeast of Uvalde, all of these streams have their origin on the Edwards Plateau. Upon crossing the Balcones fault zone these streams disappear as their waters are lost to the underlying Edwards formation. Fed by springs, the rivers generally reappear fifteen to twenty miles south of the Balcones Escarpment as perennial streams.[4]

Appendix I presents a brief general outline of the geologic formations found in the Winter Garden region.

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[3] Ibid., p. 4.

[4] Ibid., p. 21.

Hydrologically speaking, only three of these formations, the Carrizo sand, the Edwards and associated limestones, and the Leona formation, are of any importance in the production of area vegetable crops. A more detailed description of these three formations is in order, as virtually all of the ground water used for the production of vegetable crops during the 1967-1968 season was drawn from these aquifers.

In the Winter Garden region the Carrizo sand outcrops in a belt one to six miles wide in western Dimmit, eastern Maverick, western and northern Zavala, and southern Uvalde counties (Plate 4). Although the rate of dip varies with individual locations, the formation tends to dip in a generally

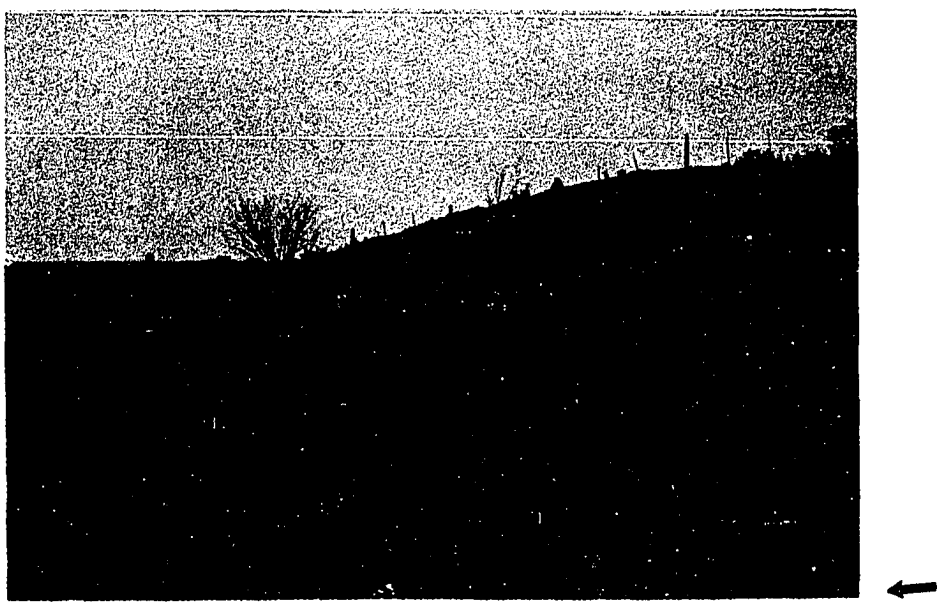

Plate 4--Outcrop of the Carrizo sand approximately nine miles north of La Pryor. Note the dipping nature of the formation.

southeasterly direction at an average rate of sixty feet per mile. This confined artesian aquifer underlies all of Zavala and Dimmit counties south and east of the outcrop (Figure 6).[5] Natural recharge of the aquifer is accomplished almost entirely by precipitation falling upon the 190,000 acre outcrop area. Small quantities of water may be lost to the Carrizo sand from streams which cross the outcrop; however, due to the almost impermeable nature of the clay and silt deposits on stream beds of the area, these losses are believed to be negligible. Although conclusive data are largely lacking, it is estimated that annual natural recharge to the Carrizo sand averages approximately 25,000 acre-feet per year.[6]

The water found in the Carrizo sand is of moderate to good quality and is generally suitable for the production of vegetable crops. The failure of early well drillers to properly case their wells has, however, resulted in some localized contamination of the aquifer by the overlying, highly mineralized (salt and gypsum) Bigford member of the Mount Selman formation.[7]

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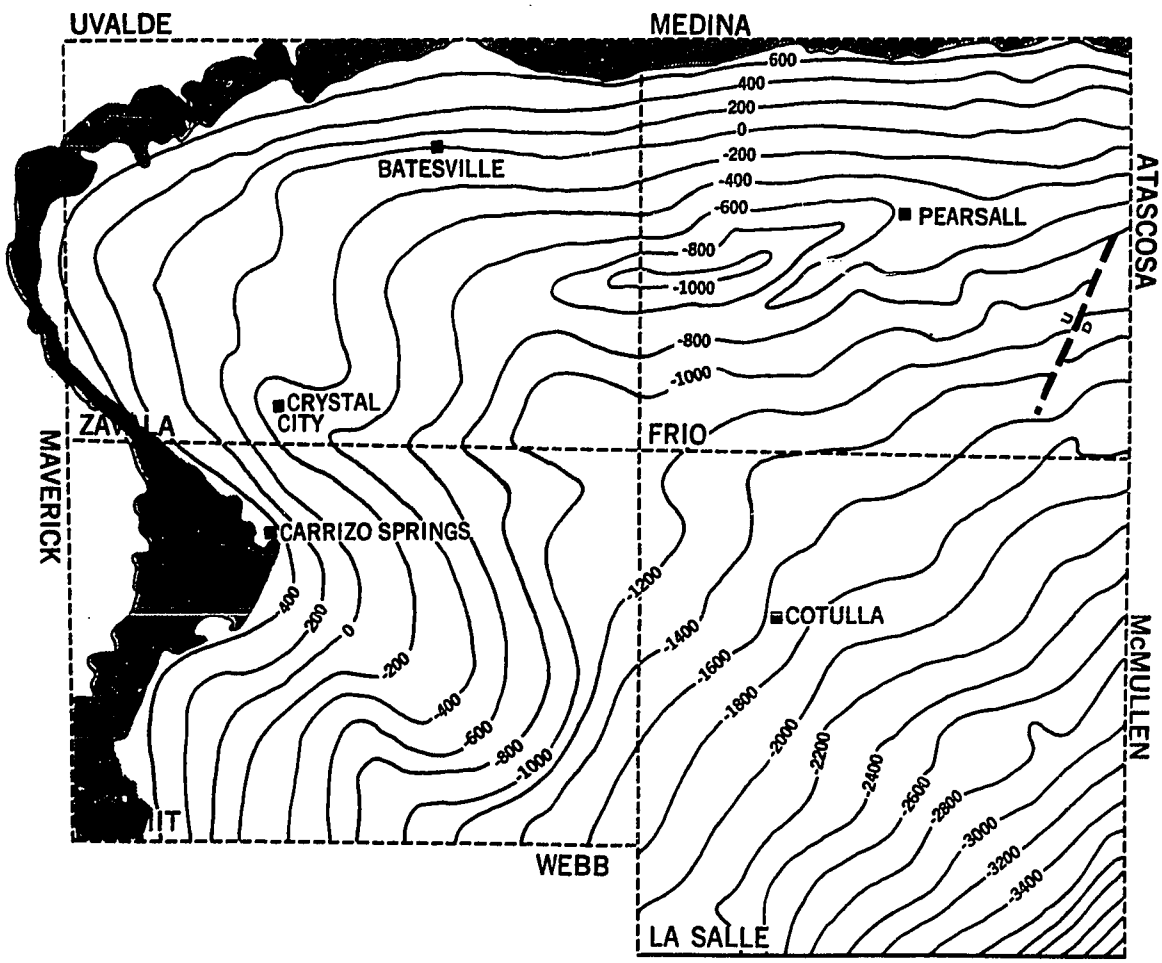
[5] Ibid., p. 43.

[6] Ibid., pp. 64-65.

[7] Walter N. White and Oscar E. Meinzer, Ground-Water in the Winter Garden and Adjacent Districts in Southwestern Texas, prepared by the U.S. Department of the Interior, Geological Survey in co-operation with the Texas State Board of Water Engineers (Washington, D.C.: Government Printing Office, 1931). p. 15. (Mimeographed.)

APPROXIMATE ALTITUDE OF THE TOP OF THE CARRIZO SAND



600

STRUCTURE CONTOUR SHOWS APPROXIMATE ALTITUDE OF TOP OF CARRIZO SAND

U
D

FAULT

CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL

OUTCROP OF CARRIZO SAND

N

SCALE IN MILES

0 10

SOURCE: TEXAS WATER DEVELOPMENT BOARD, BULLETIN 5203 AND 6520 AND REPORT 32.

Fig. 6

Due to their geologic and hydrologic similarities, the Comanche Peak, Edwards, Kiamichi, and Georgetown limestones are usually considered as a single aquifer. These light-colored massive formations, highly faulted and honeycombed with solution channels and cavities, represent the most important artesian aquifer in Uvalde County. Although the Edwards and associated limestones dip toward the south at highly variable rates, which average 100 feet per mile (Figure 7), the southerly flow of water is impeded by the less permeable nature of the formations down dip and by east-west trending faults. Water in the Edwards reservoir tends to move eastward following fault lines and associated solution channels.[8]

The boundaries of the Edwards reservoir are quite distinct. The Balcones Escarpment marks the northern limit of the aquifer. The southern boundary of the aquifer generally coincides with the so-called "bad water" line. South of this line irrigated crop production is not practicable due to the high hydrogen sulfide content of the underground water supplies.[9]

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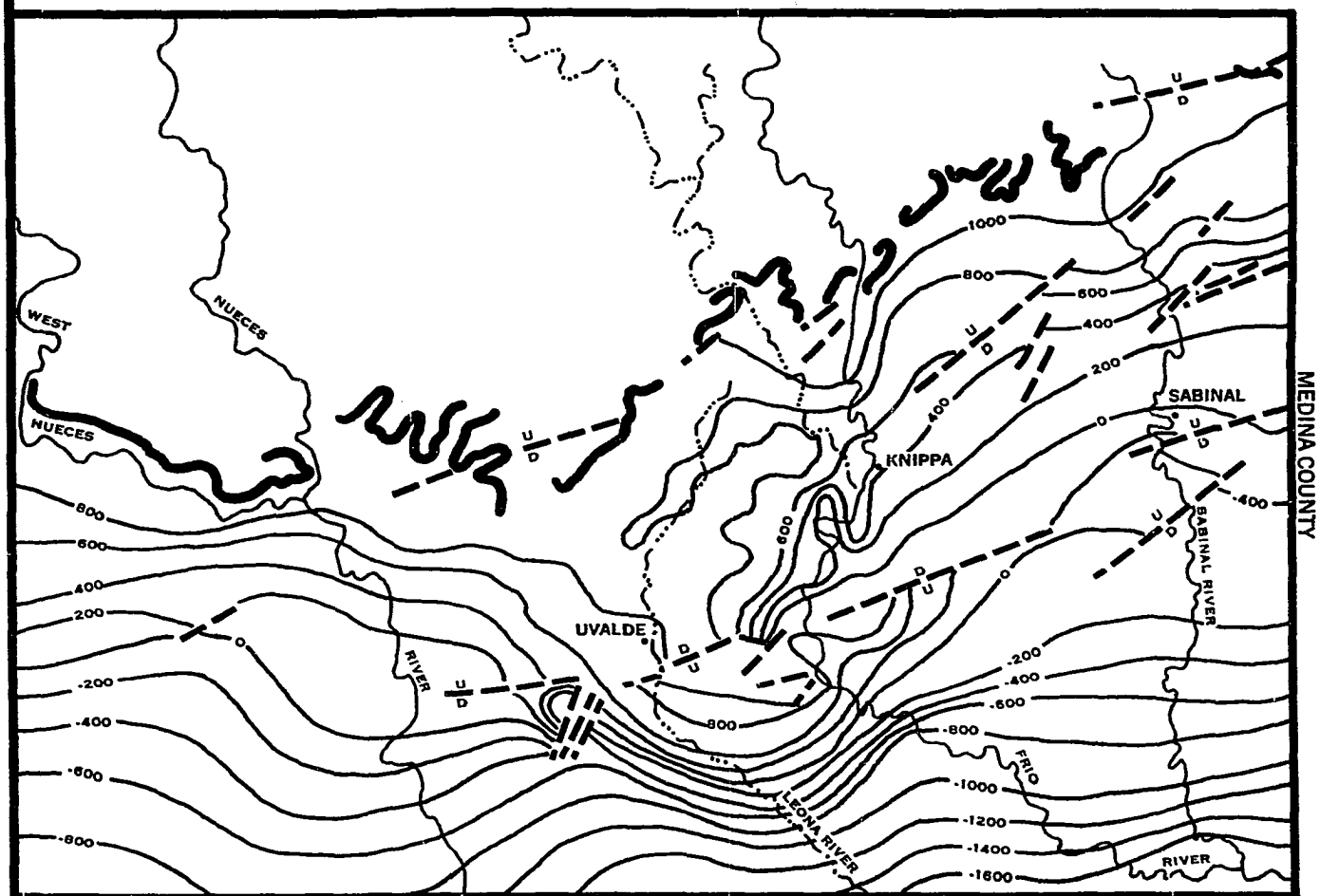
[8]William F. Guyton and Associates, Report on Ground-Water Conditions in Nueces River Conservation and Reclamation District (Austin: William F. Guyton and Associates, 1967). p. 23.

[9]U.S., Army Corps of Engineers, U.S. Army Engineer District, Forth Worth, and Edwards Underground Water District Co-operating, Survey Report on Edwards Underground Reservoir Guadalupe, San Antonio and Nueces Rivers and Tributaries, Texas, Vol. III (Fort Worth: U.S. Army Corps of Engineers, 1964). p. 21.

ALTITUDE OF THE TOP OF THE EDWARDS AND ASSOCIATED LIMESTONES, UVALDE COUNTY, TEXAS



BALCONES ESCARPMENT

600

LINE SHOWING APPROXIMATE ALTITUDE OF THE TOP OF THE EDWARDS AND ASSOCIATED LIMESTONES*

U
D

FAULT

*CONTOUR INTERVAL 200 FEET
DATUM IS MEAN SEA LEVEL

Fig. 7

AFTER: U.S. GEOLOGICAL SURVEY, WATER SUPPLY PAPER 1584

Natural recharge of the Edwards reservoir in Uvalde County, estimated at some 208,400 acre-feet per year, is very largely the result of water losses incurred by streams crossing the highly fractured and cavernous outcrop of the Edwards and associated limestones (Table 2). Of lesser importance is the precipitation which falls directly upon the outcrop area.[10] Wells tapping the Edwards aquifer usually yield large quantities of exceptionally high quality water.

In addition to the Carrizo and Edwards aquifers some ground water is drawn from the Leona formation by vegetable farmers in the Uvalde and Batesville sections of the Leona River valley. The formation, found throughout most of the Leona River valley in southern Uvalde and Zavala counties, generally is within 100 feet of the surface. Water, which enters the Leona formation via faults from the underlying Edwards and associated limestones, eventually reaches the surface as spring flow or through wells. Recharge of the Leona formation generally ceases when the water levels in Uvalde's city wells[11] fall below forty-two feet.[12]

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[10]U.S., Department of the Interior, Geological Survey, Geology and Ground-Water Resources of Uvalde County, Texas, by F. A. Welder and R. D. Reeves, Geological Survey Water-Supply Paper 1584, prepared in co-operation with the Texas Board of Water Engineers and the city of San Antonio (Washington, D.C.: Government Printing Office, 1964), p. 1.

[11]These municipal wells draw water from the Edwards aquifer.

[12]Personal interviews with Fred Mason, Rancher, Uvalde, Texas, October 10, 1968 and Grady Mahaffey, former Uvalde County Area Chairman, Edwards Underground Water District, Uvalde, Texas, October 10, 1968.

TABLE 2

ESTIMATED ANNUAL RECHARGE, IN THOUSANDS OF ACRE-FEET, TO THE EDWARDS AND ASSOCIATED LIMESTONES IN UVALDE AND EASTERN KINNEY COUNTIES, 1934-1967

Year	Nueces and West Nueces River Basins	Frio and Dry Frio River Basins	Sabinal River Basin	Total
1934	8.6	27.9	7.5	44.0
1935	411.3	192.3	56.6	660.2
1936	176.5	157.4	43.5	377.4
1937	28.8	75.7	21.5	126.0
1938	63.5	69.3	20.9	153.7
1939	227.0	49.5	17.0	293.5
1940	50.4	60.3	23.8	134.5
1941	89.9	151.8	50.6	292.3
1942	103.5	95.1	34.0	232.6
1943	36.5	42.3	11.1	89.9
1944	64.1	76.0	24.8	164.9
1945	47.3	71.1	30.8	149.2
1946	80.9	54.2	16.5	151.6
1947	72.4	77.7	16.7	166.8
1948	41.1	25.6	26.0	92.7
1949	166.0	86.1	31.5	283.6
1950	41.5	35.5	13.3	90.3
1951	18.3	28.4	7.3	54.0
1952	27.9	15.7	3.2	46.8
1953	21.4	15.1	3.2	39.7
1954	61.3	31.6	7.1	100.0
1955	128.0	22.1	.6	150.7
1956	15.6	4.2	1.6	21.4
1957	108.6	133.6	65.4	307.6
1958	266.7	300.0	223.8	790.5
1959	109.6	158.9	61.6	330.1
1960	88.7	128.1	64.9	281.7
1961	85.2	151.3	57.4	293.9
1962	47.4	46.6	4.3	98.3
1963	39.7	27.0	5.0	71.7
1964	126.1	55.1	16.3	197.5
1965	97.9	83.0	23.2	204.1
1966	169.2	134.0	37.7	340.9
1967	82.2	137.9	30.4	250.5
Total	3,203.1	2,820.4	1,059.1	7,082.6
Average	94.2	83.0	31.2	208.4

Source: Texas Water Development Board, Ground-Water Resources of the San Antonio Area, Texas, by Sergio Garza, Report 34, Table 3(Austin: Texas Water Development Board, 1966), p. 11, and personal correspondence with McDonald D. Weinert, Engineer and General Manager, Edwards Underground Water District, San Antonio, Texas, December 16, 1968.

Although hard, small concentrations of dissolved solids (roughly 350-550 ppm) and a low per cent sodium of 6 to 15 make the Leona water generally suitable for irrigation.[13]

Climate

The Winter Garden lies within the zone of transition between the humid subtropical (Köppen's Cfa) climates to the east and the steppe (Köppen's BSh) climates to the west. Seasonal variations in temperature and precipitation are largely due to the area's location between the warm, moist Gulf air masses and the relatively cooler and drier continental air masses. In general, the region has a semi-arid, continental type climate characterized by dry, short, mild winters and long, hot summers. Except for the occasional incursions of cold, dry polar air during the winter months, the Winter Garden area is dominated by warm, moist tropical air masses from the Gulf of Mexico.

Mean January temperatures range from 51.6°F at Uvalde to 53.6°F at Carrizo Springs, while July temperatures vary from Uvalde's 84.9°F to Carrizo Springs' 86.5°F (Tables 3 and 4). When cold waves, or "northers" as they are termed locally, move into the area, temperatures may fall as much as 50° in seven hours.[14] However, on the average, only

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[13]U.S., Department of the Interior, Winter Garden District Texas, 1948, p. 83.

[14]U.S., Department of Agriculture, Soil Survey Dimmit County, Texas, by Howard M. Smith and J. W. Huckabee, Jr., prepared in co-operation with the Texas Agricultural

TABLE 3

SUMMARY OF CLIMATIC DATA FOR UVALDE, TEXAS, 1928-1968[a]

Month	Temperature							Precipitation
	Means			Extremes				Mean
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year	Monthly
Jan.	64.6	38.5	51.6	92	1947[b]	7	1962	1.31
Feb.	69.1	42.5	55.8	95	1940	6	1951	1.39
March	77.0	48.5	62.8	104	1946	21	1965	1.13
April	84.3	57.3	70.8	104	1939	31	1939	2.00
May	89.1	64.9	77.0	104	1967[b]	44	1960	3.52
June	95.2	70.7	83.0	111	1942	55	1964	2.64
July	97.8	72.0	84.9	112	1939	60	1940	2.31
Aug.	98.3	71.5	84.9	110	1962	60	1967[b]	2.19
Sept.	92.6	67.2	79.9	106	1952[b]	36	1942	3.07
Oct.	84.9	57.8	71.4	102	1956[b]	30	1955	2.31
Nov.	73.4	46.5	60.0	94	1949[b]	20	1938	.96
Dec.	67.8	39.7	53.8	93	1955	18	1957	1.26
Year	82.8	56.4	69.6	112	July 1939	6	Feb. 1951	24.09

[a]Source: Climatological data based on records of Uvalde weather observation station as supplied by the Office of the Texas State Climatologist. See Appendix II for monthly and annual temperature and precipitation data for 1928-1968 period.

[b]Also on earlier dates.

TABLE 4

SUMMARY OF CLIMATIC DATA FOR CARRIZO SPRINGS, TEXAS, 1928-1968[a]

Month	Temperature							Precipitation
	Means			Extremes				Mean
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year	Monthly
Jan.	65.5	41.6	53.6	96	1943	16	1963	.94
Feb.	70.3	45.6	58.0	98	1940	13	1951	1.05
March	77.7	51.4	64.6	107	1956[b]	24	1948	.85
April	85.9	59.8	72.9	103	1963[b]	34	1945	1.89
May	90.8	66.9	78.9	108	1967	46	1956	3.33
June	96.6	72.4	84.5	114	1942	56	1955	2.32
July	99.1	73.9	86.5	112	1960	65	1940	1.55
Aug.	99.3	73.7	86.5	109	1953	62	1946	2.12
Sept.	93.6	69.5	81.6	107	1959	44	1942	3.13
Oct.	85.8	60.6	73.2	101	1951	36	1952	2.06
Nov.	74.4	49.7	62.1	97	1949	25	1959[b]	.87
Dec.	67.2	43.1	55.2	98	1951	18	1953	1.12
Year	83.8	59.0	71.4	114	June 1942	13	Feb. 1951	21.23

[a]Source: Climatological data based on records of Carrizo Springs weather observation station as supplied by the Office of the Texas State Climatologist. See Appendix II for monthly and annual temperature and precipitation data for 1928-1968 period.

[b]Also on earlier dates.

seventeen days a year record temperatures below 32°F. The length of the growing season varies from 290 days at Carrizo Springs to 256 days at Uvalde. The mean date of the last freeze in the spring ranges from February 19 at Carrizo Springs to March 8 at Uvalde. The mean date of the first fall freeze varies from November 19 at Uvalde to December 6 at Carrizo Springs.[15]

Summers are hot with maximum temperatures frequently rising into the high 90's. The temperatures are, however, somewhat ameliorated by low afternoon and early evening humidities and cooling Gulf breezes.

> The fall months of October and November, and the spring months of March and April are transitional, offering some variety in the weather pattern, as modified polar air masses move in and out of the area. Daytime temperatures are mild but usually are not hot, and nights are cool. These are the most pleasant months of the year.[16]

Between November and April the region averages about one polar front every five to six days, but due to the southerly

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Experiment Station, Series 1938, No. 4 (Washington, D.C.: Government Printing Office, 1943), p. 13.

[15]U.S., Department of Commerce, Environmental Science Services Administration, Climatological Summary for Carrizo Springs, Texas for the Period 1936-1965, by Robert Orton, prepared in co-operation with the Dimmit County Chamber of Commerce (Austin, 1966), and personal correspondence with Robert Orton, Texas State Climatologist, Austin, Texas, November 28, 1968.

[16]Robert B. Orton, The Climate of Texas and the Adjacent Gulf Waters, U.S., Department of Commerce, Weather Bureau (Washington, D.C.: Government Printing Office, 1964), p. 6.

location of the Winter Garden the strength of these polar air masses is greatly mollified.[17] Temperatures below freezing are the exception rather than the rule. Many instances of freezing or damaging temperatures are actually the result of radiational cooling rather than invasion by cold air masses. Except for these brief periods of cold weather with their concomitant drizzle and light rains, winters are characterized by warm pleasant days and cool nights.

Precipitation, which tends to increase toward the north and east, varies from an annual mean of 21.23 inches at Carrizo Springs to 24.09 inches at Uvalde. Precipitation differences are related to the uplift of warm moisture laden air masses over the Balcones Escarpment. Such movements decrease atmospheric stability and result in a greater frequency of convective showers and thunderstorms.

Sixty-seven per cent of the area's precipitation occurs from May to October and is largely the result of convectional activity. Late spring and summer showers and thunderstorms, occurring most frequently during the afternoon and early evening hours, are intense but of short duration. Spring hailstorms occasionally cause widespread crop losses. Conventional activity, tropical disturbances, and cold fronts during the fall months combine to produce

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[17] Ibid., p. 15.

the area's secondary precipitation peak in September.[18] The mean annual relative humidity is 65 per cent. This figure is quite misleading, however, as the average annual relative humidity varies from 80 per cent at 6:00 A.M. to 45 per cent at 6:00 P.M.[19]

Evaporation is quite high in the semi-arid Winter Garden region. Average annual evaporation at the Texas A&M University Rio Grande Plains Research-Demonstration Station at Winter Haven for the 1931-1967 period was 66.54 inches. Average monthly evaporation varied from 9.44 inches in July to 2.24 inches in December.[20] Low precipitation and high evaporation rates combined with a dry winter season necessitate the use of irrigation for the production of all winter vegetable crops.

Soils[21]

The Winter Garden region is situated on the boundary between the Reddish Brown soils to the west and the Reddish

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[18]Texas Water Development Board, The Climate and Physiography of Texas, by John T. Carr, Jr., Report 53 (Austin: Texas Water Development Board, 1967), p. 11.

[19]U.S., Department of Commerce, Carrizo Springs, Texas, 1936-1965.

[20]Texas A&M University, Agricultural Extension Service, Rio Grande Plains Research-Demonstration Station, "Summary of Weather Records, 1931-1967," by John D. Carpenter, and Dora T. Miller (Crystal City, n.d.). (Mimeographed.)

[21]This section compiled from data presented in U.S., Department of Agriculture, Soil Survey Dimmit County, Texas, pp. 25-44, U.S., Department of Agriculture, Soil Survey

Chestnut soils to the east. These pedocalic soils, having developed over unconsolidated and partially decomposed beds of sand, sandstone, clay, and shale, and under semi-arid climatic conditions, are generally deficient in humus and alkaline in reaction. Calcium carbonate (caliche) hardpans are found from several inches to several feet below most soils. Area soils, most of which are deficient in nitrogen and phosphorus, are generally fertile. Given suitable topography and adequate water supplies, vegetable production is possible throughout much of the Winter Garden region.

Based upon their texture, area soils may be divided into five broad soils groups (Figure 8). These are the Deep Upland soils, the Bottomland soils, the Deep Clay and Saline Clay soils, the Sandy soils, and the Gravelly Ridges soils.[22]

The old alluvial clay and clay loam soils of the Deep Upland Soil group include the Uvalde, Knippa, and Montell series. With proper management soils of this group produce excellent vegetable yields.

Zavala County, Texas, by Howard M. Smith and others, prepared in co-operation with the Texas Agricultural Experiment Station, Series 1934, No. 21 (Washington, D.C.: Government Printing Office, 1940), pp. 13-30; Generalized Soil Maps of Uvalde, Zavala, Dimmit and Frio Counties, Texas, prepared jointly by U.S. Department of Agriculture, Soil Conservation Service, Texas Agricultural Experiment Station, and Texas Agricultural Extension Service, 1967; and acquired during personal interview with Jack Stevens, Soil Scientist, U.S. Department of Agriculture, Soil Conservation Service, Area 23, Uvalde, Texas, September 19, 1968.

[22]Individual soil group composition and nomenclature suggested in letter from Jack Stevens, November 21, 1968.

GENERALIZED SOIL MAP OF THE WINTER GARDEN

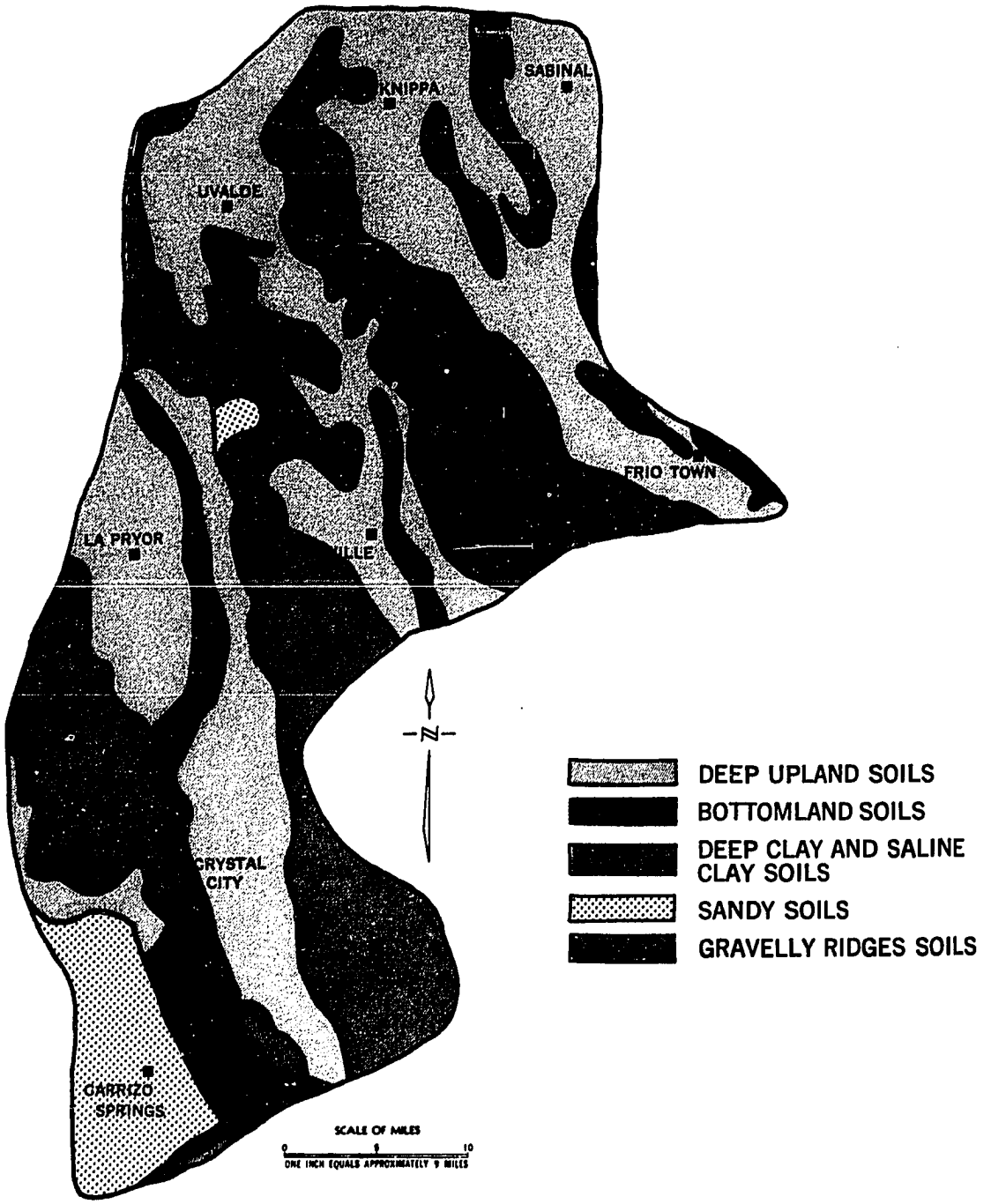

Fig. 8

SOURCE: U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE.

Soils of the Uvalde series are generally found on the nearly level alluvial fans which flank the Edwards Plateau and on the higher terraces of streams which drain the Edwards Plateau region. These moderately permeable, dark grayish-brown to grayish-brown, friable, calcareous clay loams and loams vary in depth from ten to fifteen inches.

Soils of the Knippa series are found on nearly level outwash plains adjacent to the Edwards Plateau. These moderately slowly permeable, strongly calcareous, brown to reddish-brown, crumbly clay soils are from fifteen to thirty-four inches in depth.

The dark gray to dark grayish-brown, slowly permeable clays of the Montell series are strongly calcareous. These deep (twelve to twenty inches) soils are found throughout the area on level to nearly level topography.

The deep, dark colored, silty clay loams and loams of the Bottomland Soil group include the Frio and Blanco series. The Bottomland Soil group, the Deep Upland Soil group, and the Webb and Crystal series of the Sandy Soil group represent the Winter Garden area's most highly productive soils.

The alluvial soils of the Frio series are found along the nearly level floodplains of many of the region's larger streams and their tributaries. These calcareous, very dark gray to dark grayish-brown silty loams are moderately well drained and vary in depth from twelve to forty inches. The

Blanco soils, except for their lighter color (light brownish-gray), are identical to the soils of the Frio series.

Except for scattered areas of Montell soils, the Deep Clay and Saline Clay Soil group is composed of the Maverick and Catarina series. The soils of this group have developed over calcareous clays and shales. Soil salinity, both natural and induced (by improper irrigation) is a problem throughout much of the area. Soil salinity and excessive slopes (one to twelve per cent) make the soils of this group generally undesirable for vegetable production. The vast majority of the area is range land.

The moderately deep (eight to twelve inches), dark yellowish-brown to grayish-brown calcareous clays and clay loams of the Maverick series are found on undulating to rolling slopes and lower stream divides. Runoff is rapid, and in some areas severe erosion is evident. Internal drainage is slow.

The deep (fifteen to twenty-five inches) grayish-brown to pale olive calcareous clays of the Catarina series are most generally found on gently undulating slopes (two to four per cent). These soils are extremely saline, frequently possessing up to fifteen per cent exchangeable sodium in the upper thirty inches of the solum. Internal drainage is slow.

The Sandy Soil group would include the Crystal, Webb, Leming, and Miguel series. The soils associated with this group, largely limited to the undulating topography of

the southwest portion of the Winter Garden, have developed over calcareous and non-calcareous sandstone formations.

In general, these soils are well drained; however, firm clay subsoils prevent the deep penetration of water and cause high rates of surface runoff. Wind and water erosion often become major problems once the land has been cleared for cultivation.

The moderately deep (ten to fifteen inches), friable soils of the Crystal series are generally found on the upper slopes. These brown to grayish-brown, slightly alkaline fine sandy loams are noted for their citrus production.

The soils of the Webb series are found below the Crystal series on nearly level to undulating terrain. These friable, reddish-brown to brown, non-calcareous, fine sandy loams vary in depth from eight to twelve inches.

The light gray to grayish-brown, non-calcareous loamy sands of the Leming series are found on nearly level to gently sloping surfaces. These deep (thirteen to thirty inches), coarse textured soils are likewise noted for their citrus production.

The slightly acidic to neutral loamy fine sands of the Miguel series are found on nearly level uplands and/or high stream terraces. These dark grayish-brown to grayish-brown soils vary from eight to eighteen inches in depth.

Soils of the Zapata, Quemado, and Pinal series comprise the Gravelly Ridges Soil group. These thin (three to twelve inches), brown to light grayish-brown gravelly loams

have developed over more resistant calcareous sandstone formations and outwash materials from the Edwards Plateau. Numerous caliche and chert gravel fragments are to be found within the soil. All of the soils are underlain by a hard caliche or caliche cemented gravel layer a few inches to several feet in thickness.

As indicated by their name, these soils occupy the higher slopes, ridges, and divides in the Winter Garden region. Due to their gravelly nature, low water holding capacity, and location on gently sloping to rolling surfaces, the soils of the Gravelly Ridges Soil group have no value for vegetable production. Most of the region underlain by soils of this group is in range land.

Vegetation[23]

Brushland interspersed with intermediately spaced short grasses is the natural vegetation of the Winter Garden region. The more predominant species of brush would include mesquite (Prosopis chilensis), blackbrush (Acacia amentacea), guajillo (Acacia berlandieri), huisache (Acacia farnesiana), and catclaw (Acacia spp). Pecan (Carya pecan), hackberry (Celtis spp), and live oak (Quercus virginiana), are found in many of the better watered areas. Red grama (Bouteloua

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[23]Data in this section compiled from U.S., Department of Agriculture, Soil Survey Dimmit County, Texas, pp. 5-11; U.S., Department of Agriculture, Soil Survey Zavala County, Texas, pp. 2-3; and personal interview with Jack Stevens, September 19, 1968.

trifida), curly mesquite (Hilaria belangeri), and three-awn (Aristida spp), are the dominant grasses. Various species of cacti, principally tasajillo (Opuntia leptocaulis), and prickly pear (Opuntia lindheimeri), and occasionally the salt-tolerant saladillo (Varilla texana) plant, are found in areas of heavier soils.

With regard to the physical environment, the Texas Winter Garden is well suited to the production of cool season vegetable crops. Mild temperatures prevail during most of the winter season. Fertile soils suitable for irrigation are found over much of southern Uvalde County and along the Leona and Nueces rivers in Zavala and Dimmit counties. Adequate surface and/or ground water supplies are available in most cultivatable areas.

CHAPTER III

DEVELOPMENT OF THE WINTER GARDEN VEGETABLE INDUSTRY

Early Settlement

Prior to the establishment of the Presidio de San Juan Bautista de Rio Grande by Franciscan friars in 1669, the Spanish accorded the Winter Garden sector of southwest Texas little consideration. San Juan Bautista, located at a shallow crossing on the Rio Grande approximately thirty miles south of the present site of Eagle Pass, was a major stop on the route of the famous El Camino Real that extended from Mexico City northeastward into East Texas.[1] El Camino Real served as the major link between the Spanish settlements along the Rio Grande and San Antonio. Although soldiers from San Juan Bautista ranged as far east as the Nueces River, this seemingly worthless land, with its numerous springs and

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[1]U.S., Department of Agriculture, Bureau of Plant Industry, Soil Survey Maverick County, Texas, by Howard M. Smith, R. M. Marshall and I. C. Mowery, prepared in cooperation with the Texas Agricultural Experiment Station, Series 1936, No. 10 (Washington, D.C.: Government Printing Office, 1942), p. 7.

creeks, was left largely in the hands of roving bands of Comanche, Lipan, and Apache Indians.

Texas gained its independence from Mexico in 1836, but the boundary between Texas and Mexico was not finally settled until 1848 with the signing of the Treaty of Guadalupe Hidalgo. This treaty, which ended the Mexican War, established the Rio Grande as the boundary between the United States and Mexico. The Indian threat, however, retarded the settlement of the Winter Garden area until the mid-nineteenth century when the United States government undertook the construction of a series of forts between San Antonio and Del Rio. In addition to this northern string of fortifications, the government established Fort Duncan on the Rio Grande about four miles south of the present city of Eagle Pass. With the removal of the Indian threat and the settlement of the United States-Mexican boundary problem, the area took on a more inviting appearance. Ranches were established at Cometa (1872), on the Leona River near the present site of Batesville (1875), and at Loma Vista (1881). During this period herds of longhorn cattle, sheep, and horses grazed the vast open range.[2]

Ranching operations were radically changed during the 1880's with the introduction of barbed wire and the windmill. The open range disappeared as ranchers, both

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[2]U.S., Department of Agriculture, Soil Survey Zavala County, Texas, p. 4.

large and small, fenced their lands. Longhorn cattle gradually disappeared as improved breeds were introduced into the area. The annual cattle drives up the Chisholm Trail to Dodge City and Abilene ceased.[3] The windmill created a more dependable water supply. With water available, many ranchers turned to growing various feed crops to supplement the area's natural grasses. By 1890, cropland in the Winter Garden region was largely devoted to the production of cotton, corn, grain sorghums, grass and hay crops, and small grains.[4]

Inadequate water supplies posed one of the biggest barriers to agricultural development. Water from shallow wells was frequently of inferior quality and suitable only for stock and/or domestic purposes. Although dams had been constructed on the Leona River south of Uvalde and north of Batesville, surface supplies in this semi-arid region were undependable. The water problem appeared solved in 1884 when the first artesian well[5] was brought in at Carrizo Springs.[6]

Subsequent borings convinced many persons that much

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[3]Paul S. Taylor, "Historical Note on Dimmit County, Texas," Southwestern Historical Quarterly, XXXIV (October, 1930), p. 84.

[4]Personal interview with Ben Stone, retired farmer-rancher, Carrizo Springs, Texas, October 10, 1968.

[5]The term artesian well as used in this study refers to a well whose water level rises above the surrounding land surface.

[6]U.S., Department of the Interior, Winter Garden District Texas, 1948, p. 21.

of the area was underlain by an extensive underground lake; however, large scale development of the area's water resources was not begun until the turn of the century with the introduction of high profit vegetable crops.

The Period of Expansion, 1900-1930

During the late 1800's and early 1900's, the Bermuda onion was introduced into South Texas. Earlier efforts to grow the vegetable in California, Alabama, Florida, Mississippi, and Louisiana had been unsuccessful. Although first planted by George Copp in 1896 in the vicinity of Cotulla, commercial onion production did not actually get under way until 1898 when T. C. Nye, using seed imported from the Canary Islands, grew a small acreage of the vegetable on his farm near Cotulla. The crop was subsequently shipped to Milwaukee where it attracted the attention of a local importer, a Major Seefeldt, who, recognizing the agricultural potential of South Texas, moved to the Cotulla area and provided the impetus for what was to become one of South Texas' most lucrative agricultural ventures.[7]

Although initially centered around Cotulla, onion growing rapidly spread to other parts of South Texas. Profits realized on the crop were phenomenal. It was claimed that Nye, who later moved to the Laredo area, frequently netted

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[7]Taylor, "Historical Note," p. 34.

over $1,000 per acre on his onion crop. To established farmers, long accustomed to profits of ten to fifteen dollars per acre from cotton, this new crop appeared to be a god-send.[8] Land speculators and men of vision saw that all the ingredients necessary for a successful irrigated farming area were present. The region was becoming known for its fertile soil, mild climate, and abundance of pure water. Add to this a proven crop with a potential for enormous profits, and the stage was set for the beginning of a series of some of the greatest land colonization schemes in South Texas history.

One of the earliest colonization attempts began in 1901 when Col. J. S. Taylor purchased 3,500 acres of land along the Nueces River in Dimmit County. Col. Taylor built a dam across the Nueces (Plate 5), platted his land, and offered tracts for sale to the public.[9] Taylor's relatively successful venture, although not so well advertised as some of the later land development schemes, marked the beginning of a period of economic prosperity in the Winter Garden region that was to continue through the 1920's.

Early settlers were continually plagued with the problem of getting their crops to market. During the first decade of the twentieth century, crops harvested in the Carrizo Springs-Nueces River area were hauled overland by

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[8]H. L. Preston, "The Bitter Onion War," Harper's Weekly, June 11, 1910, p. 34.

[9]Crystal Sasse Williams, "A History of Dimmit County, Texas" (Unpublished M.A. thesis, Sul Ross College, 1959), p. 82.

Plate 5--A portion of the Bermuda dam and its spillway. (The original dam, constructed of rocks and logs, has since been reinforced and concrete plated.)

Plate 6--Wagons loaded with onions in preparation for the trip to Cotulla (near Asherton c. 1900). (Photograph courtesy of Granger Anderson.)

wagon to points on the International & Great Northern Railroad which extended from San Antonio southwest through Cotulla to Laredo (Plate 6). Travel was slow, the sun hot, and frequently much of the produce was unsalable by the time it reached the rail sidings at Cotulla.[10]

The need for transportation was partially fulfilled with the coming of the railroads. Once rail construction began, towns sprang up almost overnight, and there was a rapid influx of people into the area. The earliest railroad development began in the north during the 1880's with the construction of the Galveston, Harrisburg, & San Antonio between San Antonio and Del Rio. A spur was completed from Spofford Junction of the Galveston, Harrisburg, & San Antonio south to Eagle Pass in 1883. Today these tracks are a part of the Southern Pacific Railroad system.

In 1909 the Crystal City & Uvalde Railroad was completed between Uvalde and the new town of Crystal City. Subsequent branches of this line connected Crystal City with Carrizo Springs (1911) and with Gardendale on the International & Great Northern Railroad (1912). Today both the old San Antonio, Uvalde, & Gulf and the International & Great Northern Railroad are a part of the Missouri Pacific system. The year 1909 also saw the completion of the Asherton & Gulf Railroad between Asherton and Artesia Wells on

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[10]Personal interview with Grover C. Jackson, retired Attorney at Law, Crystal City, Texas, October 3, 1968.

the International & Great Northern Railroad.[11] These tracks, the lifeline of Catarina and Asherton, were abandoned during the late 1950's.

With access to outside markets assured, settlement of the area proceeded at an ever-increasing rate. Ranchers, sensing tremendous profits, began breaking up their holdings into smaller tracts and selling them to eager northern colonists. The Seven D, Cross S, and Catarina ranches in Zavala and Dimmit counties were among some of the larger ranches so divided.

The years between 1900 and 1910 saw the establishment of Bermuda, Asherton, Crystal City, La Pryor, and Big Wells. Between 1910 and 1920 the settlements of Winter Haven, Valley Wells, Dentonio, Brundage, and Palm were founded. During the 1920's the most notable farming development was that centered around Catarina.

The name "Winter Garden", today generally associated with that portion of the Gulf Coastal Plain lying west of a line from San Antonio to Laredo, was initially confined to a much smaller area of southwest Texas. In 1908 Major Alexander Boynton established the Winter Garden Ranch. Land developers and local citizens later used the name of this 7,000 acre farming development, located between the Nueces River and

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[11] U.S., Department of Agriculture, Bureau of Soils, Reconnoissance Soil Survey of Southwest Texas, by Arthur E. Kocher and party, Advance Sheets-Field Operations of the Bureau of Soils, 1911 (Washington: D.C.: Government Printing Office, 1912), p. 14.

Espantosa Lake in Dimmit County, in their efforts to promote the development of adjacent areas.[12]

About 1919 citizens from Asherton, Big Wells, Crystal City, and Carrizo Springs formed the Winter Garden Chamber of Commerce. The region initially designated as the Winter Garden by this group included these four towns and their adjacent areas.[13] Ultimately the Winter Garden Chamber of Commerce expanded its original boundaries to include all of Dimmit, Zavala, and Maverick counties, and the fourth precinct of Frio County (Figure 9).[14] Vigorous action by this group, as well as by local chambers of commerce and area land developers, made the name "Winter Garden" synonymous with prosperity. Literature published by these groups describing the area's mild, sunny climate, fertile soils, and flowing water wells, promised prospective settlers an almost Eden-like existence.[15]

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[12]Grover C. Jackson, personal interview.

[13]Mid-Century Edition, The Zavala County Sentinel, November 1, 1957, pp. 1 and 4; and personal interviews with F. W. Pulliam, former Manager, Zavala-Dimmit Counties Water Improvement District No. 1, Crystal City, Texas, June 3, 1968, and B. E. Pickett, M.D., Carrizo Springs, Texas, February 6, 1969.

[14]Catarina Chamber of Commerce, Catarina in the Heart of the Winter Garden District of Southwest Texas (Catarina, Texas: Catarina Chamber of Commerce, n.d.), p. 12.

[15]For example see Ibid., and The Winter Garden Ranch, Originally Part of the Famous "Cross S" Dimmit County, Texas (San Antonio: San Antonio Printing Company, 1910 [?]).

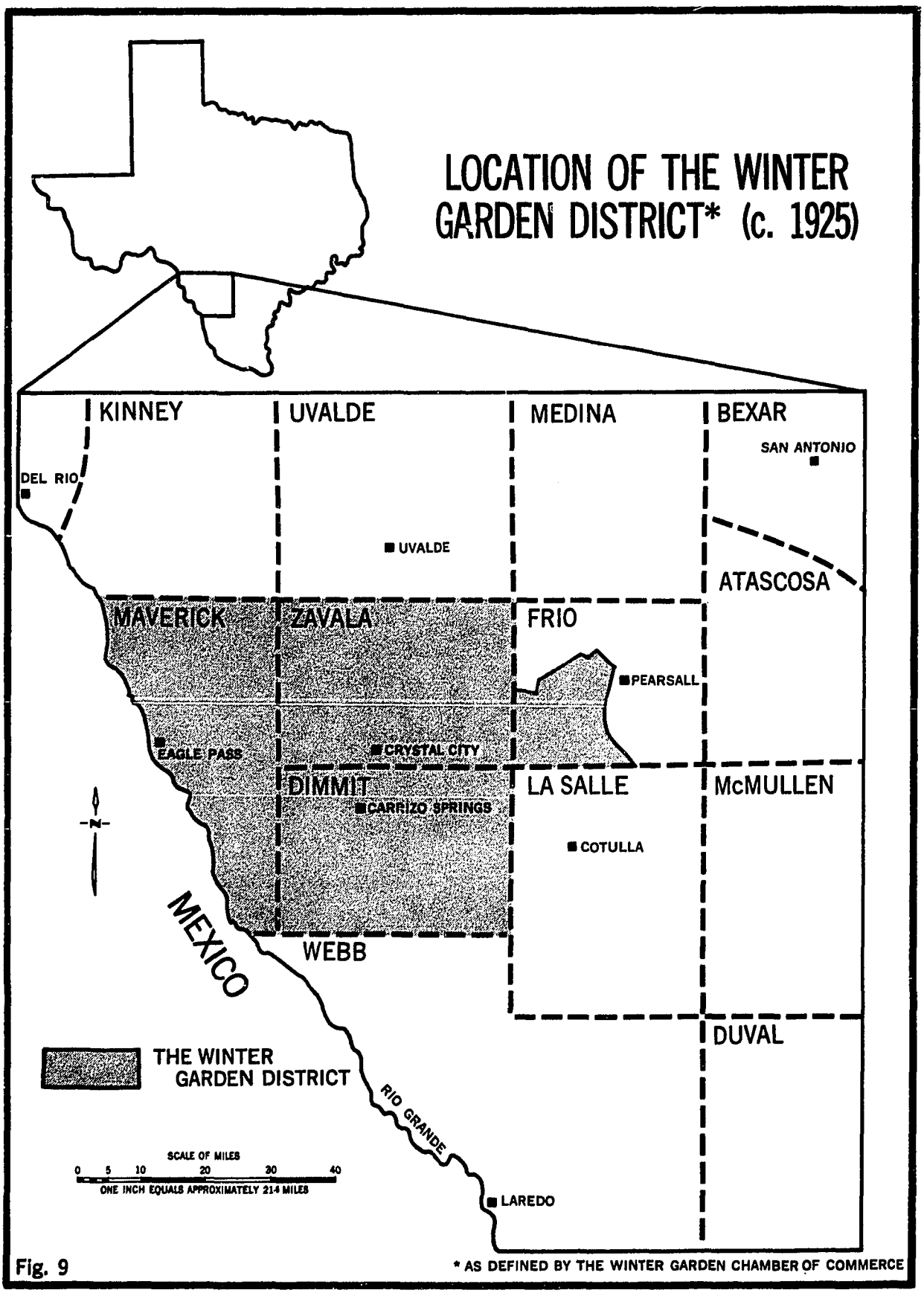

Fig. 9

* AS DEFINED BY THE WINTER GARDEN CHAMBER OF COMMERCE

During the early years of the twentieth century, the area's population grew rapidly as people came from all over the United States to make their homes and fortunes in the Winter Garden. Although most of the new colonists were Americans, the greatest increase in population occurred among those with Spanish surnames (Table 5). Numerous job opportunities in an expanding agricultural economy, political disturbances in Mexico, and the almost total lack of immigration control were all contributing factors in the movement of Mexican citizens across the Rio Grande. These Mexican nationals formed the area's laboring class. Labor was abundant and wages, ranging from fifty cents to a dollar per day, although extremely low by United States standards, were higher than could be expected in Mexico for similar work.[16]

Prior to the economic depression of the 1930's, Zavala and Dimmit counties were the major winter vegetable producing counties in southwest Texas (Table 6). During this period Dimmit County, although noted for its onion and spinach production, was a substantial producer of cabbage and lettuce (Appendix III). Zavala County produced sizable quantities of onions, but was most famous for its spinach. Spinach became such a popular and profitable vegetable crop that Crystal City in 1937 erected a statue in honor of Popeye and proclaimed itself "the Spinach Capital of the World".

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[16]Grover C. Jackson, personal interview.

TABLE 5

POPULATION GROWTH OF WINTER GARDEN AREA COUNTIES, 1860-1960[a]

County	Dimmit	Frio	La Salle	Maverick	Uvalde	Zavala
1860	--	42	--	726	776	26
1870	109	309	69	2,951	851	133
1880	665	2,130	789	2,967	2,541	410
1890	1,049	3,112	2,139	3,698	3,804	1,097
1900	1,106	4,200	2,303	4,066	4,647	792
1910	3,460	8,895	4,747	5,151	11,233	1,889
1920	5,296	9,296	4,821	7,418	10,769	3,108
1930[b]	8,828	9,411	8,228	6,120	12,945	10,349
Native White	2,510	3,386	2,590	1,269	7,604	2,617
Foreign Born White	75	49	61	112	89	52
Negro	18	104	76	18	222	19
Other	6,225	5,872	5,501	4,721	5,030	7,661
1940	8,542	9,207	8,003	10,071	13,246	11,603
1950	10,654	10,357	7,485	12,292	16,015	11,201
1960	10,095	10,112	5,972	14,508	16,814	12,696

[a]Source: U.S. Department of the Interior, Census Office, Report on Population of the United States at the Eleventh Census: 1890, Part 1; and Twelfth Census of the United States, 1900: Population, Part 1; and U.S. Department of Commerce, Bureau of the Census, Thirteenth Census of the United States: 1910, Vol. III, Population; Fifteenth Census of the United States: 1930, Vol. III, Population; Sixteenth Census of the United States, 1940: Population, Vol. II, Characteristics of the Population, pt. 6, Pennsylvania-Texas; and Eighteenth Decennial Census of the United States Census of Population: 1960, Vol. I, Characteristics of the Population, pt. 45, Texas.

[b]Returns not available.

[c]Except for the Census of 1930 Mexicans were classed as "white". In the 1930 Census Mexicans are classed as "other".

TABLE 6

INDIVIDUAL VEGETABLE CROP STATISTICS, BY COUNTY, 1899-1944[a]

		Dimmit	Frio	La Salle	Maverick	Uvalde	Zavala
Vegetable Acreage							
Onions	1899	[b]	[b]	12	0	0	0
Misc. vegetables	1899	34	74	14	4	15	17
All Vegetables Except Irish and Sweet Potatoes (in acres)	1909	235	330	655	79	23	31
Value all vegetable crops ($)	1909	39,399	33,917	128,399	13,990	1,708	7,458
Vegetables Harvested for Sale (except Irish and sweet potatoes)							
Value ($)	1944	1,434,817	633,193	109,529	1,489,808	139,231	1,031,194
	1939	304,461	32,566	32,399	753,322	3,472	607,343
	1929	655,053	61,580	73,677	227,946	27,801	1,150,833
	1919	[c]	[c]	[c]	[c]	[c]	[c]
Acres	1944	9,867	11,571	2,191	13,351	1,467	14,378
	1939	3,751	2,515	2,240	6,277	45	8,295
	1929	6,541	2,379	1,572	1,368	385	11,132
	1919	2,255	762	504	67	[b]	532
Individual crop acreages							
Beets	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	32	[c]	[c]	6	[c]	[b]
	1929	8	0	0	0	0	21
	1919	0	0	0	0	0	0
Broccoli	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	0	0	0	[c]	0	0
	1929	0	0	0	0	0	0
	1919	[c]	[c]	[c]	[c]	[c]	[c]
Cabbage	1944	0	30	2	16	0	[b]
	1939	29	7	38	16	0	29
	1929	51	0	10	8	[b]	41
	1919	173	[b]	[b]	3	0	17
Carrots	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	398	[c]	[c]	13	[c]	136
	1929	39	5	0	40	0	35
	1919	0	0	6	0	0	0
Cauliflower	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	11	28	0	92	0	0
	1929	[c]	[c]	[c]	[c]	[c]	[c]
	1919	[c]	[c]	[c]	[c]	[c]	[c]
Lettuce and Romaine	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	0	0	0	[c]	[c]	[b]
	1929	[b]	2	0	1	0	5
	1919	84	1	12	0	0	[b]
Onions	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	1,082	[c]	168	217	0	430
	1929	3,157	133	443	598	19	2,251
	1919	1,659	353	183	52	0	474
Spinach	1944	[c]	[c]	[c]	[c]	[c]	[c]
	1939	644	107	405	5,085	[c]	7,304
	1929	1,606	93	750	626	312	8,226
	1919	177	0	26	0	0	23

[a]Source: U.S. Department of the Interior, Census Office, Twelfth Census of the United States, 1900: Agriculture, Part II, Crops and Irrigation; and U.S. Department of Commerce, Bureau of the Census, Thirteenth Census of the United States: 1910, Vol. VII, Agriculture-Reports by States, Nebraska-Wyoming; Fourteenth Census of the United States: 1920, State Compendium-Texas; Fifteenth Census of the United States, 1930, Agriculture, Vol. II, State Reports, pt. 2, the Southern States; Sixteenth Census of the United States, 1940: Agriculture, Vol. I, State Reports, pt. 5, Statistics for Counties; and U.S. Census of Agriculture: 1945, Vol. I, pt. 26, Texas.

[b]Less than one (1) acre.

[c]Not available.

The economic boom created by the high profit vegetable crops was not limited to the Dimmit-Zavala County area. In La Salle County, Cotulla, Encinal and, to a lesser degree, Fowlerton and Los Angeles were notable producers. In Frio County vegetable production flourished around Pearsall, Derby, and Dilley--all stops on the International & Great Northern Railroad. Although never as productive as Dimmit or Zavala County, the Eagle Pass and later the Quemado Valley areas of Maverick County, utilizing water from the Rio Grande, were major winter vegetable producers during the early years of the twentieth century.

Vegetable farming became a prominent activity around the town of Uvalde and along the Leona River south and east of the city. There was, however, little external movement of vegetables from Uvalde County as most of the produce was consumed locally. Railcar shipments of vegetables from the county prior to World War II reflect for the most part produce grown on a 900 acre spinach farm south of Uvalde on the Leona River (c. 1928) and a 3,000 acre farming operation near Batesville (c. 1936).[17]

The vast majority of the vegetable crops moved out of the area by rail as shipments tended toward the larger more distant cities of the Mid-West and the Northeast.

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[17]Personal interview with George C. Jolley, retired vegetable farmer-farm implements dealer, Uvalde, Texas, September 29, 1968.

Although truck transportation was available in the area during the 1920's and 1930's, the lack of an adequate road system, combined with the relatively low prices paid at the short haul market terminals, tended to minimize this form of transportation.[18]

During the boom era (1905-1932) many vegetable farmers experienced prosperity. Many farming ventures were, however, unsuccessful. Numerous factors account for these failures, and among the more prominent was the difficulty of profitably marketing the crop. During this period California and the Lower Rio Grande Valley provided the main source of competition for the Winter Garden vegetable producers. In addition, the area was forced to compete with Spain and Egypt for the eastern seaboard onion market, and with Virginia and South Carolina for the early spinach market.[19]

Prior to the Depression several vegetable growers associations were formed, both locally and regionally, in an attempt to gain some measure of price stability. All were unsuccessful. Poor management and the lack of co-operation among growers were important contributing factors to the failure of these early co-operative ventures. Growers

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[18]Personal interview with A. F. Childress, retired owner, C&M Produce Company, Uvalde, Texas, September 26, 1968.

[19]Southwestern Bell Telephone Company, General Commercial Engineering Department, Economic Survey of Texas (St. Louis: Southwestern Bell Telephone Company, 1928), p. 152.

contended that the commission merchants and the Retail Grocers Association were responsible for most of their marketing problems.[20]

By 1920 declining water levels in wells, vegetable diseases, and an alkali problem on the area's heavier clay soils had contributed in large part to the decline of Asherton as a major vegetable producer. Dentonio never found an adequate water supply. The Depression brought bankruptcy to most of Catarina's settlers before the town really had a chance to become firmly established (Plates 7 and 8).[21]

In general, the failure of many individual farmers and settlements was due to agricultural inexperience and/or lack of capital. Many of the farmers came from the Great Plains or from the eastern United States and were not familiar with irrigation farming and its associated problems. A number of the early vegetable growers were not even farmers by background. The first few years were naturally quite difficult. Large debts were incurred due to the expenses involved in drilling deep water wells, in clearing land for cultivation, and in establishing profitable marketing ties. Frosts, untimely rains, and the lack of experience in growing the highly sensitive vegetable crops caused numerous crop failures. Many settlers had paid such high prices for land

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[20]F. W. Pulliam, personal interview.

[21]Personal interview with Granger Anderson, agent, New York Life Insurance Company, Crystal City, Texas, October 10, 1968.

Plate 7--Catarina street scene, 1968. Palm trees, a few of which may still be seen, once lined the town's main street.

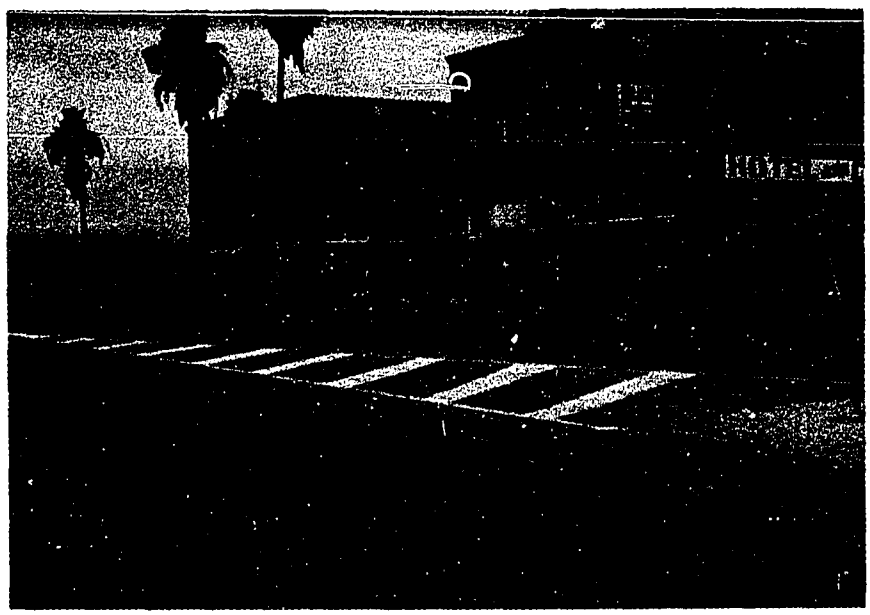

Plate 8--This hotel, built by Catarina land developers, was initially used to house prospective buyers. Today only the hotel's cafe is operative.

that mortgage payments prevented them from ever getting it into production.

The Period Since 1930

The Economic Depression of the 1930's

Due to the low farm prices of the Depression years, numerous individuals were unable to meet the mortgage payments on their land. High taxes frequently caused the farmer to sell his land. Through delinquent taxes, forclosures, and deflated land prices, various towns, counties, and individuals came to control sizable acreages. Much of the land cleared prior to the Depression was eventually returned to range land (Plate 9).[22] Although many problems were

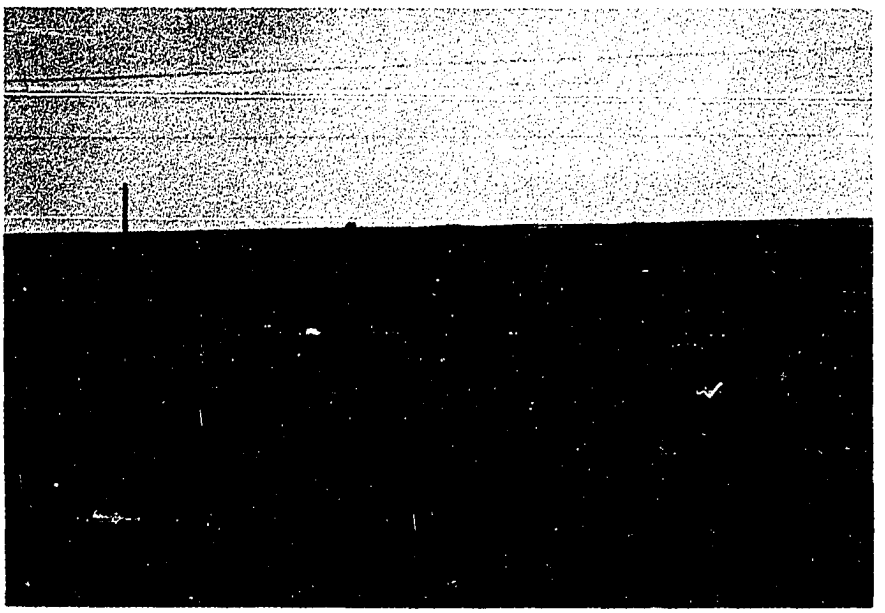

Plate 9--Abandoned vegetable field approximately five miles southwest of Carrizo Springs presently being used for pasturage. Note well and old irrigation ditch which extends from the northern end of the well enclosure across the lower one-half of the photograph.

[22]Grover C. Jackson, personal interview.

encountered, low farm prices during the Depression and lack of experience in growing vegetable crops under irrigation were the primary factors contributing to the failure of many individual farmers and the decline and/or failure of certain farming settlements.

Vegetable farms, then as now, tended to be located adjacent to area towns and along the Nueces River. Even in the 1930's, farmers usually lived in town and commuted daily to their fields. Transportation was a definite problem as most roads were unimproved. Crop losses were high as vegetable farmers were frequently unable to get their produce to town and the packing sheds during inclement weather. During the early years of the Depression, in an effort to help alleviate unemployment and to improve rural transportation, work was begun on the now invaluable farm to market road system.

The Depression of the 1930's financially ruined many Winter Garden vegetable farmers; however, this group as a whole suffered less than did area livestock producers. The cattle ranchers, having large sums of money invested in land and cattle, were frequently unable to find the capital necessary to provide for the upkeep of their herds. The average vegetable farmer had no such fixed expenses. During the Depression many area vegetable growers temporarily ceased commercial production and grew only enough to meet the

immediate needs of their families.[23]

Localization of the Vegetable Industry

Many changes have taken place in the Winter Garden vegetable industry since 1930. Rolling topography, sandy soils, and relatively deep-lying aquifers have always limited vegetable acreage in Frio and La Salle counties. The small vegetable acreages in these counties prevented the growth of an efficient marketing system so necessary in the vegetable industry. These factors, when combined with the financial and marketing problems created by the Depression, virtually eliminated the winter vegetable industry in these counties.

Prior to World War II the lack of dependable water supplies, inability to obtain adequate financing for the high cost vegetable crops, and the absence of a means to market the harvested produce had combined to undermine the establishment of large scale commercial vegetable farming operations in Uvalde County. Surface water was, with the exception of the Leona River, inadequate. Shallow wells yielded water of questionable quality for vegetable farming. The existence of the Edwards underground reservoir was unknown. Uvalde County had always been dependent upon a relatively stable livestock economy. Financial institutions and monied individuals refused to finance the highly speculative, unsecured vegetable

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[23]Personal interview with Jack B. Hooks, County Engineer, Zavala County Road Department, Crystal City, Texas, September 21, 1968.

crops. With such limited vegetable acreages it was impossible for a packing shed to operate profitably.[24]

By 1940 improvement in the conditions which had previously plagued the vegetable farmer was evident. The Edwards reservoir had been discovered and proved to be an excellent source of cheap, pure water. Financing became obtainable as produce shed operators to the south became aware of the enormous potential of Uvalde County. With water and financing available, growers and shippers soon established themselves in the Uvalde area.[25]

Although small acreages of onions and spinach had been grown along the Rio Grande near Eagle Pass since the turn of the century, it was not until 1931, with the opening of the Quemado Valley area north of Eagle Pass, that Maverick County gained real prominence as a winter vegetable producer. A variety of crops was grown during the late 1930's and early 1940's; however, spinach, and to a lesser degree onions, continued to dominate the vegetable acreage. Rail shipments of vegetables from Maverick County increased from 552 cars in 1931 to a peak of 2,248 cars in 1942.

Large scale vegetable farming was a profitable but short-lived enterprise in Maverick County. Cheap surface water of questionable quality (salt content ranges from 600 to 1,800 parts per million during the course of a year),

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[24]George C. Jolley, personal interview.

[25]A. F. Childress, personal interview.

inexperienced irrigation farmers, and poor drainage combined to produce a high water table with its attendant salt problems. Soil salinity forced the removal of sizable acreages from cultivation during the early postwar years.

During the drought of the 1950's, area ranchers, unable to find forage for their cattle, bought up many abandoned and some still operative vegetable farms and planted them in grasses.[26]

A measure of prosperity returned to the Dimmit-Zavala County area with the advent of World War II. Acreages increased as the demand for vegetables, both fresh and processed, intensified. Although spinach and onions were the primary crops grown during the war, a wide variety of vegetables was produced. Most of the vegetables were sold fresh market; however, many of the smaller farmers grew produce exclusively for a local cannery.[27]

In 1946, after several years of research, a branch of California Packing Corporation[28] (hereafter referred to as Del Monte) was established in Crystal City (Plate 10).

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[26]Personal interview with Wilbur E. Bohmfalk, Work Unit Conservationist, U.S. Department of Agriculture, Soil Conservation Service, Eagle Pass, Texas, October 7, 1968.

[27]Personal interviews with James R. Pipes, Postmaster, Crystal City, Texas, September 22, 1968, and William F. Smither, agent, SAS Insurance Agency, Crystal City, Texas, September 22, 1968.

[28]This organization changed its name to Del Monte Corporation in 1967.

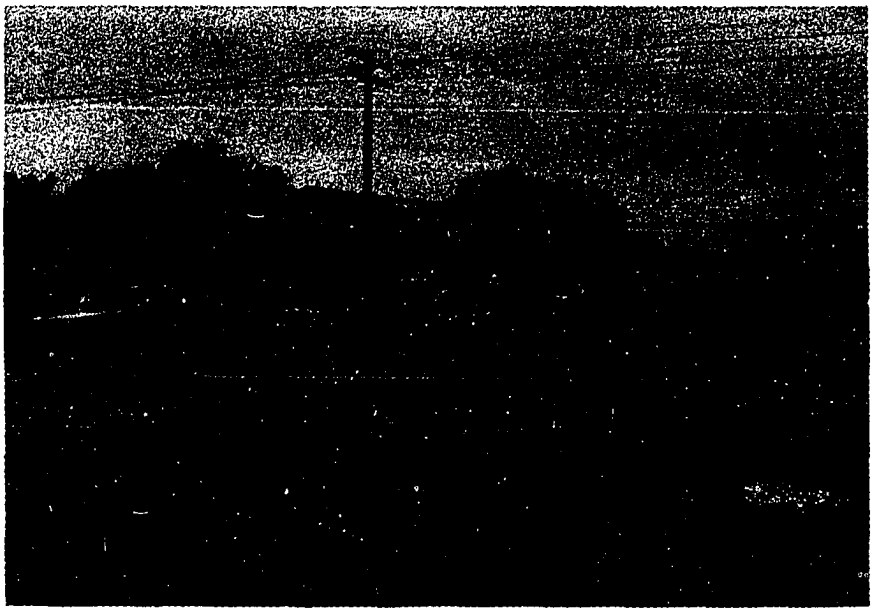

Plate 10--A portion of Del Monte's Crystal City cannery. Workers to the right of the plant are unloading and washing spinach.

Purchasing 3,200 acres of choice land northeast of the city, Del Monte quickly proved a boon to the economy of the area. The company not only provided numerous permanent and seasonal jobs in its cannery and fields, but also established itself as the region's leading scientific vegetable farmer. Utilizing the most modern methods and equipment, and making extensive use of the latest developments in chemical fertilizers and pesticides, Del Monte's farming operation became the model which many area farmers were quick to imitate.

In the late 1940's farmers from the Coastal Bend and Lower Rio Grande Valley began developing large cotton and vegetable acreages around Batesville and Frio Town. During the 1950-1957 drought several Batesville farmers extended their operations into the Knippa area. However,

it was not until the early 1960's that Knippa and adjacent Sabinal became vegetable producers of any consequence.

At Batesville, water was initially obtained from the relatively shallow Leona formation, but with the onset of the drought ground water supplies from this formation were quickly depleted and area farmers were forced to drill wells into the underlying Carrizo sand.[29]

During the drought Winter Garden vegetable farmers, utilizing ground water, were not hampered by a lack of water as were their competitors in the Lower Rio Grande Valley. Vegetable prices and profits were relatively high during these years due to a decline in production over most of South Texas.

Despite some improvement in his income, the small vegetable farmer continued to operate on a marginal basis. Since the end of World War II there has been an intensification of the trend toward fewer and larger vegetable farms. The drought of the 1950's, combined with the cost-price squeeze brought about by marketing problems and the rising costs of labor, equipment, and other farm supplies was largely responsible for the elimination of most of the smaller vegetable farming operations in the Winter Garden.

During the drought many farmers found it necessary to replace farm machinery and irrigation equipment purchased during the boom years of the early 1940's. These individuals,

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[29]George C. Jolley, personal interview.

unable to capitalize such a large investment, were frequently forced to sell their farms.

In addition to increased operating costs, the small farmer was faced with a locally unfavorable marketing situation. Due to limited acreages and a lack of marketing facilities, small growers were forced to sell their produce through a local shed. As a rule, these sheds were owned and operated by the area's larger growers. The small farmer frequently found that when it came time to sell the crop, his produce, regardless of its quality, was of secondary importance to that of the shed owner.

Between 1949 and 1964 there was an over all increase of some 5.1 million dollars in the value of all farm products sold in the Winter Garden (Table 7). It will be noted that although 1964 vegetable acreage was essentially the same as that of 1949, the value of all vegetables sold in 1964 was more than double that of 1949 (Table 8). Due to inflation and the processes at work within the vegetable industry with regard to pricing, it is impossible to note with any accuracy the reasons for this increase in value. The decline in value of all farm products reflected in the 1954 Census for that year was largely due to the drought, and was limited almost entirely to the livestock sector of the economy.

The true value of the vegetable industry to the Winter Garden is not reflected in Census data. Census figures only show monies received from vegetable sales. Far more important than the actual sales is the money generated

TABLE 7

VALUE OF AGRICULTURAL PRODUCTS SOLD, BY COUNTY, 1949-1964[a]
(1,000 dollars)

			Dimmit	Uvalde	Zavala	Total Winter Garden[b]
All farm products sold		1964	5,594	9,994	10,821	26,410
		1959	5,169	8,362	10,544	24,075
		1954	3,498	7,113	7,142	17,753
		1949	4,376	8,078	8,852	21,306
All livestock and livestock products		1964	2,618	8,273	4,710	15,601
		1959	3,091	7,068	6,063	16,222
		1954	1,563	5,633	3,352	10,548
		1949	1,508	6,871	5,226	13,605
All crops		1964	2,916	1,581	6,068	10,565
		1959	2,079	1,294	4,481	7,853
		1954	1,935	1,476	3,791	7,202
		1949	1,217	1,202	3,626	6,045
All vegetables		1964	2,527	595	3,452	6,574
		1959	1,626	259	2,009	3,894
		1954	1,431	952	1,450	3,834
		1949	861	296	1,585	2,741
Vegetables Harvested for Sale (Other than Irish and Sweet Potatoes)	Farms	1964	25	22	51	98
		1959	36	15	32	83
		1954	54	6	25	85
		1949	65	6	20	91
	Acres	1964	8,308	3,312	12,996	24,616
		1959	6,771	2,309	10,647	19,727
		1954	8,142	3,253	8,944	20,339
		1949	9,094	3,656	13,153	25,903

[a]Source: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture: 1950, Vol. I, Pt. 26, Texas; U.S. Census of Agriculture: 1954, Vol. I, Counties and State Economic Areas, pt. 26, Texas; U.S. Census of Agriculture: 1959, Vol. I, Counties, pt. 37, Texas; and U.S. Census of Agriculture: 1964, Vol. I, pt. 37, Texas.

[b]As only county statistics are available, the Frio Town area is excluded.

Note: The material presented in this Table is intended only to depict gross trends in Winter Garden agriculture.

TABLE 8

INDIVIDUAL VEGETABLE CROP STATISTICS, BY COUNTY, 1949-1964[a]

			Dimmit	Uvalde	Zavala	Total Winter Garden[b]
Beets	Farms	1964	c	c	c	c
		1959	1	0	2	3
		1954	6	0	2	8
		1949	20	0	1	21
	Acres	1964	c	c	1,300[d]	1,300[d]
		1959	65	0	904	969
		1954	53	0	40	93
		1949	236	0	5	241
Broccoli	Farms	1964	c	c	c	c
		1959	c	c	c	c
		1954	0	0	0	0
		1949	1	0	1	2
	Acres	1964	c	c	c	c
		1959	c	c	c	c
		1954	0	0	0	0
		1949	25	0	40	65
Cabbage	Farms	1964	9	5	14	28
		1959	5	10	10	25
		1954	7	5	8	20
		1949	8	4	4	16
	Acres	1964	756	176	1,351	2,283
		1959	377	594	828	1,799
		1954	72	256	345	673
		1949	57	105	125	287
Carrots	Farms	1964	6	15	19	40
		1959	17	10	12	39
		1954	21	1	8	30
		1949	75	2	13	90
	Acres	1964	990	940	1,169	3,099
		1959	2,013	504	755	3,272
		1954	1,262	40	254	1,556
		1949	3,171	45	434	3,650
Cauliflower	Farms	1964	c	c	c	c
		1959	c	c	c	c
		1954	c	c	c	c
		1949	c	c	c	c
	Acres	1964	200[d]	c	100[d]	300[d]
		1959	c	c	c	c
		1954	c	c	c	c
		1949	c	c	c	c
Lettuce	Farms	1964	c	c	c	c
		1959	0	4	4	8
		1954	4	5	13	22
		1949	13	8	7	28
	Acres	1964	c	200[d]	700[d]	900[d]
		1959	0	310	257	567
		1954	228	908	1,300	2,436
		1949	154	576	684	1,414
Onions	Farms	1964	18	10	17	45
		1959	29	2	17	48
		1954	37	3	25	65
		1949	46	5	19	70
	Acres	1964	3,297	899	2,241	6,437
		1959	2,451	160	1,531	4,142
		1954	1,870	62	1,495	3,427
		1949	818	166	711	1,695
Spinach	Farms	1964	c	c	c	c
		1959	2	2	11	15
		1954	9	4	14	27
		1949	14	10	31	55
	Acres	1964	1,500[d]	100[d]	3,200[d]	4,800[d]
		1959	476	625	5,178	6,279
		1954	1,210	1,152	3,195	5,557
		1949	2,101	2,227	8,674	13,002

[a]Source: U.S. Department of Commerce, Bureau of the Census, U.S. Census of Agriculture: 1950, Vol. I, pt. 26, Texas; U.S. Census of Agriculture: 1954, Vol. I, Counties and State Economic Areas, pt. 26, Texas; U.S. Census of Agriculture: 1959, Vol. I, Counties, pt. 37, Texas; and U.S. Census of Agriculture: 1964, Vol. I, pt. 37, Texas.

[b]As only county statistics are available, the Frio Town area is excluded.

[c]Not available.

[d]Rounded to nearest 100 acres. From: Texas Crop and Livestock Reporting Service, Texas Vegetable Statistics, Bulletin 43 (Austin, Texas: n.p., 1967).

by the produce industry. During the course of a crop year, vegetable growers provide numerous jobs in area fields and packing sheds. In Dimmit and Zavala counties the wages received by agricultural laborers support almost in toto the retail and service sectors of the economy.

In 1929, the Texas A&M College system established an agricultural experiment station at Winter Haven (Plate 11).

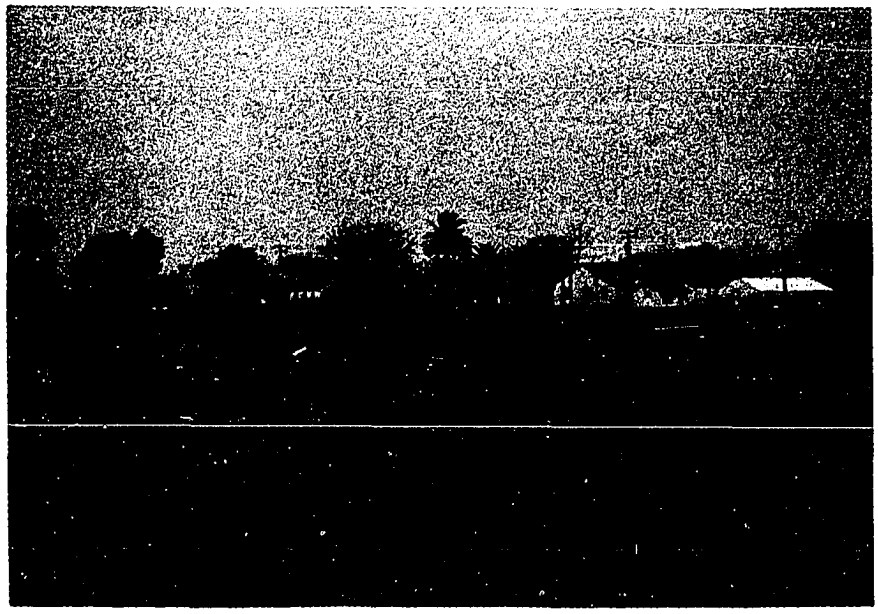

Plate 11--A portion of the Rio Grande Plains Research-Demonstration Station, Winter Haven, Texas.

Since that time the station has introduced many new and more resistant varieties of fruits and vegetables to area farmers. Experimentation co-ordinated by the station is presently being carried on in a number of areas, but emphasis appears to have shifted from vegetables to feed crops and fruit. There is little need for the experiment station to devote a great deal of its time or money to vegetable research as

area farmers tend to rely on their own agronomists, private industry, or each other for advice on growing vegetables.

The Contemporary Scene

During the 1967-1968 season seventy-nine vegetable farmers planted 21,768 acres to cool season vegetables (Table 9). Beet, broccoli, and cauliflower acreages are relatively insignificant. Almost the entire beet crop is grown by Del Monte for processing. Neither broccoli nor cauliflower has ever been a popular crop in the Winter Garden. Both crops are highly perishable and require large labor inputs prior to shipment. As labor costs continue to increase, further declines in broccoli and cauliflower acreages may be expected. Onions and spinach, long the most important vegetable crops in the Winter Garden, accounted for over 50 per cent of the total winter vegetable acreage planted during the 1967-1968 season.

As indicated by Figure 10 there are two distinct vegetable growing districts within the Winter Garden. The Northern District, largely developed within the last twenty years, includes the Frio Town area and the towns of Uvalde, Knippa, Sabinal, La Pryor, and Batesville. The older and more concentrated Southern District, long recognized as the "heart of the Winter Garden," includes the towns of Crystal City, Carrizo Springs, Brundage, and Big Wells.

Although vegetables are widely distributed within the Winter Garden, there is a tendency for certain crops

TABLE 9

WINTER VEGETABLES PLANTED, BY COUNTY, 1967-1968 SEASON

		Dimmit	Uvalde	Zavala	Frio (Frio Town area only)	Total Winter Garden
Cool Season Vegetables Planted	Farms	13	30	34	6	79
	Acres	2,898	4,500	13,320	1,050	21,768
	Av. farm size	223	150	392	175	276
Beets	Farms	1	--	1	--	2
	Acres	3	--	600	--	603
	Av. farm size	3	--	600	--	302
Broccoli	Farms	1	--	--	--	1
	Acres	50	--	--	--	50
	Av. farm size	50	--	--	--	50
Cabbage	Farms	7	18	25	3	49
	Acres	715	850	2,320	90	3,975
	Av. farm size	102	47	93	30	81
Carrots	Farms	4	26	17	6	49
	Acres	425	1,990	1,720	420	4,555
	Av. farm size	106	77	101	70	93
Cauliflower	Farms	2	1	1	--	3
	Acres	205	35	80	--	320
	Av. farm size	103	35	80	--	107
Lettuce	Farms	1	8	15	1	23
	Acres	5	405	920	25	1,355
	Av. farm size	5	51	61	25	59
Onions	Farms	12	17	26	2	56
	Acres	1,345	1,000	3,610	140	6,095
	Av. farm size	112	59	139	70	109
Spinach	Farms	1	2	14	3	17
	Acres	150	220	4,070	375	4,815
	Av. farm size	150	110	291	125	283

Source: Data presented in Tables 9, 10, and 11 and on Figures 10 through 18 gathered through personal interviews with Winter Garden area vegetable growers, vegetable shippers, crop dusters, and agricultural chemical dealers. Although an effort was made to acquire at least three estimates (preferably from the grower, his shipper, and the agricultural chemical dealer) of a grower's acreage, this was not always possible. Growers in the Northern District and particularly in the Batesville-Uvalde area were generally reluctant to divulge crop data. In these areas great reliance was placed on agricultural chemical dealer estimates.

Because of the variable nature of the estimates received, it was necessary to utilize averages. Acreage data (by individual crop) collected on each farmer was computed in the following manner: (1) data collected was assigned a value depending upon its source -- individual grower = 2, a neighboring grower = 1, the grower's shipper = 1, agricultural chemical dealers = 1, and crop dusters = 1; (2) estimates were multipled by their respective values; (3) the resulting figures were then averaged.

TOTAL COOL SEASON VEGETABLE ACREAGE IN THE WINTER GARDEN (1967-1968)

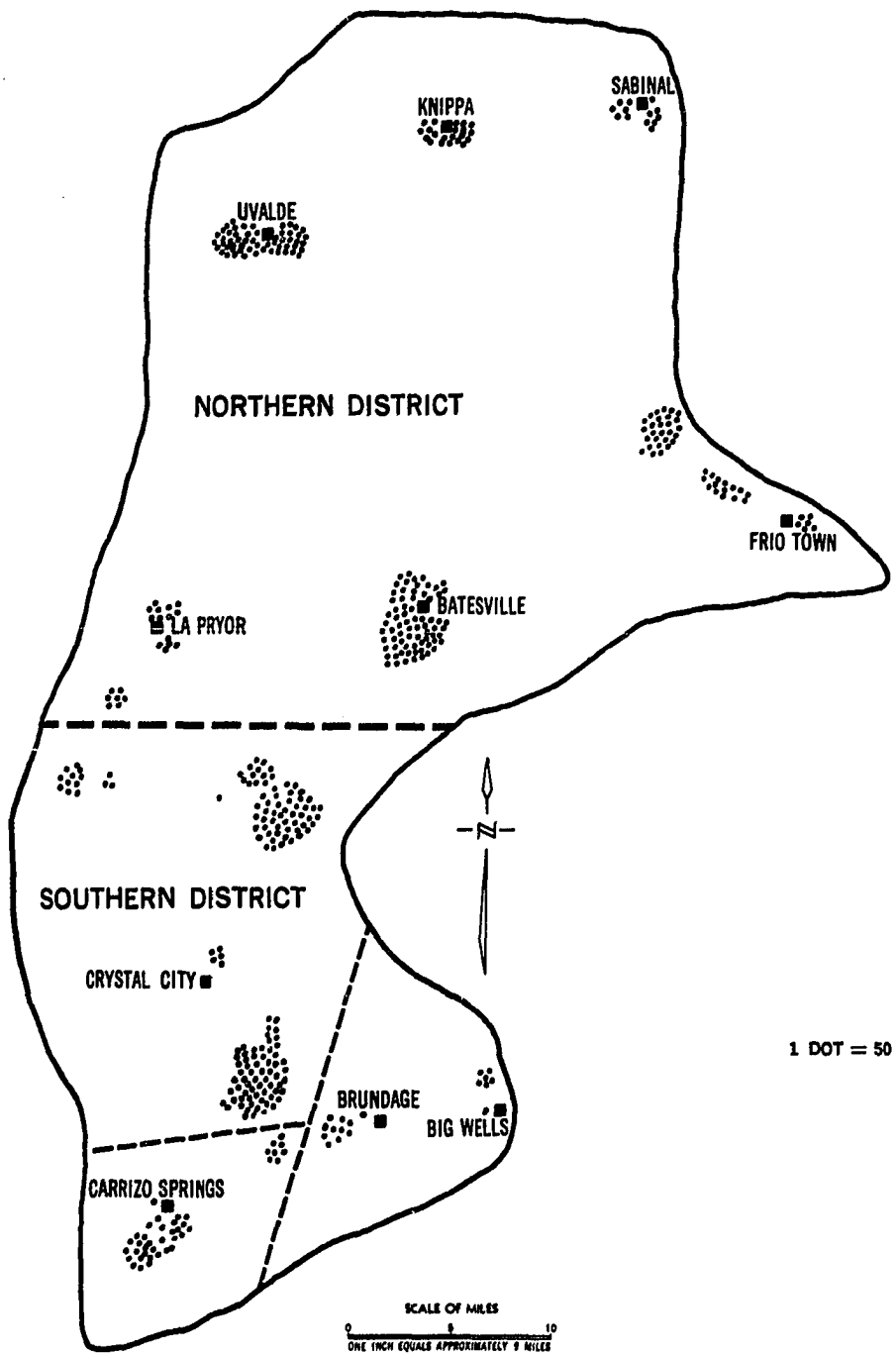

Fig. 10

Source: Field Interviews

(i.e., beets and spinach) to be concentrated in particular areas (Figures 11 to 18). A variety of factors, primarily cultural in nature, are responsible for these concentrations. In the ensuing pages attention is focused upon the similarities and differences between these two vegetable producing areas.

Northern District. The Northern District is economically dominated by Uvalde (population 1960: 10,293). Area vegetable farmers depend upon the town's packing sheds, banks, and farm equipment and supply outlets for most of their needs. With few exceptions, all of the produce grown in the Northern District is financed by and/or shipped through Uvalde based firms.

During the 1967-68 season fifty-six Northern District growers planted approximately 11,620 acres of winter vegetables (Table 10). This area accounted for 53 per cent of the Winter Garden's total acreage. Vegetable farms which average 208 acres varied in size from 25 to 810 acres. The fact that Northern District farmers planted over 50 per cent of the Winter Garden's cabbage, carrot, lettuce, and onion acreage may be attributed almost exclusively to the planting policies of area packing sheds. Because sheds finance most Northern District growers, the actual vegetable acreage planted is largely determined by what individual shippers feel will be needed to satisfy their particular markets.

Although age and education obviously vary with each individual, most of the farmers in the Uvalde, Batesville,

BEETS FOR FRESH MARKET AND PROCESSING (1967-1968)

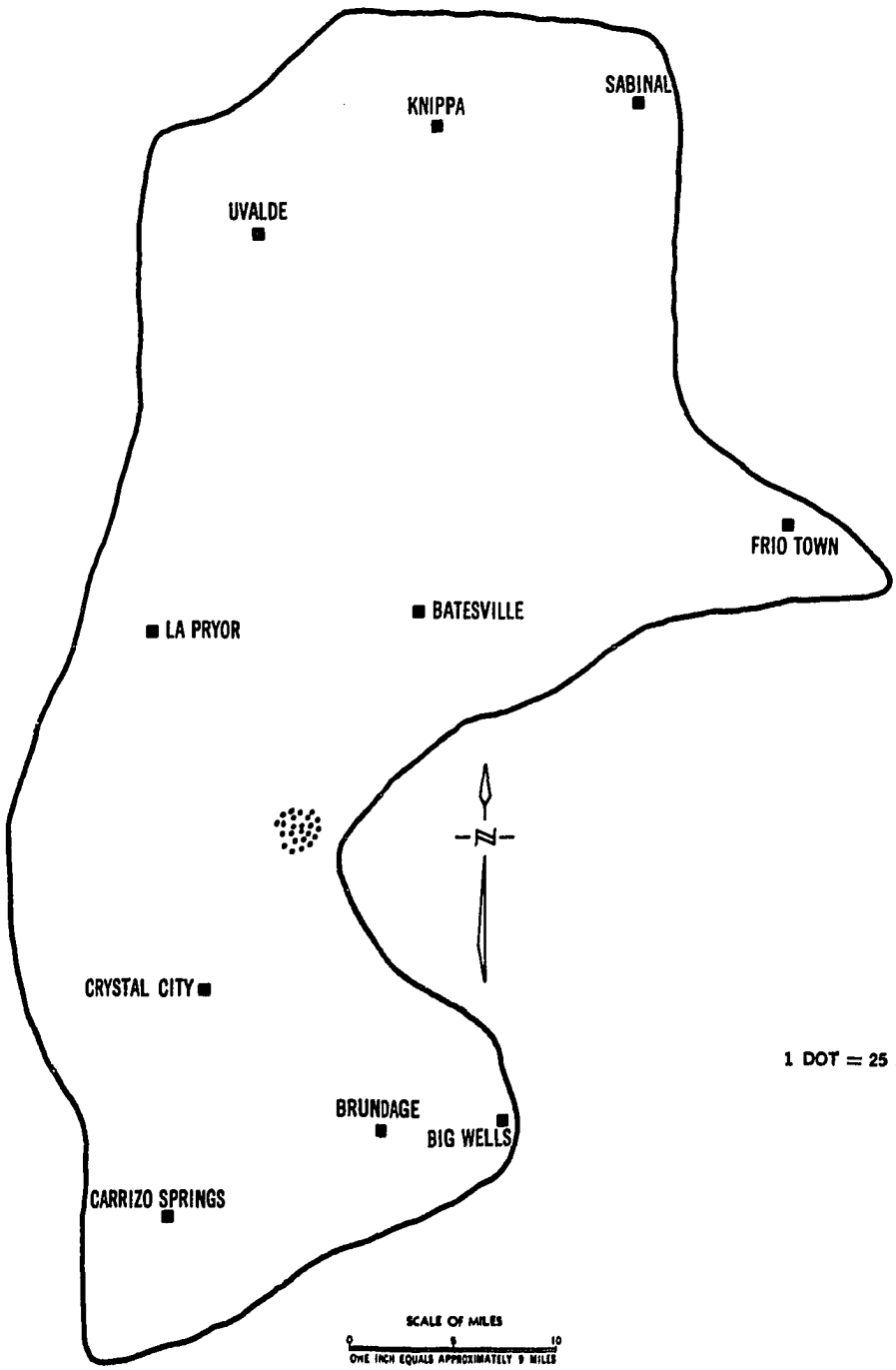

Fig. 11

Source: Field Interviews

BROCCOLI FOR FRESH MARKET (1967-1968)

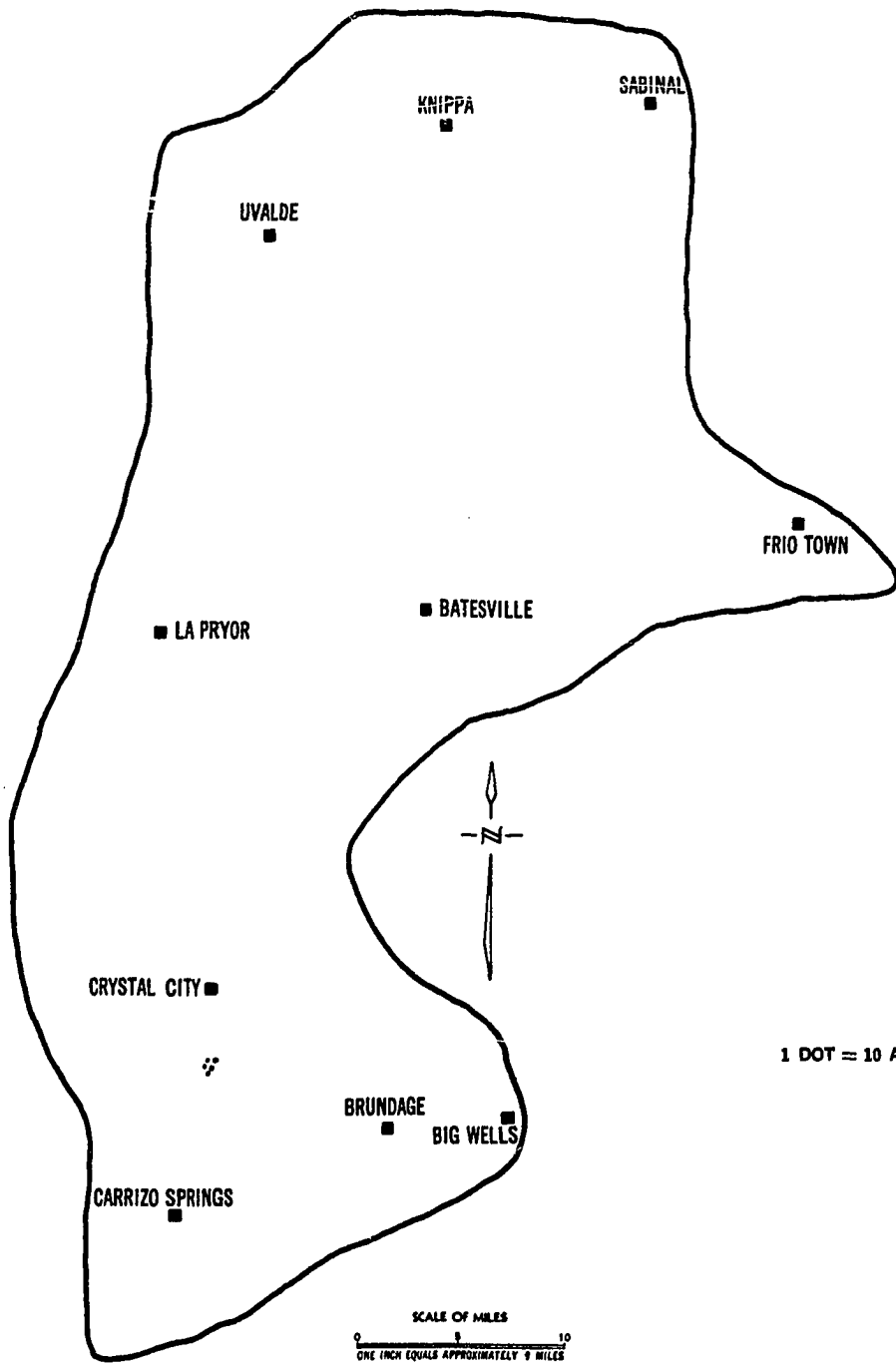

Fig. 12

Source: Field Interviews

CABBAGE FOR FRESH MARKET (1967-1968)

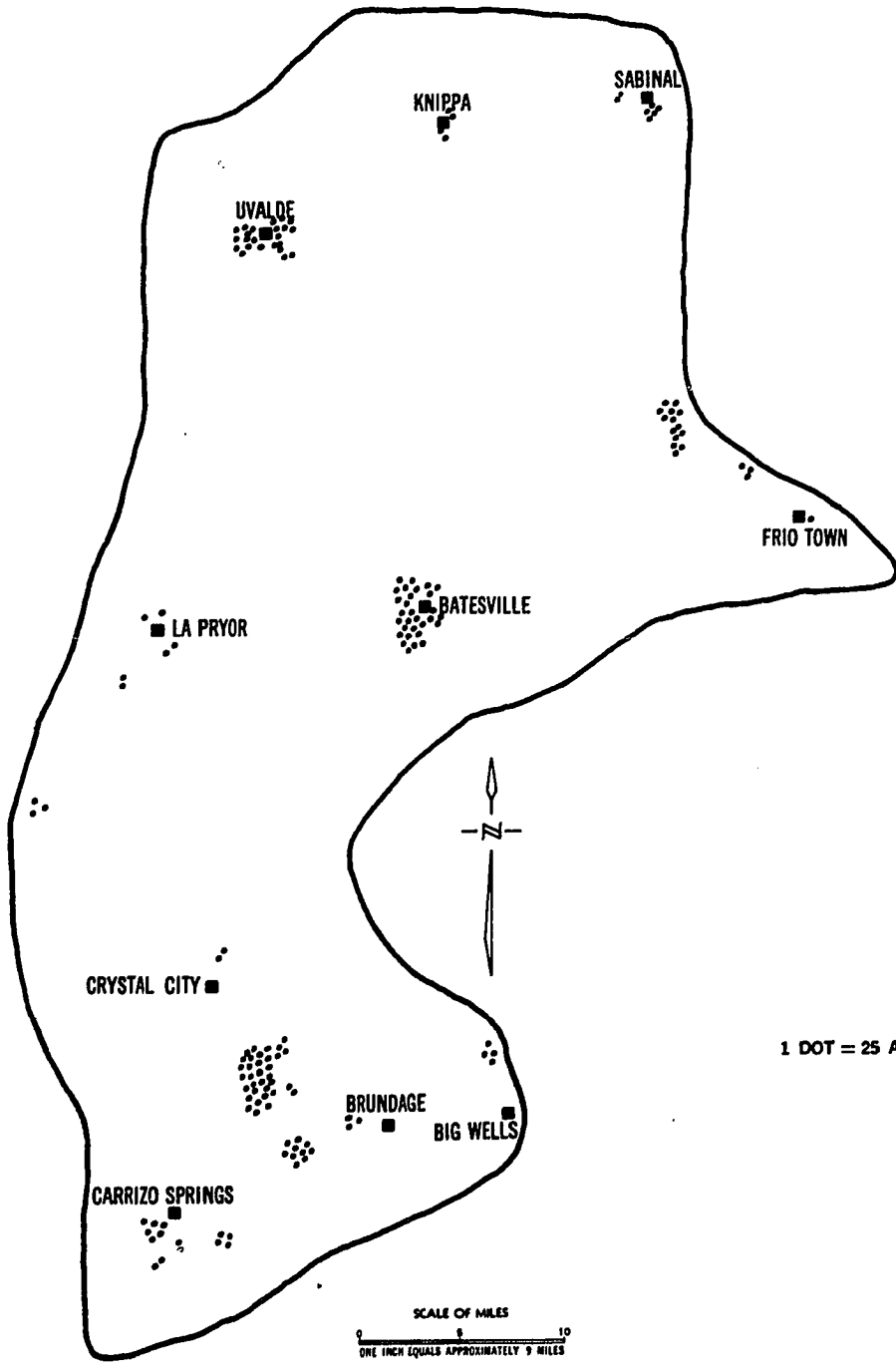

Fig. 13

Source: Field Interviews

CARROTS FOR FRESH MARKET (1967-1968)

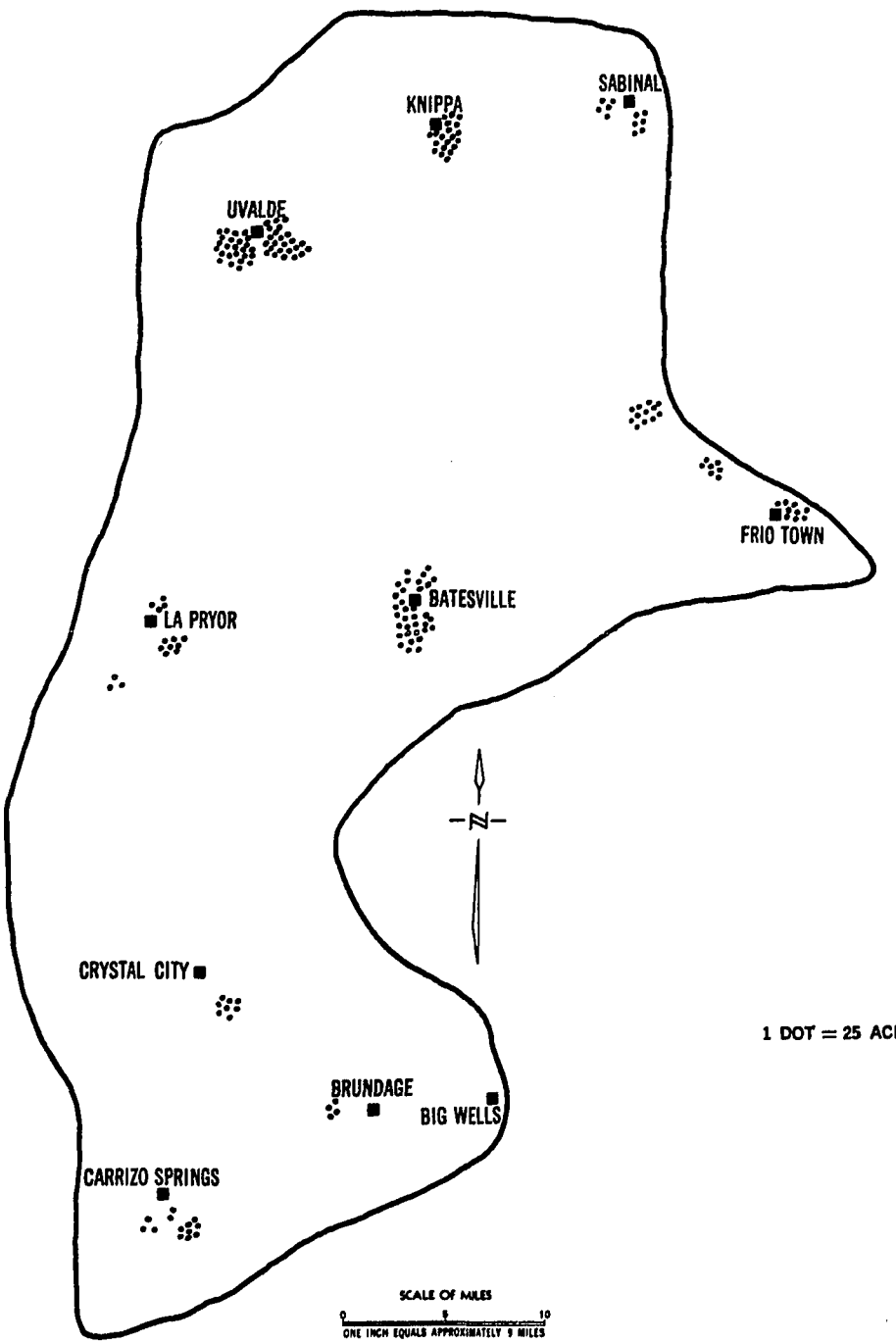

Fig. 14

Source: Field Interviews

CAULIFLOWER FOR FRESH MARKET (1967-1968)

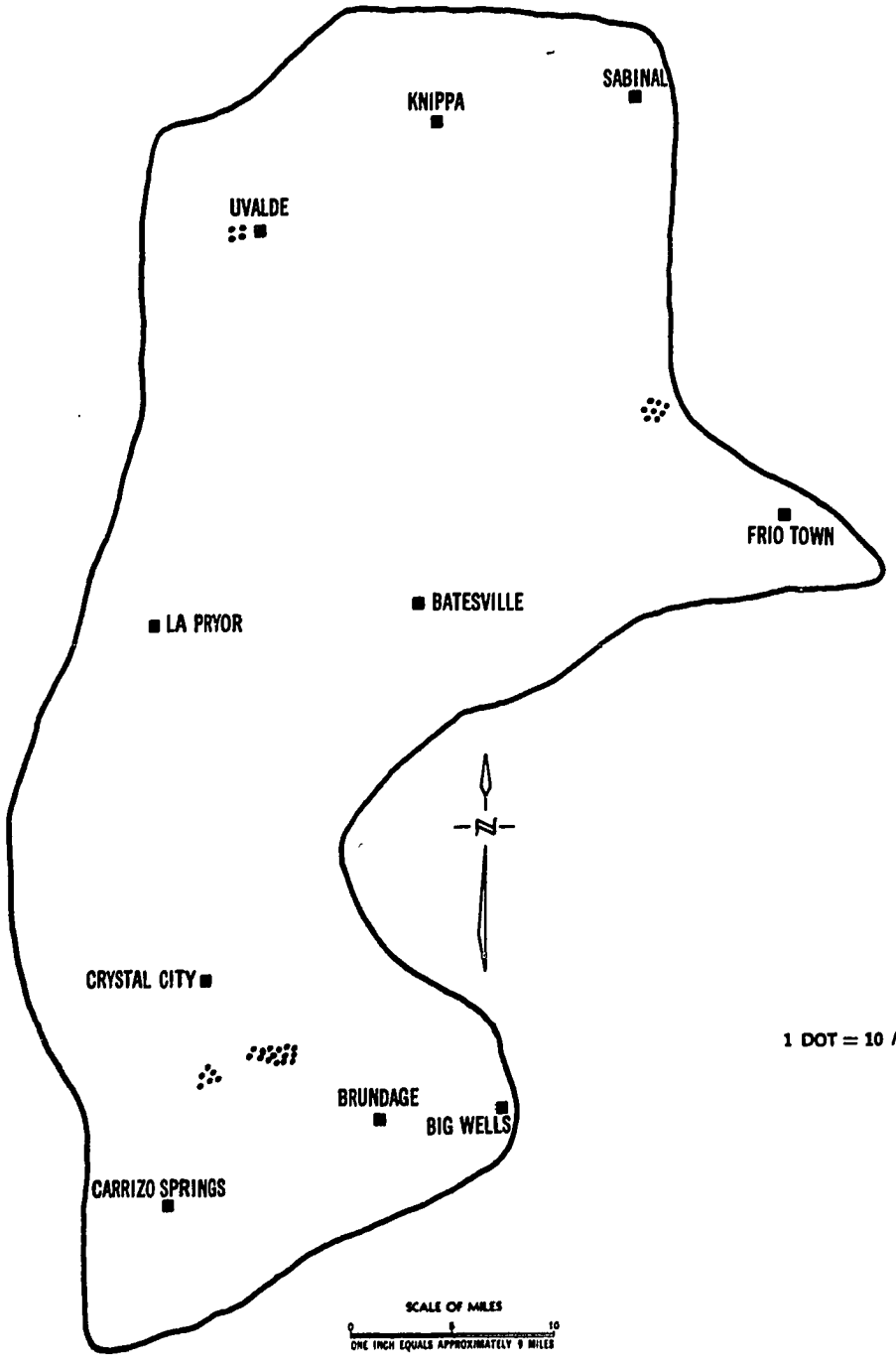

Fig. 15

Source: Field Interviews

LETTUCE FOR FRESH MARKET (1967-1968)

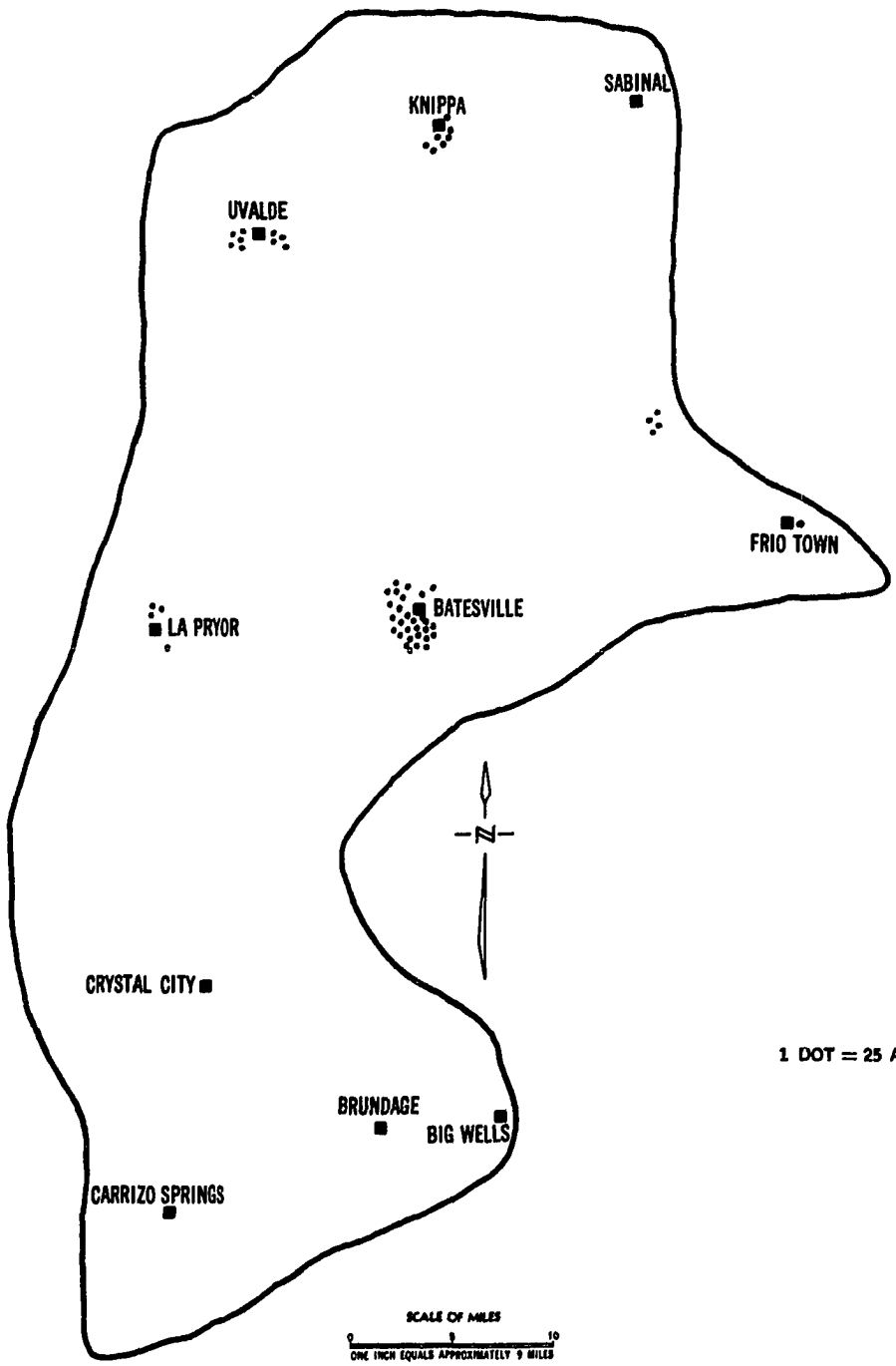

Fig. 16

Source: Field Interviews

ONIONS FOR FRESH MARKET (1967-1968)

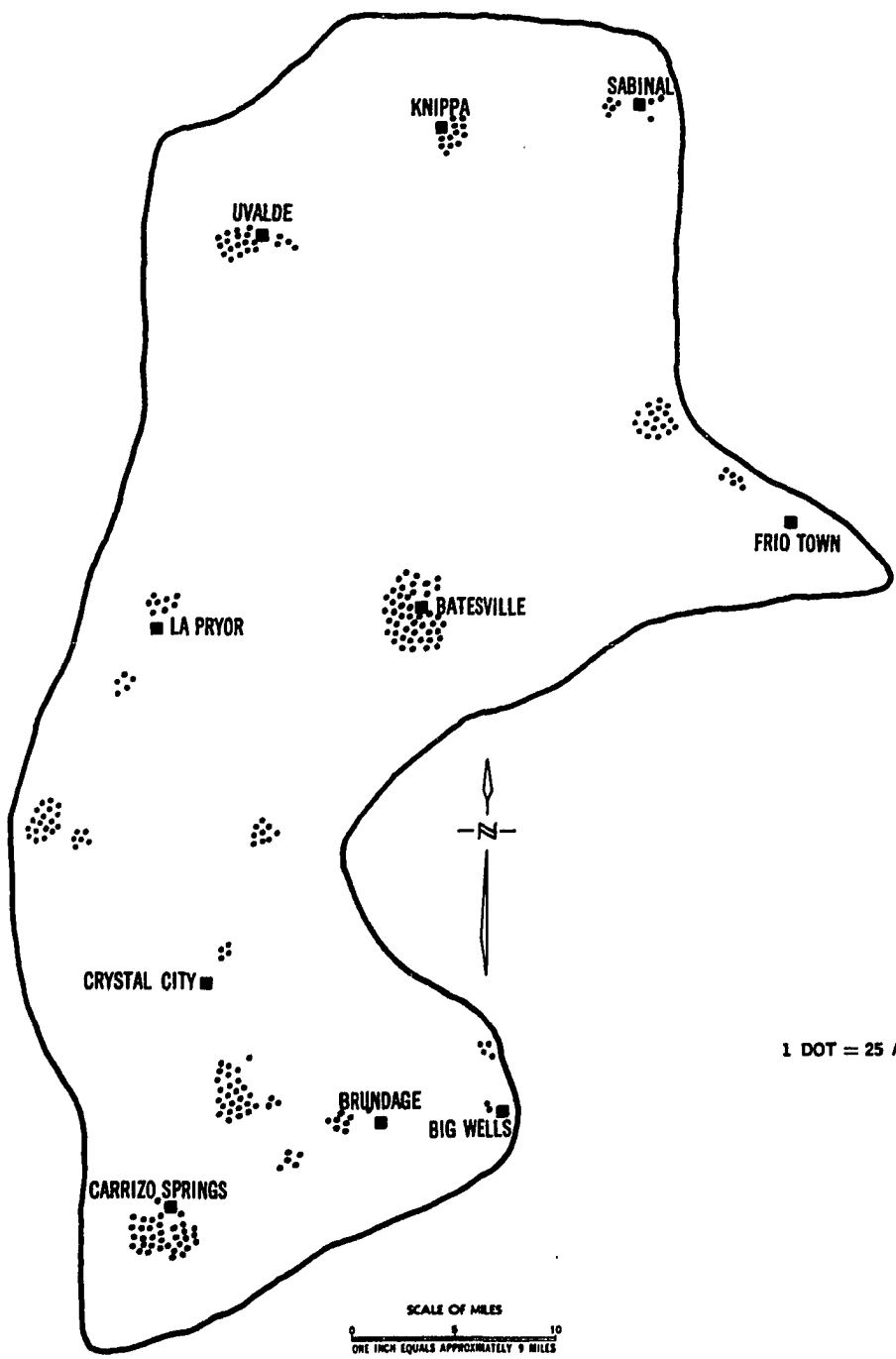

Fig. 17

Source: Field Interviews

SPINACH FOR FRESH MARKET AND PROCESSING (1967-1968)

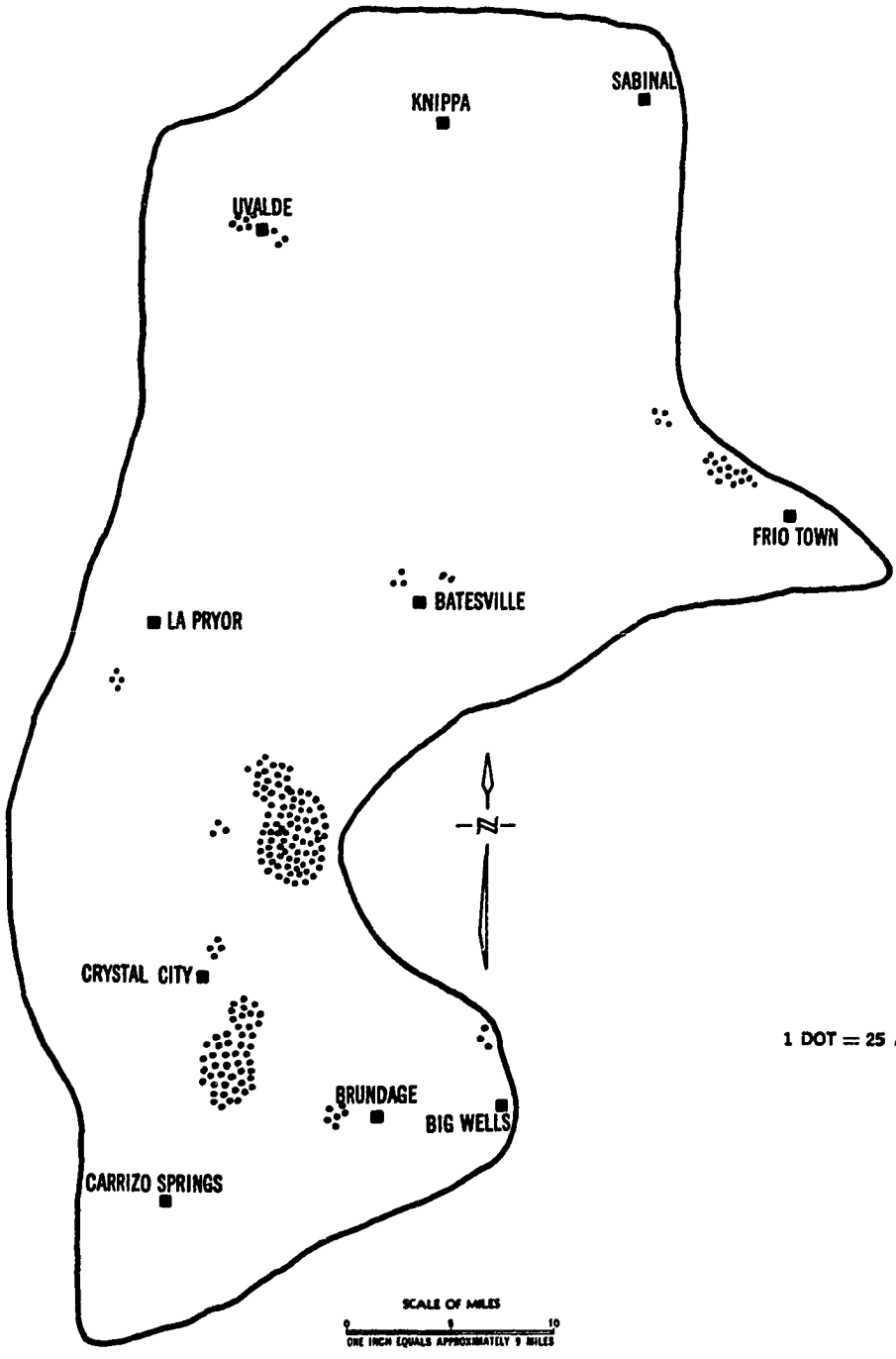

Fig. 18

Source: Field Interviews

TABLE 10

STATISTICAL SUMMARY, BY INDIVIDUAL CROP AND PRODUCING AREA--NORTHERN DISTRICT, 1967-1968 SEASON

Vegetable	Northern District 56 Growers Average Size Farm-208 A.			Batesville 16 Growers Average Size Farm-226 A.			Uvalde 14 Growers Average Size Farm-198 A.			Frio Town 8 Growers Average Size Farm-304 A.		
	A.	% of N. Dist. A.	% of Winter Garden A.	A.	% of Batesville A.	% of Winter Garden A.	A.	% of Uvalde A.	% of Winter Garden A.	A.	% of Frio Town A.	% of Winter Garden A.
Beets	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Broccoli	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Cabbage	2,210	19.0	55.6	755	20.9	19.0	565	20.4	14.2	445	18.3	11.2
Carrots	3,930	33.8	86.3	850	23.5	18.7	1,220	44.0	26.8	710	29.2	15.6
Cauliflower	115	1.0	35.9	0	0.0	0.0	35	1.3	10.9	80	3.3	25.0
Lettuce	1,350	11.6	99.6	725	20.1	53.5	220	7.9	16.2	125	5.1	9.2
Onions	3,075	26.5	50.5	1,150	31.8	18.9	515	18.6	8.4	590	24.2	9.7
Spinach	940	8.1	19.5	135	3.7	2.8	220	7.9	4.6	485	19.9	10.1
Total	11,620		53.4	3,615		16.6	2,775		12.7	2,435		11.2

Vegetable	Knippa 11 Growers Average Size Farm- 98 A.			La Pryor 7 Growers Average Size Farm-153 A.			Sabinal 5 Growers Average Size Farm-130 A.		
	A.	% of Knippa A.	% of Winter Garden A.	A.	% of La Pryor A.	% of Winter Garden A.	A.	% of Sabinal A.	% of Winter Garden A.
Beets	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Broccoli	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Cabbage	100	9.3	2.5	160	15.0	4.0	185	28.5	4.7
Carrots	500	46.5	11.0	380	35.5	8.3	270	41.5	5.9
Cauliflower	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0
Lettuce	185	17.2	13.7	95	8.9	7.0	0	0.0	0.0
Onions	290	27.0	4.8	335	31.3	5.5	195	30.0	3.2
Spinach	0	0.0	0.0	100	9.3	2.1	0	0.0	0.0
Total	1,075		4.9	1,070		4.9	650		3.0

Source: Field interviews (see Table 9 for description of method).

La Pryor, and Frio Town areas are middle-aged (forty to sixty years old), high school graduates. Only a few of these individuals live on their farms or in adjacent small towns; the great majority tend to live in or near Uvalde. These men may be properly classed as farmers as most depend directly upon the soil for their livelihood. Most consistently plant vegetables, but, depending upon the marketing situation in a given year, they may realize more income from cotton and grain crops than from vegetables.

Knippa and Sabinal growers are generally younger (twenty-five to forty years old) and better educated. Virtually all are high school graduates and several have had some college training. Unlike other Northern District growers, these rancher-growers tend to live on their farms. Although vegetable farming is becoming increasing important around Knippa and Sabinal, most growers are primarily dependent upon the sale of cotton, grain, and livestock for their livelihood.

Southern District. Crystal City, with a 1960 population of 9,101 is the Southern District's leading trade center. The town's numerous vegetable packing sheds and retail firms handle between 85 and 90 per cent of the agricultural business generated by the Southern District's vegetable industry. Most of the remaining trade is carried on through firms in Carrizo Springs (population 1960: 5,699).

Twenty-three area growers planted 10,148 acres of winter vegetables during the 1967-1968 season (Table 11).

TABLE 11

STATISTICAL SUMMARY, BY INDIVIDUAL CROP AND PRODUCING AREA--SOUTHERN DISTRICT, 1967-1968 SEASON

Vegetables	Southern District 23 Growers Average Size Farm-441 A.			Crystal City 11 Growers Average Size Farm-669 A.			Carrizo Springs 8 Growers Average Size Farm-242 A.			Brundage-Big Wells 4 Growers Average Size Farm-215 A.		
	A.	% of S. Dist. A.	% of Winter Garden A.	A.	% of Crystal City A.	% of Winter Garden A.	A.	% of Carrizo Springs A.	% of Winter Garden A.	A.	% of Brundage-Big Wells A.	% of Winter Garden A.
Beets	603	5.9	100.0	600	8.2	99.5	3	.2	.5	0	0.0	0.0
Broccoli	50	.5	100.0	50	.7	100.0	0	0.0	0.0	0	0.0	0.0
Cabbage	1,765	17.4	44.4	1,010	13.7	25.4	585	30.3	14.7	170	19.8	4.3
Carrots	625	6.2	13.7	200	2.7	4.4	335	17.3	7.4	90	10.5	2.0
Cauliflower	205	2.0	64.1	205	2.8	64.1	0	0.0	0.0	0	0.0	0.0
Lettuce	5	.04	.4	0	0.0	0.0	5	.3	.4	0	0.0	0.0
Onions	3,020	29.8	49.5	1,650	22.4	27.1	1,005	52.0	16.5	365	42.4	6.0
Spinach	3,875	38.2	80.5	3,640	49.5	75.6	0	0.0	0.0	235	27.3	4.9
Total	10,148		46.6	7,355		33.8	1,933		8.9	860		4.0

Source: Field interviews (see Table 9 for description of method).

These vegetable plantings, which accounted for 47 per cent of the Winter Garden's total cool season acreage, averaged 441 acres and varied in size from 40 to Del Monte's 2,400 acres. Southern District growers planted 100 per cent of the Winter Garden's beet and broccoli acreage and over 50 per cent of the region's cauliflower and spinach acreage. Although shed planting policies are important, Del Monte's cannery and, to a lesser degree, tradition are the most significant factors influencing vegetable plantings in the southern area. Del Monte produces virtually all of the Winter Garden's beet crop, and grows and/or contracts over 50 per cent of the spinach acreage in the Southern District.

Vegetable farmers in the south tend to be middle-aged high school graduates. With few exceptions these individuals live in either Crystal City or Carrizo Springs. Unlike most of the northern area growers, virtually all vegetable producers in the Southern District depend entirely upon vegetable sales for their main source of income. Southern growers generally cultivate larger acreages, and tend to be more scientific in their farming methods than are their northern counterparts. In contrast to the majority of the northern vegetable growers who have been in the vegetable business less than ten years, most Southern District producers have been growing vegetables at least twenty years.

Agricultural development of the Winter Garden region began approximately 100 years ago with the establishment of

large cattle and sheep ranches. The area was sparsely populated until the late nineteenth and early twentieth century with the coming of the railroads and the introduction of commercial vegetable farming. Based first upon Bermuda onions and later upon spinach, the economy of the region thrived up to the economic depression of the 1930's.

Since the Depression the boundaries of the Winter Garden region have undergone considerable change. Commercial winter vegetable farming is no longer a significant industry in La Salle or Maverick counties. Uvalde County, although still predominately livestock oriented, is becoming increasingly important as a winter vegetable producer.

CHAPTER IV

WATER AND THE VEGETABLE GROWER

The Water Problem

To an individual unfamiliar with the intricacies of the vegetable industry, it would appear that water was the primary problem confronting most Winter Garden vegetable farmers. Many once flowing wells in Zavala and Dimmit counties today have pump settings below 200 feet. As all vegetable crops in the Winter Garden must be grown with the aid of irrigation, it is only natural that water, its availability, quantity, and quality, should be of concern to area farmers. Although both surface and ground water are utilized, approximately 90 per cent of the water applied to area crops is taken from underground formations.[1] Except for the waters acquired from the Leona formation in the Batesville region, virtually all of the ground water is obtained from either the Carrizo or Edwards aquifer. Only along the Nueces River between Crystal City and Carrizo Springs is surface water of any importance for irrigation.

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[1]Personal interview with A. H. Dawson, Work Unit Conservationist, U.S. Department of Agriculture, Soil Conservation Service, Carrizo Springs, Texas, September 20, 1968.

The numerous springs and artesian wells which once made the Winter Garden famous have disappeared as irrigated acreages have expanded and ground water withdrawals have increased (Plate 12). Although water use varies considerably

Plate 12--Artesian well near Asherton (c. 1895). Many of the early wells in the Carrizo sand had similar flows. (Photograph courtesy of Granger Anderson.)

among area farmers depending upon precipitation and types of soil and crops grown, approximately twelve inches (one acre-foot) of water are applied to each irrigated acre during the course of a year.[2] It would appear, from the figures presented

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[2]Letter from Dr. Bruce A. Perry, Professor, Soil and Crop Science Department, Horticulture Section, Texas A&M University, College Station, Texas, December 28, 1969, and personal interview with Leander Wagner, Tax Assessor and Collector-Bookkeeper, Zavala-Dimmit Counties Water Improvement District No. 1, Crystal City, Texas, February 6, 1969.

in Table 12, that between 1919 and 1929 ground water withdrawals in Zavala and Dimmit counties began to exceed annual recharge (25,000 acre-feet). Area residents generally agree that with few exceptions wells in Zavala and Dimmit counties had ceased to flow by the late 1920's. Artesian wells were generally found south and east of the Winter Garden in Atascosa, Frio, and La Salle counties (Figure 19). Irrigated acreages and ground water withdrawals in Zavala and Dimmit counties continued to increase through 1964.

Although total withdrawals from the Carrizo aquifer in the Zavala-Dimmit County region vary from year to year depending upon precipitation and crop acreage, agriculture is by far the major ground water consumer. In a 1948 study of the Winter Garden area, it was estimated that irrigated agriculture used 52,000 acre-feet (94.8 per cent) of an estimated 54,800 acre-feet of water withdrawn from the Carrizo aquifer. Municipal (2.6 per cent), domestic and stock (1.8 per cent), and industrial (.7 per cent) water consumption was insignificant.[3]

Irrigated agriculture, long prominent in the Zavala-Dimmit County area, has in recent years become increasingly important in Frio and Atascosa counties. Increased plantings of peanut and grain sorghum crops have been instrumental in expanding irrigated acreage in these two counties from

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[3]U.S., Department of the Interior, Winter Garden District Texas, 1948, p. 56.

TABLE 12

IRRIGATED LAND IN FARMS IN THE WINTER GARDEN AND ADJACENT AREA, 1909-1964[a] (in acres)

Year	Atascosa	Dimmit	Frio	La Salle	Zavala	Uvalde
1909	b	3,327	b	2,165	1,021	1,676
1919	2,312	5,397	655	2,531	1,642	484
1929	1,452	13,694	1,101	2,419	13,126	1,693
1939	2,321	14,305	761	3,094	23,384	1,021
1944	2,943	13,345	916	5,217	32,367	2,285
1949	4,106	21,898	2,323	1,812	46,287	8,521
1954	6,667	18,340	9,415	4,420	45,763	13,529
1959	13,041	15,807	16,585	2,779	37,068	13,571
1964	23,841	22,312	37,877	5,216	59,251	22,478

[a]Source: U.S. Department of Commerce, Bureau of the Census, Thirteenth Census of the United States: 1910, Vol. VII, Agriculture-Reports by States, Nebraska-Wyoming; Fourteenth Census of the United States: 1920, State Compendium-Texas; Fifteenth Census of the United States, 1930, Agriculture, Vol. II, State Reports, pt. 2, the Southern States; Sixteenth Census of the United States, 1940: Agriculture, Vol. I, State Reports, pt. 5, Statistics for Counties; U.S. Census of Agriculture: 1945, Vol. I, pt. 26, Texas; U.S. Census of Agriculture: 1950, Vol. I, pt. 26, Texas; U.S. Census of Agriculture: 1954, Vol. I, Counties and State Economic Areas, pt. 26, Texas; U.S. Census of Agriculture: 1959, Vol. I, Counties, pt. 37, Texas; and U.S. Census of Agriculture: 1964, Vol. I, pt. 37, Texas.

[b]Not available.

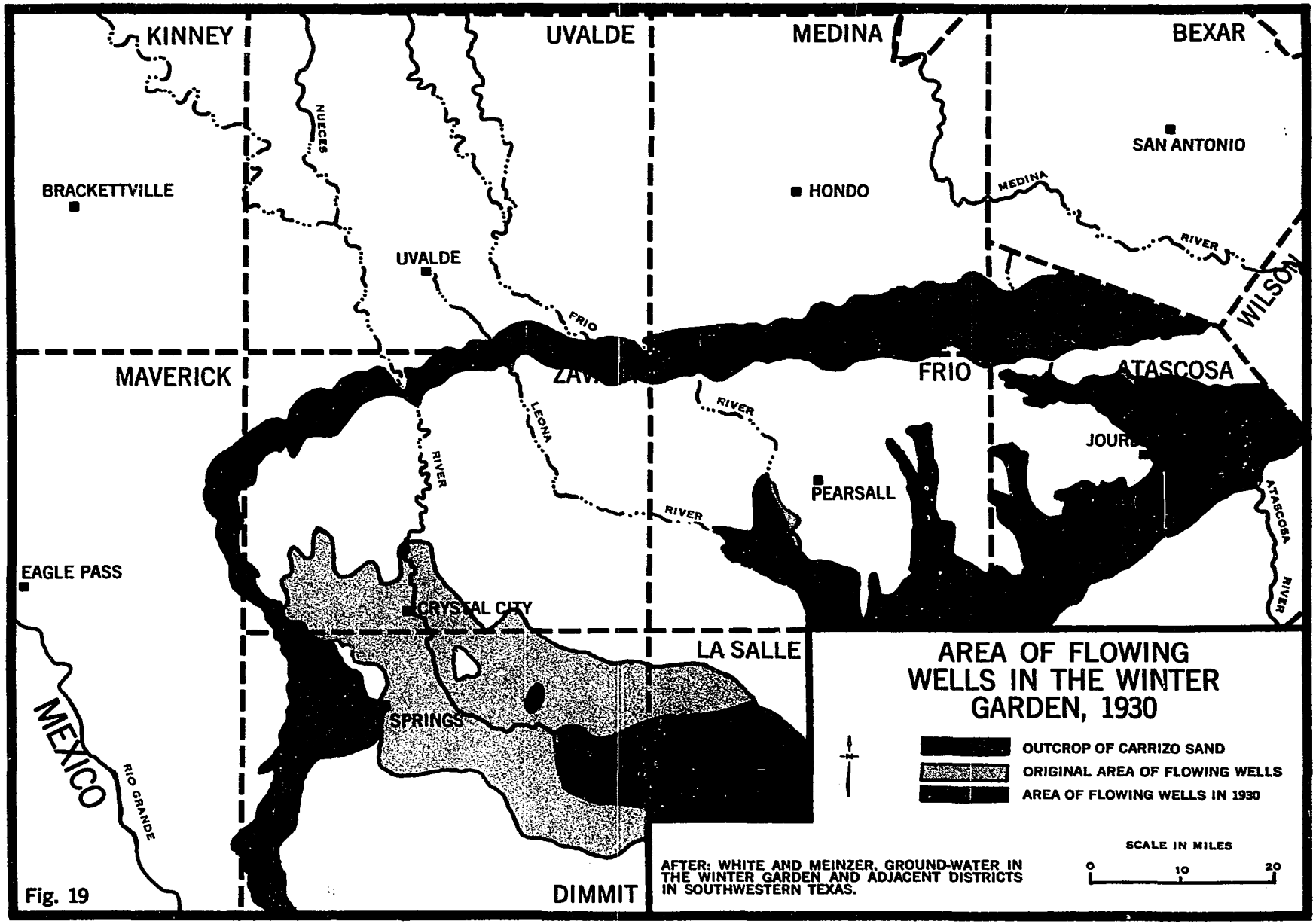
KINNEY
UVALDE
MEDINA
BEXAR
NUECES
SAN ANTONIO
BRACKETTVILLE
HONDO
MEDINA
RIVER
UVALDE
FRIO
WILSON
MAVERICK
ZAVALA
FRIO
ATASCOSA
RIVER
LEONA
RIVER
RIVER
PEARSALL
EAGLE PASS
CRYSTAL CITY
LA SALLE
SPRINGS
MEXICO
RIO GRANDE
DIMMIT
AREA OF FLOWING WELLS IN THE WINTER GARDEN, 1930
OUTCROP OF CARRIZO SAND
ORIGINAL AREA OF FLOWING WELLS
AREA OF FLOWING WELLS IN 1930
SCALE IN MILES
0
10
20
AFTER: WHITE AND MEINZER, GROUND-WATER IN THE WINTER GARDEN AND ADJACENT DISTRICTS IN SOUTHWESTERN TEXAS.

Fig. 19

3,859 acres in 1944 to 61,718 acres in 1964. As ground water demands on the Carrizo aquifer become greater in Frio and Atascosa counties, Winter Garden farmers, by virtue of their location adjacent to the outcrop area will, in time, experience even greater reductions in artesian pressures.[4]

Water-level data on selected observation wells in the Winter Garden region have been periodically collected by state and federal agencies since 1929. A comparison of Table 12, climatic data for Uvalde and Carrizo Springs (Appendix II), and hydrographs of wells tapping the Carrizo sand (Figure 20) indicates that increased ground water withdrawals generally coincide with expanded acreages and/or sub-normal precipitation.

In the Asherton-Crystal City-La Pryor area, artesian pressures were relatively stable until 1940-1941. Well levels, which have declined almost continuously since that period, reached their lowest points during the drought of the 1950's. The greatest declines were experienced in the Crystal City area where the water level in Well 77-18-601 fell from forty-one feet in August, 1941 to 302 feet in September, 1955.[5] During the latter portion of the drought (1955-1956)

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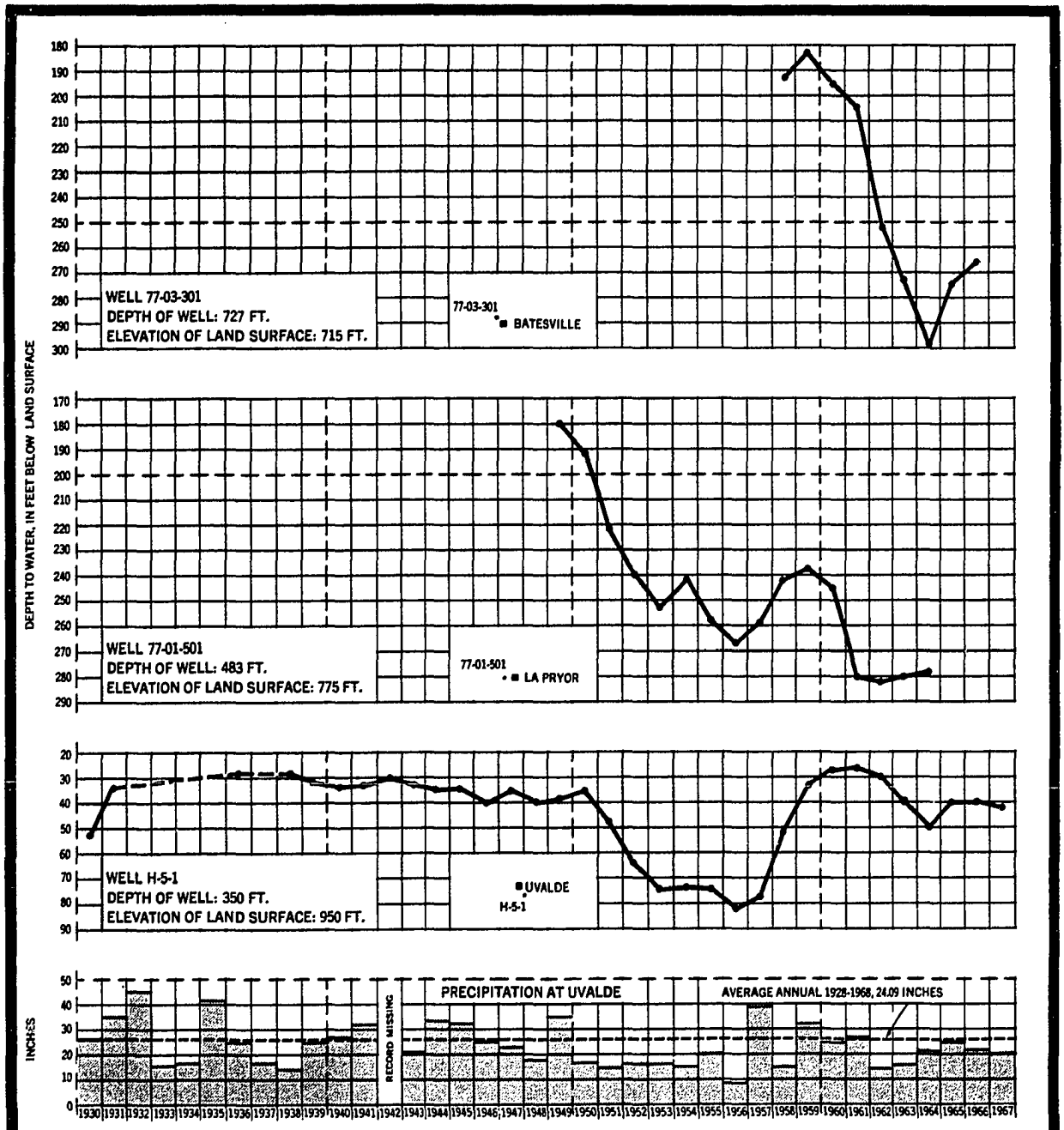
[4]Personal interview with C. R. Follett, Hydrologist, U. S. Geological Survey, Austin, Texas, February 25, 1969.

[5]Texas Water Development Board, Water-Level Data From Observation Wells in the Northwestern Gulf Coastal Plain of Texas, by James W. Howard, Report 70 (Austin: Texas Water Development Board, 1968), pp. 205-206.



HYDROGRAPHS OF SELECTED WELLS IN ZAVALA AND UVALDE COUNTIES AND PRECIPITATION AT UVALDE*

*AS SEASONAL FLUCTUATIONS MAY CAUSE CONSIDERABLE VARIATIONS IN WATER LEVELS, MEAN ANNUAL MEASUREMENTS WERE USED IN CONSTRUCTING REPRESENTATIVE HYDROGRAPHS.
DEPICTED HYDROGRAPHS WERE SELECTED AS REPRESENTATIVE EXAMPLES OF AREA WELLS ON THE BASIS OF THEIR GENERAL FLUCTUATION PATTERNS AND PERIOD OF RECORD.
INSUFFICIENT DATA PREVENTED THE CONSTRUCTION OF A HYDROGRAPH FOR A WELL IN THE CRYSTAL CITY-CARRIZO SPRINGS AREA.

CALCULATED FROM: TEXAS WATER DEVELOPMENT BOARD, WATER-LEVEL DATA FROM OBSERVATION WELLS IN THE NORTHWESTERN GULF COASTAL PLAIN OF TEXAS, BY JAMES W. HOWARD, REPORT TO (AUSTIN, TEXAS) TEXAS WATER DEVELOPMENT BOARD, 1968, PP. 183-198 AND 191-192, TEXAS BOARD OF WATER ENGINEERS, RECORDS OF WATER-LEVEL MEASUREMENTS IN KINNEY, UVALDE AND VAL VERDE COUNTIES, TEXAS, 1929 TO MARCH, 1956, BY C. R. FOLLETT, BULLETIN 5611 (N. P.: TEXAS BOARD OF WATER ENGINEERS, 1956), PP. 38-40, AND RECORDS OF U.S. GEOLOGICAL SURVEY, SAN ANTONIO, TEXAS.

Fig. 20

several wells in the vicinity of Crystal City were being pumped from 500 to 600 feet.[6] Comparable pump settings are occasionally found in the area today.

Declining well levels are a problem of much concern in the more recently developed Batesville-Frio Town region. Although adequate records of water level measurements are largely lacking for wells tapping the Carrizo sand in this area, such limited records as are available indicate that there has been a considerable decline in the artesian surface locally since the end of World War II. The greatest declines have taken place around Batesville where the water level in well 77-03-301 fell seventy-two feet from 1957 to 1966 (an average annual decline of eight feet).

The decline of water levels in Zavala and Dimmit counties is one of the most serious problems facing area farmers. Figure 21 indicates that between 1929-1930 and 1965 water levels declined from zero to thirty feet on the outcrop of the Carrizo sand. During this same period, declines of over 320 feet were recorded east of Crystal City along the intensively cultivated Nueces River floodplain.

Unlike their counterparts in Zavala and Dimmit counties to the south, Uvalde County farmers, drawing water from the relatively undeveloped western end of the Edwards underground reservoir, are not plagued by rapidly declining well

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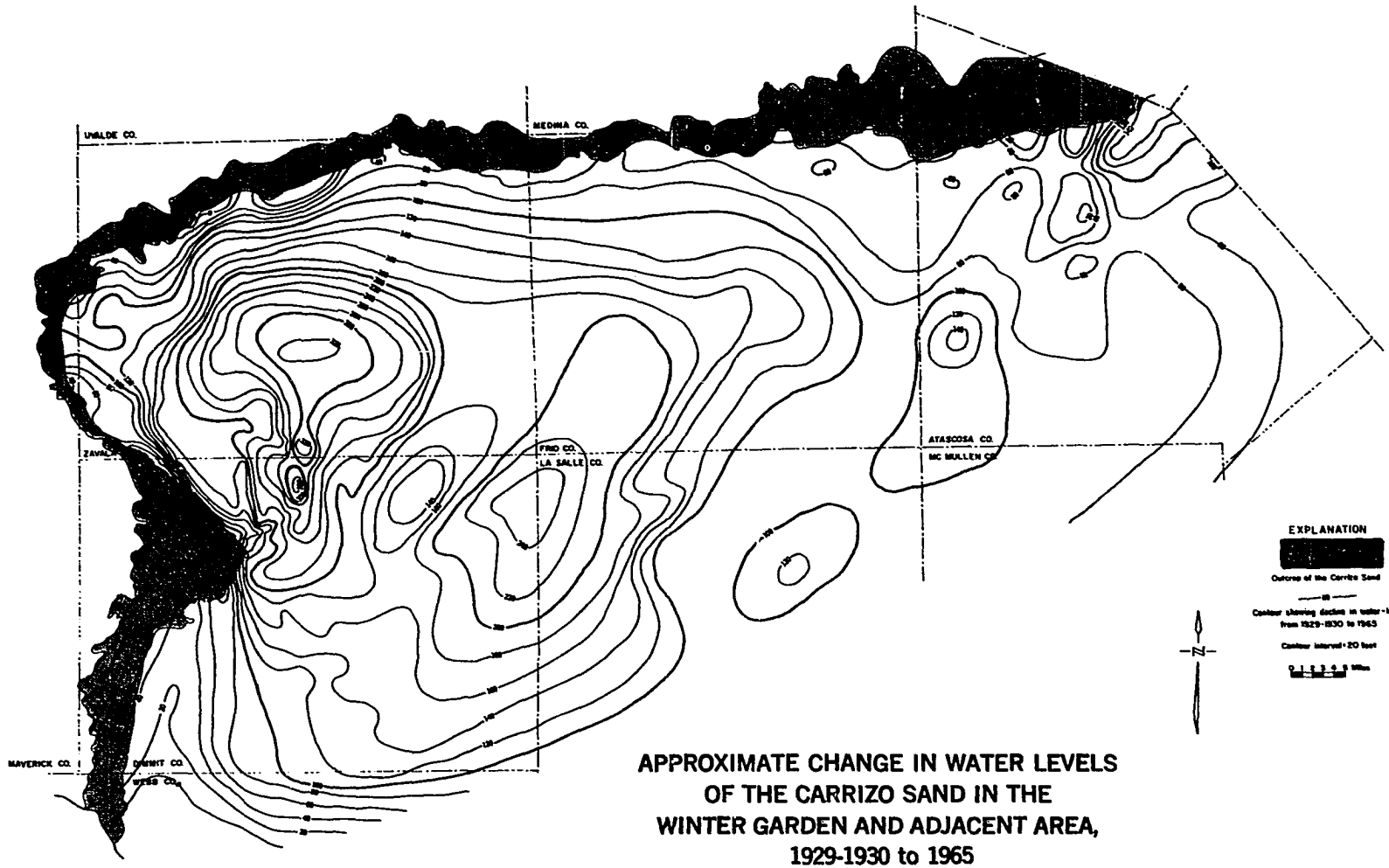
[6]Personal interview with F. W. Pulliam, former Manager, Zavala-Dimmit Counties Water Improvement District No. 1, Crystal City, Texas, June 3, 1968.



APPROXIMATE CHANGE IN WATER LEVELS OF THE CARRIZO SAND IN THE WINTER GARDEN AND ADJACENT AREA, 1929-1930 to 1965 (PRELIMINARY COPY)

MAP BY ROBERT L. BLUNTZER, GEOLOGIST
(COURTESY TEXAS WATER DEVELOPMENT BOARD)

Fig. 21

levels. In fact water is not even considered a significant problem by area growers at the present time. Although farmers, especially those in the eastern portion of Uvalde County, must often pump from considerable depths to obtain water, pumps are generally set at less than 100 feet. The hydrograph of well H-5-1 indicates that well levels, except for a period during the drought of the 1950's, have generally fluctuated between thirty and eighty feet. Underground water is both shallow and plentiful. Wells yielding 1,000 gallons per minute (gpm) are common in the Edwards; however, it should be noted that due to the faulted nature of the aquifer, wells only a few hundred yards apart may vary considerably in the quantity of water they produce.[7]

Although Uvalde County contributes over 40 per cent of the total annual recharge of the Edwards underground reservoir, discharge within the county is minimal. In 1967 a total of 80,900 acre-feet of ground water was discharged from the Edwards aquifer in Uvalde County. Agriculture (83.9 per cent) and spring flow (8.7 per cent) accounted for over 92 per cent of this discharge figure. During this same period a total of 557,400 acre-feet of ground water was discharged from the Edwards and associated limestones. Over half of this figure, or 239,700 acre-feet of ground water,

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[7]Personal interview with R. V. Raney, Owner, Raney's Windmills, Pumps and Well Supplies, Uvalde, Texas, February 7, 1969.

was discharged in Bexar County alone.[8]

It is with good reason that Uvalde County vegetable growers consider Bexar County, and more specifically San Antonio, to be the major threat to their future water supplies. San Antonio's 587,718 (1960) inhabitants represent an increase of almost 44 per cent over the 1950 population of 408,442. All of San Antonio's water supply is currently obtained from wells tapping the Edwards aquifer.[9] As the city continues to expand, it will impose even greater demands upon the Edwards aquifer for its municipal and industrial water requirements.

As has been noted, farmers drawing water from the Carrizo sand are faced with the problem of declining well levels. These declines, the result of overdevelopment of the Carrizo aquifer, are largely due to Texas' lack of legislation regarding regulation of ground water withdrawals. In 1904 the Texas Supreme Court in Houston and Texas Central Railroad vs. East ruled that percolating ground water is a part of the soil and as such belongs to the landowner. The Court held that landowners are within their rights to withdraw

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[8]Edwards Underground Water District, Ground-Water Discharge from the Edwards and Associated Limestone, San Antonio Area, Texas, 1968, by Paul Rettman, prepared in cooperation with the U.S. Geological Survey, Edwards Underground Water District and the Texas Water Development Board, Bulletin 17 (San Antonio: Edwards Underground Water District, 1968), p. 2.

[9]Letter from William L. Groff, City Water Board, San Antonio, Texas, February 3, 1969.

at any time any quantity of water desired as long as reasonable and legitimate (beneficial) use is made of the water taken.[10] As no Texas court has ever departed from the absolute ownership policy, this decision is still the basis for ground water ownership in Texas.[11]

Conservation Efforts

Programs designed to maintain present water supplies and insure adequate future supplies are operative in both the Northern and Southern districts of the Winter Garden. The Zavala-Dimmit Counties Water Improvement District No. 1, chartered in 1924, embraces approximately 18,723 acres of land along the Nueces River east of Crystal City (Figure 22). Organized to provide water for irrigation to local farmers, the District is governed by a five man board of directors.

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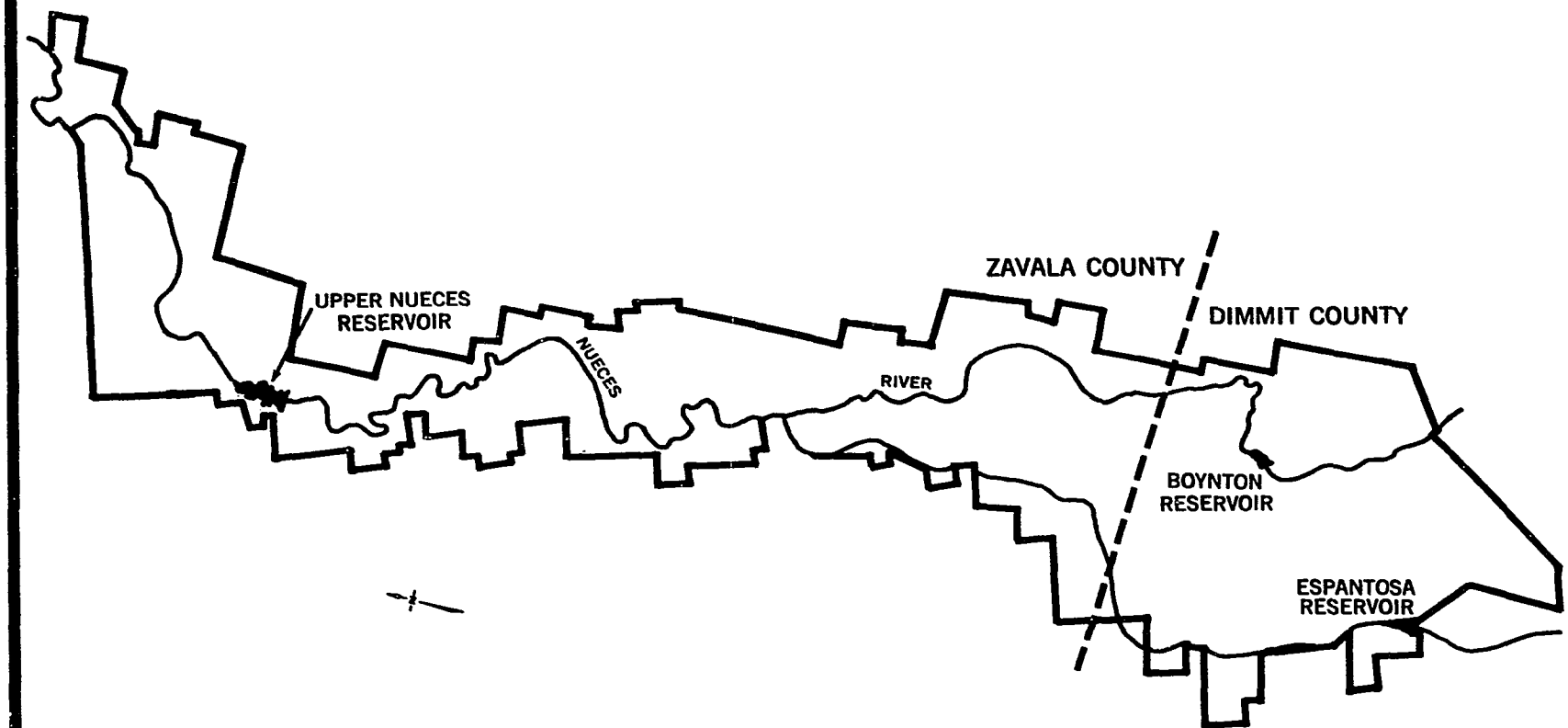
[10] Corpus Christi vs. Pleasanton decided by the Texas Supreme Court in 1955 is the most significant case in recent years to deal with Texas ground water law. This decision has far reaching implications for irrigated agriculture in the Winter Garden area. In this case the Court ruled that the city of Corpus Christi, which had access to four wells in Atascosa County, was legally entitled to take water from these wells, divert it into a nearby stream, and transport it via the Nueces River some 118 miles downstream for municipal use. Despite the fact that an estimated 60 to 75 per cent of the water transported was lost through evaporation and seepage, waste was not considered to have occurred since the water was intended for beneficial purposes. Preceeding discussion based on data presented in U.S., Congress, House, Report of the U.S. Study Commission-Texas, H. Doc. 494 Pt. 2, 87th Cong., 2nd sess., 1962, p. 329.

[11] Arthur P. Duggan, "Texas Ground-Water Law," Proceedings Water Law Conference, sponsored by the School of Law, the University of Texas (Austin, November 20-21, 1952), p. 13.

THE ZAVALA-DIMMIT COUNTIES WATER IMPROVEMENT DISTRICT NO. 1



SCALE

1 INCH: 3,000 FEET

SOURCE: LEANDER WAGNER, TAX ASSESSOR-COLLECTOR-BOOKKEEPER, ZAVALA-DIMMIT COUNTIES WATER IMPROVEMENT DISTRICT NO. 1.

Fig. 22

This group, elected by District members, is empowered to set the rates, collect taxes, and make expenditures as necessary for the successful operation of the District.

The District owns, operates, and maintains three dams within the Nueces River watershed. The Upper Nueces Reservoir (capacity 7,590 acre-feet), located approximately six miles north of Crystal City on the Nueces River, is the District's major storage facility (Plate 13). Water is released through

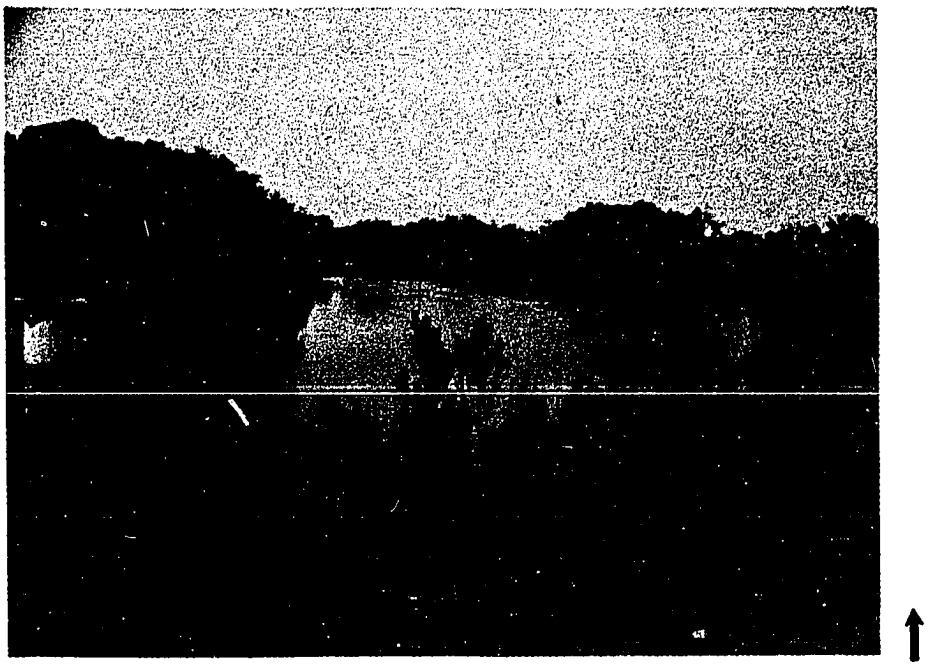


Plate 13--The Upper Nueces Reservoir as viewed from atop the dam.

the Upper Dam as needed to keep the Boynton (capacity 2,984 acre-feet) (Plate 14) and Espantosa (capacity 1,745 acre-feet) (Plate 15) reservoirs full. Although the District is allowed to impound storm waters as needed, natural stream flow cannot legally be obstructed.

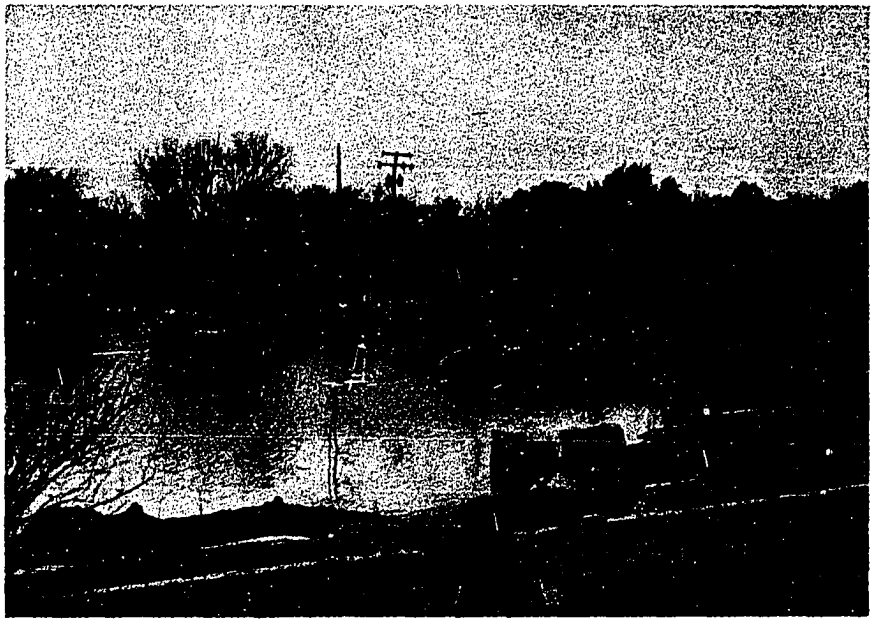


Plate 14--A portion of the Boynton Reservoir and dam. Note the elevated electric pumping plants. The concrete structures in the foreground represent a portion of the original distribution system for Boynton's Winter Garden Ranch land development project.

Plate 15--Espantosa Reservoir as viewed from a point near the dam. This reservoir was formed by the damming of Espantosa slough (a partially abandoned meander of the Nueces River).

During 1968 the District tax rate was $.50 per $100 land valuation. All acreage within the District is classified as either irrigable (valued by the District at $126 per acre) or brushland (valued by the District at $15 per acre). As the District is free of bonded indebtedness, the taxes levied are used for the maintenance of the three dams and adjacent levees and for administrative expenses. The District, which presently has a reserve of some $52,000, expects to reduce the tax rate to $.25 per $100 in 1969.

Landowners are allowed to withdraw unlimited quantities of water for irrigation purposes as long as supplies are available from District reservoirs (Plate 16). Occasionally the District's water supplies are exhausted by expanded acreages or extended periods of sub-normal precipitation. In such instances growers are forced to rely upon their own deep wells for their water needs. These wells, known locally as "standby" wells, tap the Carrizo sand (Plate 17).[12]

The Edwards Underground Water District, established in 1959 by the Texas legislature "to conserve, preserve, protect and increase the recharge of and prevent the waste and pollution of the underground" reservoir, includes all of Uvalde County, most of Medina and Bexar counties and a small portion of Comal and Hays counties (Figure 23).[13] The

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[12]Information regarding the Zavala-Dimmit Counties Water Improvement District No. 1 obtained from Leander Wagner, personal interview.

[13]Edwards Underground Water District, The Edwards

Plate 16--Water is taken from area reservoirs by electrically powered pump units such as this one at Bermuda.

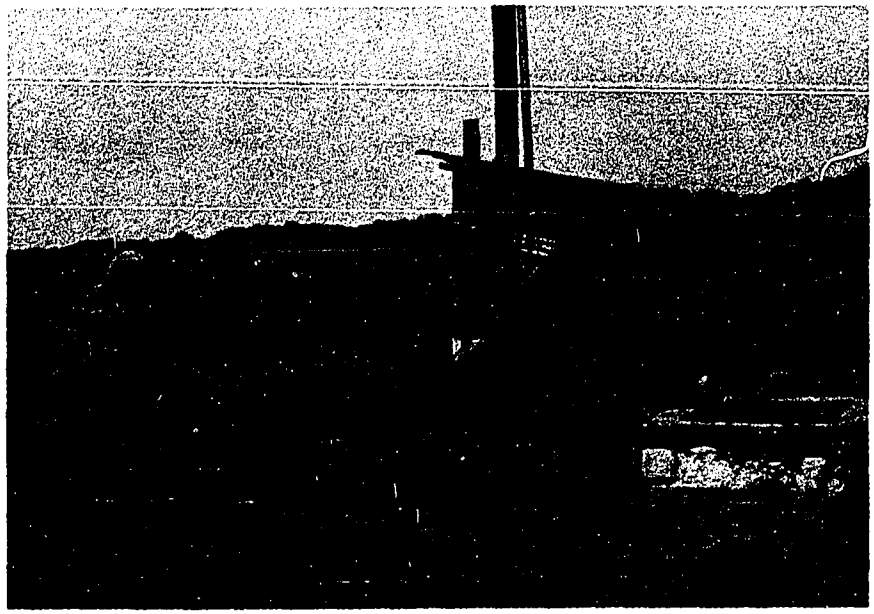

Plate 17--This "standby" well is located adjacent to the Nueces River (tree line in background) approximately three miles southeast of Crystal City. Water, pumped into the concrete structure at the bottom right of the photograph, is distributed to the upper end of the field via ditches.

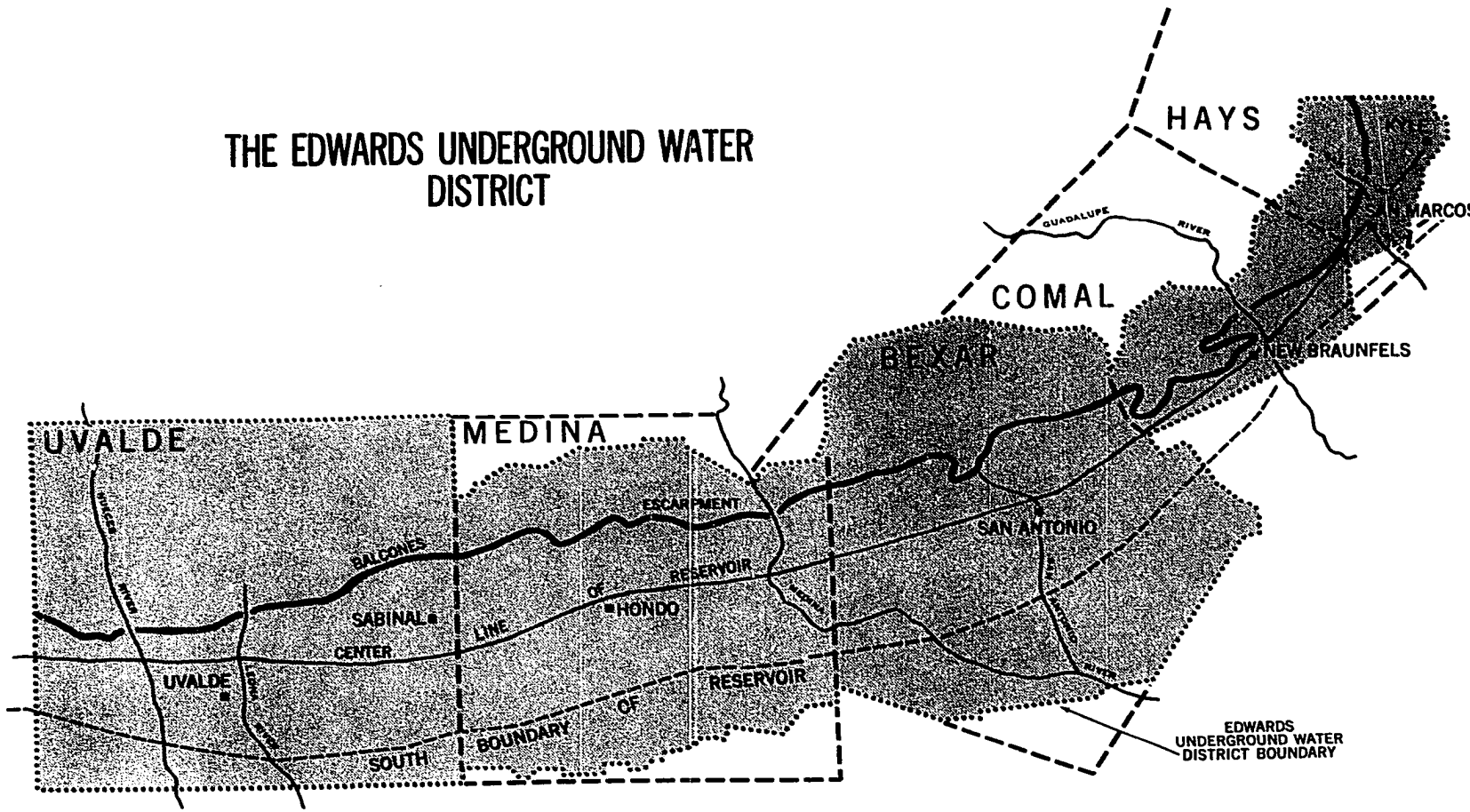

Fig. 23

SOURCE: EDWARDS UNDERGROUND WATER DISTRICT.

District, governed by a fifteen member board of directors (three directors from each of the member counties), is empowered by statute to acquire land through purchase, through securing easements, or by the right of eminent domain for the purpose of erecting and/or equipping recharge facilities, and to conduct surveys and develop plans relative to the accomplishment of District purposes. Operating funds are derived from a tax of $.02 per $100 property valuation levied on District residents.[14]

The possibility of artificially recharging area aquifers has been the subject of much conversation among Winter Garden residents during the last fifty years. One of the earliest attempts at artificial ground water recharge in the Winter Garden occurred in March, 1926 when F. W. Pulliam and F. M. Getzendaner supervised the pumping of water from Caymanche Lake into a nearby irrigation well tapping the Carrizo aquifer. Although accurate intake measurements were not recorded, overall results indicated that the Carrizo sand was capable of absorbing large quantities of water.[15] In 1926 water was at or near the surface throughout most of the Winter Garden region. Because water was readily available

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Underground Water District and Edwards Underground Reservoir (San Antonio: Edwards Underground Water District, n.d.). p. 6.

[14]Fred Mason and Grady Mahaffey, personal interview.

[15]F. M. Getzendaner, "Replenishing Carrizo Sand Water," Catarina, Texas, 1953, pp. 2-3. (Mimeographed.)

and relatively inexpensive to obtain, the recharge experiment drew little notice from area farmers.

Since the drought of the 1950's a few individuals, recognizing the implications of the continually declining piezometric surface, have taken it upon themselves to try and implement some type of artificial recharge program. The most recent experiment involving artificial recharge of the Carrizo aquifer was conducted approximately six miles northeast of Carrizo Springs on the Albert Ivy farm in the summer of 1966. During the sixty-two hour test period, the recharge absorption rate was continuously in excess of 1,000 gpm. Conclusions reached by those in charge of the experiment indicate that recharge of the Carrizo aquifer is feasible.[16]

Application is presently being made by the Carrizo Sand Water Group for a $175,000 grant from the Economic Development Administration (U.S. Department of Commerce) to construct a demonstration feasibility project. Project plans call for three wells, one-half of a mile apart, to be drilled into the Carrizo sand. Two of these wells, complete with a filtering system, will be employed in recharge activities. The third well is to be used for observation purposes.[17]

Attempts to artifically recharge the Edwards aquifer

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[16]Personal interview with William C. Davidsson, Project Co-ordinator, Urban Renewal Agency, Crystal City, Texas, October 15, 1968.

[17]Personal interview with Sam Anderson, Executive Director, Urban Renewal Agency, Crystal City, Texas, October 14, 1968.

began during the drought of the 1950's. To date most recharge projects have been concerned with building impounding structures to divert floodwaters into the fractured limestones of area stream beds.

One of the most notable recharge efforts in Uvalde County is on the Fred Mason ranch. The recharge project, one of the thirteen in Uvalde County, is located on intermittent Indian Creek, a tributary of the Nueces River, some twenty miles north of Uvalde. The facility consists of a dam, two grates, and a protective fence. The dam, situated approximately forty feet downstream from the grates, is 243 feet long and has a maximum height of eleven feet. Two grates constructed of two-inch concrete filled tubing prevent large logs and rocks from entering the injection shafts (Plate 18). The chain link fence located north and east of the grates provides these structures with further protection from debris-filled flood waters. All water impounded by the dam is diverted to the grate area by a channel cut below grade (Plate 19). Accumulated debris is removed from the fence and grates by fire after each recharge period.[18] Although long term data regarding recharge by the Mason facility are not available, Welder and Reeves of the United States Geological Survey estimated recharge during an eleven hour period in May, 1957, at 290 acre-feet.[19]

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[18]Fred Mason, personal interview.

[19]U.S., Department of the Interior, Uvalde County, Texas, p. 32.

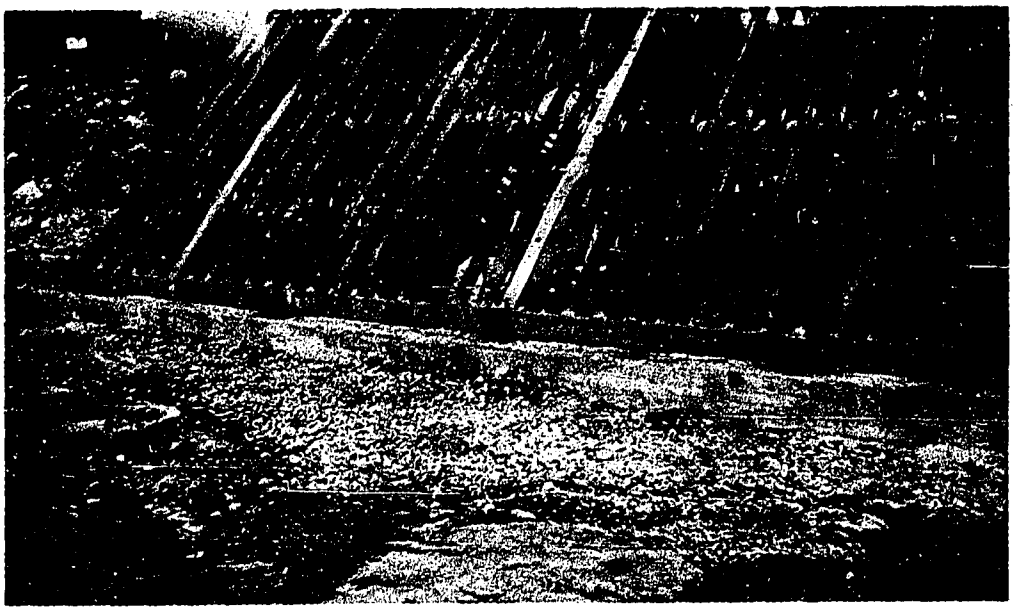

Plate 18--Protective grating overlying recharge injection shaft. (Photograph courtesy of Fred Mason.)

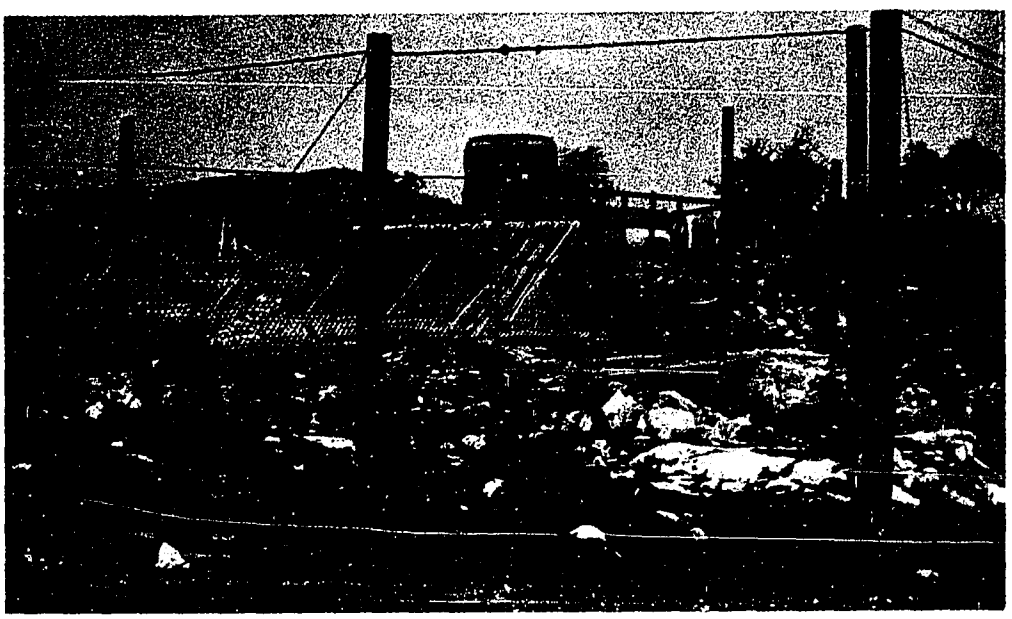

Plate 19--Upstream portion of the Mason recharge facility. (Photograph courtesy of Fred Mason.)

Efforts to conserve water are being made both locally and at the state level. The recently released Texas Water Plan proposes to divert 200,000 acre-feet of water from the Rio Grande near Eagle Pass to provide irrigation water for approximately 232,600 acres of potentially irrigable land in the Winter Garden and adjacent areas. Water diverted from the Rio Grande would be replaced in the Lower Rio Grande Valley area by water from the Coastal Canal (a proposed series of connecting artificial and natural waterways extending from humid northeast Texas to the semi-arid Lower Rio Grande Valley).[20]

The High Costs of Obtaining Water

During the period prior to the Depression and to a lesser extent through World War II, many area vegetable farmers preferred to lease rather than buy land. Lease arrangements varied, but as a rule the grower was granted the use of a designated acreage for a period of five years. In return, the grower was required to clear the land and drill and equip a specified number of producing wells (generally one well for every 150 to 200 acres of land). This was an ideal arrangement for both the vegetable farmer and the landowner. The poor vegetable farming practices so prevalent in the area prior to World War II rendered the

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[20]Personal interview with Paul T. Gillett, Agricultural Specialist, Texas Water Development Board, Austin, Texas, February 7, 1969.

land practically worthless for the production of vegetable crops by the end of the fifth year. This was of little concern to the lessor, usually a rancher, who upon termination of the lease possessed both cleared pasturage and deep water wells.

The labor required to clear the land was cheap, wells were relatively inexpensive to install; and water, although rarely flowing, was shallow and could easily be obtained with low horsepower pumps. Costs to the grower usually amounted only to the expenses involved in well installation (generally less than $10,000) as most of his clearing costs were returned from the sale of firewood. With a potential for profit many times this amount, well costs were a small price to pay for the use of another's land.[21]

Conditions today are quite different. The once shifting vegetable acreages have been more or less stabilized by the ever-increasing expenses involved in buying and clearing land and acquiring irrigation water. Buying land is one of the vegetable growers greatest expenses. Although brushland suitable for irrigation may generally be purchased for between $75 to $100 an acre, farmers can expect to pay from $250 to $500 an acre for land previously cleared and equipped with deep wells. The area's highest priced acreages are found along the Nueces River east of Crystal City where both surface and ground water are available. Average costs per

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[21]F. W. Pulliam and Grover C. Jackson, personal interviews.

acre are considerably less in the Uvalde ($350), Batesville ($300), and Carrizo Springs ($200) sectors of the Winter Garden.[22]

If brushland is purchased, the land must be cleared and graded. Today bulldozers do in days what it once took hand labor weeks to accomplish. Although varying considerably with quantity and size of brush, land in the Winter Garden can be mechanically cleared and graded, at an average cost of $60 per acre (Plate 20).[23]

Plate 20--Recently cleared area two miles west of Batesville being prepared (graded) for irrigation.

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[22]Personal interviews with M. O. Cardin, abstractor, Paul J. Little, Attorney at Law, Crystal City, Texas, March 21, 1969, and Josh Ashby, retired banker, Ashby and Garner Company, Uvalde, Texas, March 21, 1969.

[23]Personal interview with Joe Miller, Area Engineer U.S. Department of Agriculture, Soil Conservation Service, (Area 23), Uvalde, Texas, March 20, 1969.

The single most important factor responsible for the stabilization of vegetable acreage has been the increased cost of obtaining water. The average cost of a fully equipped irrigation well installed in the Winter Garden area in 1967 was approximately $30,000. Average well costs might be broken down as follows: (1) $10 to $13 per foot to drill a well twelve inches in diameter (average expenditure for drilling a well in the area is $10,000), (2) $7,000 to $10,000 to purchase and install a deep-well turbine pump, (3) $7,000 to $10,000 to purchase and install a natural gas power plant. Average life expectancy of the pump and power plant, with an overhaul in the fifth year of operation, is ten years.[24]

During an average winter season one well will supply irrigation water to between 250 and 300 acres of land. High evaporation rates during the summer months reduce this figure to approximately 100 acres.[25]

Although electricity, gasoline, and diesel fuels have been used in the past, virtually all of the deep wells installed in the Winter Garden within the last fifteen years utilize natural gas as the source of power. Rates on natural gas, the cheapest fuel available to area farmers, vary from $.15 to $.55 per 1,000 cubic feet. Older contracts, which

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[24]Personal interview with Fred W. Miller, Owner, Zavala Pump and Engine Company, Crystal City, Texas, February 4, 1969.

[25]Personal interview with William W. Ballard, Partner, Able Irrigation Company, Uvalde, Texas, September 28, 1968.

reflect the lower rates, are, upon expiration, being replaced by contracts calling for the $.55 rate.

As indicated by Table 13 the fuel costs required to bring an acre-foot of water to the surface fluctuate considerably depending upon well location, pumping depth, and yield. Although these expenditures vary from one dollar near Uvalde to over four dollars in the Sabinal area, it is important to note that these figures represent only a portion of the total costs involved. When equipment is depreciated over a ten year period, per acre-foot water costs increase appreciably. The total delivered cost of an acre-foot of water from the Carrizo sand in the Crystal City area ranges from six dollars to seven dollars. Total per acre-foot expenditures (fuel, District taxes, and equipment depreciation) for water by farmers in the Zavala-Dimmit Counties Water Improvement District No. 1 average approximately two dollars.[26]

The advantages of farming in the Uvalde or Batesville area are several. Uvalde growers have access to shallow water from an easily rechargeable aquifer. Farmers near Batesville acquire their water from the Carrizo sand and/or, except during extended periods of drought, the Leona formation. Tight soils and the moderately mineralized nature of the Leona water prohibits its exclusive use by area growers. Farmers generally mix the waters of the Leona and Carrizo

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[26]Fred W. Miller, personal interview.

TABLE 13

APPROXIMATE FUEL COSTS REQUIRED TO ACQUIRE WATER IN THE WINTER GARDEN AREA, 1967-1968[a]

Area	Average Depth From Which Water Is Drawn (in feet)	Average Well Yield (gpm)	Average Size Pump (horsepower)	Average Fuel Costs[b] For One Acre-Foot Water (in dollars)
Uvalde	80	1,200	40	1.00
Sabinal	400	2,000	270	4.03
Batesville (Carrizo sand)	250	1,000	100	2.99
Batesville (Leona formation)	70	750	25	1.86[c]
Crystal City	350	1,000	125	3.73
Zavala-Dimmit Counties Water Improvement District No. 1[d]	30	1,500	20	.91[c]

[a]Source: Computed from data acquired through personal interviews with Fred W. Miller, owner, Zavala Pump and Engine Company, Crystal City, Texas, February 4, 1969; R. V. Raney, owner, Raney's Windmills, Pumps and Well Supplies, Uvalde, Texas, February 7, 1969; and Leander Wagner, Tax Assessor and Collector-Bookkeeper, Zavala-Dimmit Counties Water Improvement District No. 1, Crystal City, Texas, February 6, 1969.

[b]Figures are for natural gas (at $.55 per 1,000 cubic feet rate) unless otherwise indicated.

[c]Electricity.

[d]Surface water.

formations (Plate 21). This practice maintains soil fertility and substantially reduces total water costs.

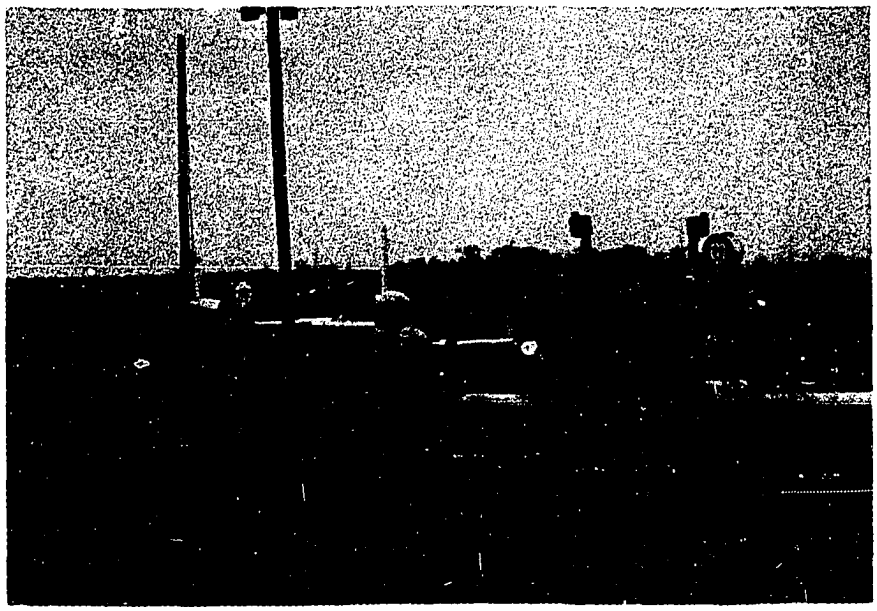

Plate 21--Farmers in the Batesville area use natural gas powered pumping plants (foreground) to obtain water from the Carrizo sand. Small electrically powered pumps (background) are used to draw water from the shallow Leona formation.

Water Utilization

Once water has been brought to the surface it is transported to the upper (higher) end of the field and distributed. With the exception of the larger spinach growers, most of whom still flood irrigate (Plate 22) and Del Monte which uses sprinkler systems, water is applied to all Winter Garden vegetable crops by furrow irrigation.

In the past, vegetable growers have tended to apply water to the individual furrows by means of siphon tubes. As each tube must be primed by hand (Plate 23), this is not only slow but, with today's wage scale, quite expensive.

Plate 22--Flood irrigating spinach approximately three miles southeast of Crystal City. (Photograph courtesy of Dale Barker.)

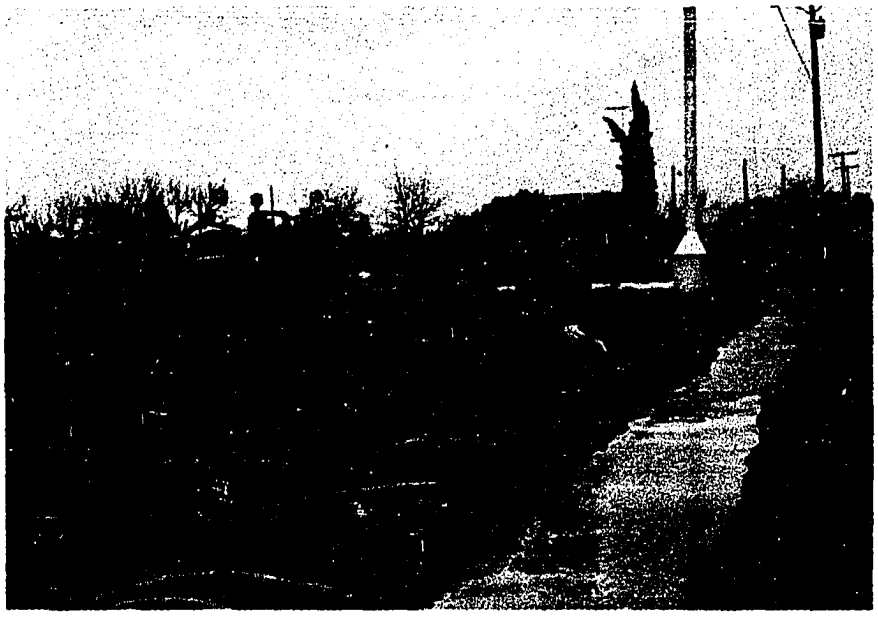

Plate 23--Irrigating with siphon tubes is a slow and backbreaking task.

Depending upon tube number and diameter, an experienced irrigator, working steadily, can water between ten and twenty acres of land per day. As equipment costs are minimal, this method of application is the most popular means of irrigating vegetable crops in the Winter Garden at the present time.

Within the last five years there has been a trend among area vegetable growers toward the use of gated aluminum pipe (Plate 24). Use of this portable lightweight pipe with its adjustable openings (gates) eliminates the need for open ditches with their attendant weed and seepage problems and allows farm equipment more freedom of movement in the fields. Although a high initial investment of approximately fifty-six dollars per acre is required to set up the system, the savings realized through reduced labor costs return the operator most of his investment within the first few seasons of operation.[27]

Except for Del Monte and an adjacent farming operation, sprinkler irrigation is non-existent in the Winter Garden (Plate 25). These systems, well adapted to rolling topography and sandy soils, are relatively common on the peanut acreages of Frio, Atascosa, and northwestern La Salle counties. To set up a sprinkler irrigation system in the Winter Garden requires an investment of approximately $125 per acre. Due to the system's many movable parts, maintenance costs are quite high. Constant care must be taken to

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[27]William W. Ballard, personal interview.

Plate 24--Care must be taken when irrigating with gated pipe to see that all gates are opened properly. Carelessness in adjusting gate openings generally results in uneven watering and considerable waste in the form of excess tailwater.

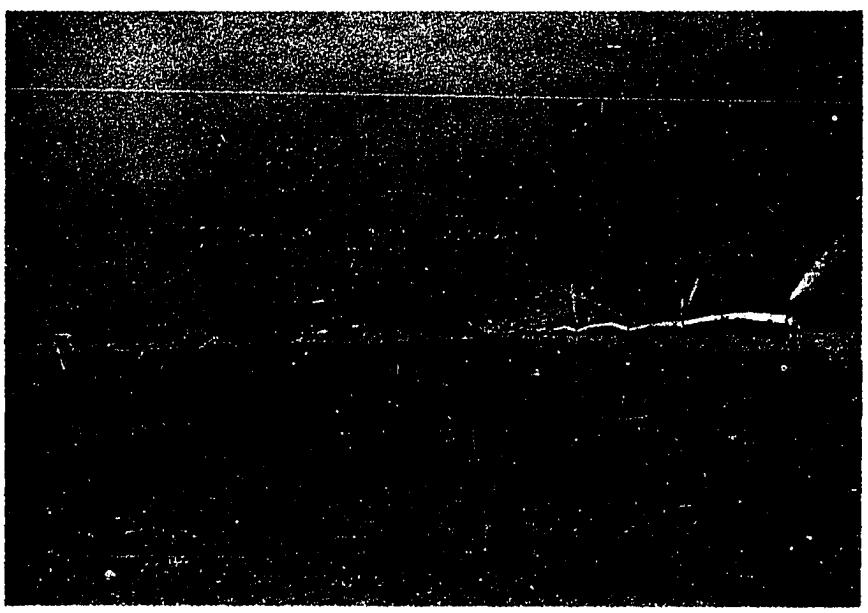

Plate 25--A self-propelled sprinkler irrigation system in operation approximately eleven miles northeast of Crystal City.

prevent dust, dirt, and accumulations of calcium carbonate from clogging sprinkler tips. Vegetable farmers are neither willing nor able to make the investment required to install and maintain these systems at the present time.[28]

From a hydrological standpoint the Winter Garden may be divided into two distinct sections: (1) a southern area underlain by the Carrizo aquifer, and (2) a northern area underlain by the Edwards aquifer. Farmers who draw water from the Carrizo aquifer, once noted for springs and flowing wells, often find it necessary to pump water from depths in excess of 300 feet. Farmers who get water from the Edwards aquifer are more fortunate than their counterparts to the south. Although the faulted nature of the aquifer produces widely varying conditions locally, most wells in the Edwards aquifer draw water from less than 200 feet.

Long term overdevelopment of the Carrizo aquifer and rising labor and equipment costs have appreciably increased farmer expenditures required to obtain irrigation water. Although expenditures for water vary widely with the individual farmer's location and type of farming operation, approximately 30 per cent of the average Winter Garden vegetable grower's pre-harvest production costs are budgeted for the acquisition of needed irrigation water.[29] At present

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[28] Ibid.

[29] Personal interview with John D. Carpenter, Farm Foreman III, Texas A&M University, Rio Grande Plains Research-Demonstration Station, Winter Haven, Texas, March 21, 1969.

efforts to reduce these costs are limited to the installation of labor saving irrigation equipment. Programs to increase available water supplies include local ground water recharge projects and state plans for surface water diversion from the Rio Grande.

CHAPTER V

LABOR AND THE VEGETABLE PRODUCER

Development of the Labor Pool

Early Movements, 1900-1940

Persons of Mexican descent have long provided the base of South Texas' agricultural labor force. Ranchers during the late 1800's employed Mexican vaqueros (cowboys) and pastores (sheep handlers-herders and the seasonal shearers). With the development of irrigated farming, the demand for agricultural labor, especially field hands, increased. Despite the influx of laborers during the early years of the twentieth century, the Winter Garden contained few permanent Mexican residents prior to the "spinach boom" of the early 1920's.

Onions, which preceded spinach as the area's most prominent vegetable, were, with respect to labor, a "short season" crop. Although considerable numbers of workers were required for the fall transplanting (three to four weeks) and spring harvesting (approximately six weeks) activities, the interim period offered little opportunity for employment. Most of the labor used in area vegetable fields during the

onion era (c. 1900-1930) was seasonally contracted by individual farmers from Mexico.

As spinach acreages expanded during the early 1920's the need for workers became so great that area growers, although continuing to contract labor from Mexico, actually encouraged Mexican families to establish permanent residence in the Winter Garden area. Response to these efforts was so favorable that by 1926 Crystal City spinach producers ceased to contract labor from Mexico.[1]

Until the end of World War II most vegetable farmers produced only one crop a year. Growers spent the summer months cultivating the land and preparing it for the next season's crop. Laborers, unable to find work locally during this period, were forced to migrate. Most of the early migrants, lacking both transportation and information concerning employment opportunities, were organized into crews by labor contractors. These crews followed the cotton harvests which began in the Coastal Bend area in late June or early July and ended in northwest Texas in October or November. Few of the early migrants ever left Texas.[2]

By the late 1920's increasing numbers of Mexican

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[1]Selden C. Menefee, Migratory Workers of South Texas, prepared by the Federal Works Agency, Works Projects Administration (Washington, D.C.: Government Printing Office, 1941), p. 3.

[2]George O. Coalson, "The Development of the Migratory Farm Labor System in Texas: 1900-1954" (unpublished Ph.D. dissertation, University of Oklahoma, 1955), p. 44.

families were able to afford their own automobile or truck. During the summer months many of these families, no longer dependent upon the labor contractor for transportation, began migrating to the relatively higher paying jobs in the sugar beet and vegetable fields of north central United States.[3]

About 1932, returning workers began experiencing difficulty in finding consistent winter employment. The Depression had reduced both the size of the market and the prices paid for spinach. In addition, spinach farmers were faced with diseases (curly top and blue mold), occasional frosts, and an almost uncontrollable weed problem. The growers had little choice but to reduce both acreages and wages.[4]

During the Depression most Mexican families depended upon the monies they received from cotton and sugar beet work to tide them through the lean winter months (Table 14). The ability of the Winter Garden laborer to dovetail spinach, onion, cotton, and sugar beet work kept all but a few Mexican families employed during the Depression years. Although there was some Mexican emigration from the Winter Garden region during this period, most families remained in the area and took what little work they could get in the vegetable fields.[5]

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[3] Ibid., p. 46.

[4] Menefee, Workers, pp. 9-10.

[5] Ibid., p. xiii.

TABLE 14

SUMMARY OF MEDIAN EARNINGS AND HOURS IN VARIOUS TYPES OF WORK OF CRYSTAL CITY MIGRANTS, 1938[a]

Type of Work	Number of Families Employed	Average Family Cash Earnings	Average Individual Weekly Earnings	Average Hours Per Week	Average Duration of job (days)
Total	300	$506	$4.53	43	86
Spinach	277	$124	$3.13	40	79
Beets	188	400	6.33	49	196
Cotton	100	278	4.22	47	85
Onions	89	43	5.43	46	44
Other farm	35	71			
Nonfarm:					
Private employment	49	97	3.75	49	90
Emergency government employment	13	208	6.00[b]	30	132

[a]Selden C. Menefee, Migratory Workers of South Texas, prepared by the Federal Works Agency, Works Projects Administration (Washington, D.C.: Government Printing Office, 1941), p. 56.

[b]Allows for time lost.

Importation of Mexican Labor, 1941-1964

With the United States' entrance into World War II in 1941, vegetable acreages were increased appreciably, and Mexican workers were once again able to find winter employment. As in the past, the warmer seasons of the year brought about increased demands for agricultural labor throughout much of the United States. Labor shortages were widespread during the spring and summer of 1942, as many of the nation's farm workers left the fields for the military and higher paying jobs in industry.

The widespread demand for farm labor resulted in an agreement between the United States and Mexico in August, 1942 which provided for the temporary employment of Mexican nationals in United States agriculture. The agreement was later supplemented by Public Law 45 in April, 1943. This legislation, as subsequently amended, provided for the federal government to authorize "the expenditure of public funds for recruitment, transportation, placement, and supervision of foreign workers."[6] Texas, accused by Mexico of exploiting and discriminating against its nationals, was not allowed to legally receive workers between 1942 and 1947.[7]

Although Public Law 45 did not expire until the end of 1947, the importation of Mexican workers ceased during the

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[6]U.S. President's Commission on Migratory Labor, Migratory Labor in American Agriculture (Washington,D.C.: Government Printing Office, 1951), p. 38.

[7]Ibid., p. 39.

spring of that year. Subsequent agreements between the United States and Mexico provided for legalizing illegal aliens. Over the years numerous Mexican nationals had taken up permanent residence in the United States, and it was Mexico's wish to legalize these individuals since they were already working in the United States. In 1947 approximately 55,000 illegal aliens were legalized in Texas under the terms of an intergovernmental agreement. Except for the period between February, 1948 and August, 1949, this practice of legalizing illegal immigrants was continued up to the passage of Public Law 78 in July, 1951.[8]

Public Law 78 (the Bracero Act), administered by the Department of Labor, was designed both to provide American farmers with an adequate labor supply during the critical pre-harvest and harvest periods and to assure the Mexican government that its nationals would be protected from unscrupulous employers. Agreements were subsequently negotiated between the United States and Mexico which guaranteed the alien worker certain living and working conditions (Appendix IV).

Between July, 1951 and December, 1964, Public Law 78, despite its many drawbacks, provided the basis upon which Mexican agricultural labor was imported into the United States. Throughout its existence the law was maligned by labor unions and farmers as well as numerous other influential

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[8] Ibid., pp. 52-53.

groups in both the United States and Mexico. When one considers the overall unpopularity of the bracero program, it is amazing that the law was in effect for as long as it was. Domestic workers and labor unions opposed the law on the grounds that foreign laborers were guaranteed certain working and living conditions not granted the domestic worker. These groups firmly believed the bracero to be responsible for depressing agricultural wages in the United States.[9] Farmers, for whom the program was intended, were opposed to the law because it required them to guarantee foreign laborers both work and minimum wages. Few farmers could justify in their own minds why they should be required to furnish braceros with such items as housing, fuel, utilities, insurance, and transportation when heretofore such items had always been the responsibility of the worker (Plate 26).[10] Mexican employers and labor unions, alarmed at the growing numbers of young workers annually drawn into the bracero stream, were likewise opposed to a continuance of the program.[11] Through the efforts of these and other groups,

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[9]U.S., Congress, Senate, Committee on Agriculture and Forestry, Extension of the Mexican Farm Labor Program, Hearings, before the Committee on Agriculture and Forestry, Senate, on S. 1207, 83rd Cong., 1st sess., 1953, pp. 97-98.

[10]George O. Coalson, "Mexican Contract Labor in American Agriculture," The Southwestern Social Science Quarterly, XXXIII (December, 1952), p. 231.

[11]David E. Vassberg, "The Use of Mexicans and Mexican-Americans as an Agricultural Work Force in the Lower Rio Grande Valley of Texas" (unpublished M.A. thesis, University of Texas at Austin, 1966), p. 86.

public sentiment against the continuation of the bracero program became so strong that the law was allowed to expire on December 31, 1964.

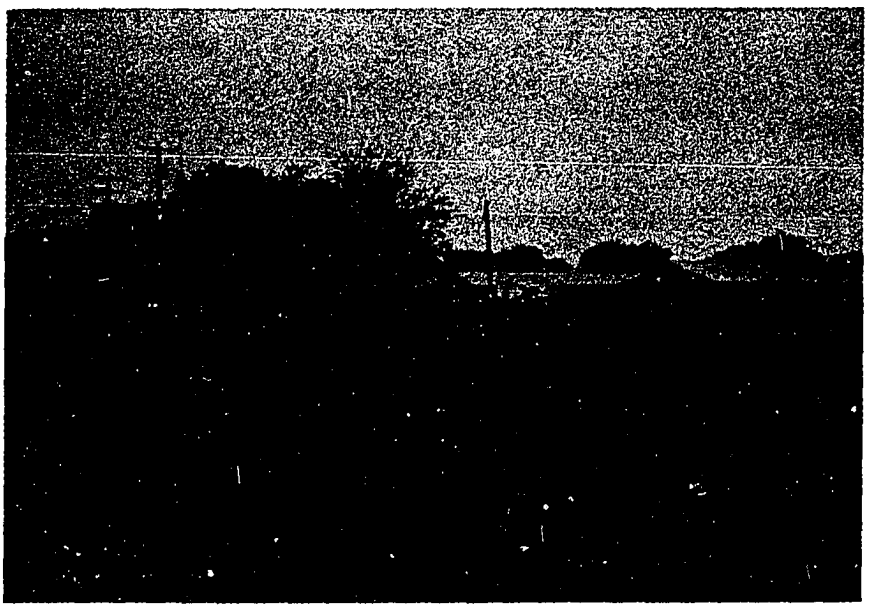

Plate 26--These structures behind Del Monte's farm headquarters were once used to house braceros.

Labor Today

Wages

The furor connected with efforts to terminate Public Law 78 brought the plight of the migratory worker to the attention of the American public. In September, 1966 amendments to the Fair Labor Standards Act of 1938 were approved which extended minimum wage coverage to certain agricultural workers. All agricultural workers engaged in producing goods for interstate commerce are included under the provisions of this act unless they are:

1. Workers who are employed in agriculture by an employer who did not use 500 man-days of farm labor in any calendar quarter of the preceding calendar year;

2. Members of the employer's immediate family;

3. Hand harvest laborers paid piece rates in an operation generally recognized as piece work in the region, if (a) they go each day to the farm from their permanent residence, and (b) they have been employed in agriculture less than 13 weeks in the preceding calendar year;

4. Migrant hand harvest laborers 16 years of age or under and employed on the same farm as their parents, if (a) they are paid piece rates in an operation generally recognized as piece work in the region, and (b) the piece rate is the same as paid workers over age 16;

5. Employees principally engaged in the range production of livestock.[12]

The Act as amended provided for a minimum wage of one dollar an hour effective February 1, 1967. The minimum wage was increased to $1.15 an hour (effective February, 1968) and later (February 1, 1969) to $1.30 a hour.[13] Barring further legislation the minimum wage to be paid agricultural workers will remain at this level. It should be noted that these figures represent the minimum hourly wage an agricultural worker may receive. The wages actually paid individual workers will depend upon geographic location, labor supply, and skills needed.

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[12]U.S., Department of Labor, Wage and Hour and Public Contracts Divisions, Hired Farm Workers under the Fair Labor Standards Act as amended in 1966, Publication 1161 (Washington, D.C.: Government Printing Office, 1966), p. 3.

[13]Ibid., p. 1.

Movements

The termination of Public Law 78 had an immediate and profound effect upon Texas' migratory workers. With the supply of alien laborers removed, employment opportunities for the domestic worker increased. Northern states, unable to obtain adequate seasonal labor within their own borders looked to Texas, a labor surplus area, as a source of supply. Since 1964 out-of-state growers and processors, faced with the prospect of possible labor shortages, have intensified their recruiting efforts in Texas (Table 15).[14]

The number of states employing Texas migrants has risen from twenty-four in 1964 to thirty-nine in 1967 (Table 16). During 1967 the Texas Employment Commission received 2,451 out-of-state requests listing 132,660 job openings. The Commission filled 85,574 of these openings. The Bureau of Labor Statistics, which is responsible for licensing out-of-state recruiters, reported 34,158 agricultural workers leaving the state for temporary employment in 1967.[15]

In addition to out-of-state recruiting, Texas farmers find their labor supply being threatened by industry. Many of those who migrate north each year find unskilled or semi-skilled jobs in industry and do not return to the state.

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[14]Most of these recruiters are representatives of sugar beet companies or fruit and vegetable processors.

[15]Texas Good Neighbor Commission, Texas Migrant Labor - The 1967 Migration, Chapter 1 (n.p.: Texas Good Neighbor Commission, n.d.), p. 3.

TABLE 15

TEXAS MIGRANT LABOR MOVEMENTS, 1962-1967

Year	Total Individuals	Per Cent Change From Previous Year	Total Interstate	Total Intrastate	Intrastate Percentage
1967	158,500	-2	132,300	26,200	17
1966	162,000	-3	129,500	32,500	20
1965	167,000	30	128,500	38,500	23
1964	129,000	1	104,000	25,000	19
1963	128,000	1	95,000	36,800	29
1962	127,000	--	91,000	33,000	26

Source: Texas Good Neighbor Commission, Texas Migrant Labor-The 1967 Migration, Chapter 5 (n.p.: Texas Good Neighbor Commission, n.d.), p.1.

TABLE 16

PRINCIPAL RECEIVING STATES FOR TEXAS MIGRANT LABOR (Total Individuals)

Year	Mich.	Wis.	Ohio	Ill.	Colo.	Idaho
1964	28,598	17,982	21,921	14,841	7,500	15,709
1965	31,681	16,357	25,776	12,326	13,402	14,450
1966	39,800	10,753	17,270	9,506	11,422	9,100
1967	43,400	13,328	17,820	9,352	14,550	9,400

Source: Texas Good Neighbor Commission, Texas Migrant Labor - The 1967 Migration, Chapter 5(n.p.: Texas Good Neighbor Commission, n.d.), p. 5.

The higher wages paid in Texas cities attract many of the younger Mexican-Americans. Overall Texas is losing an estimated 5 per cent of its farm labor supply annually.[16]

As noted previously, most Mexican-Americans are forced to migrate from the Winter Garden during the summer months as there is virtually no work available for them during this period. In 1967, 6,339 workers entered the interstate migratory stream from Dimmit, Zavala, and Uvalde counties.[17] Although these individuals traveled to twenty different states, the majority went to Wisconsin (2,085), Montana (1,041), Minnesota (1,026), and Ohio (805).[18]

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[16] Ibid., Chapter 3, p. 2.

[17] Texas Employment Commission, "Migrant Crews and Workers by Local Office Area and County of Crew Leader Residence--Interstate-1967," Austin, n.d. (Mimeographed.)

[18] Letter from Del Harp, Employment Interviewer III, Texas Employment Commission-Farm, Crystal City, Texas, December 27, 1968, and personal interview with Eufemio Duran, Employment Interviewer II, Texas Employment Commission-Farm, Uvalde, Texas, February 7, 1969.

Workers begin leaving the Winter Garden area about March 15; however, large scale exodus does not get under way until May 1.[19] The vast majority of migrant laborers find their first work in sugar beets. Those leaving the area in mid-March generally work in the beet fields of Washington and Oregon. The second migratory stream which begins moving about the middle of April usually finds work in Idaho and Montana beet fields. About May 15 the third and final large group of migrants departs the Winter Garden for the beet fields of the Dakotas, Colorado, and Kansas.

Sugar beet workers are generally engaged in blocking and thinning activities. Blocking entails the removal of most of the excess plants from the individual rows. In this operation a small cluster of plants is left every eight to twelve inches. Thinning removes all but the hardiest plant from the blocked cluster. As a rule beet work lasts approximately six weeks. Most migrants manage to find work in area vegetable crops after this work is completed.

Beginning about July 15 these workers begin to migrate toward Wisconsin and Michigan. Cucumber harvesting is active in these states between July 15 and September 1. Although the vast majority of the migrants are engaged in the actual harvest, many workers find employment in area canneries.

As September approaches the migrants begin moving

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[19]Information regarding migrant movements was obtained through personal interviews and correspondence with Del Harp.

south into Illinois, Indiana, and Ohio for the tomato harvest. Employment opportunities are very similar to those found in cucumbers. Tomato harvesting activities cease with the season's first frost (generally between the 1st and 15th of October). Unable to find adequate work the migrants begin returning to the Winter Garden area.

Employment in Winter Vegetables

Since the early 1960's migrants returning to the Winter Garden area have found fewer job opportunities awaiting them. Due to competitive pressures and the cost-price squeeze, area vegetable farmers have found it necessary to adopt more scientific farming methods. These individuals, realizing the importance of increasing production and crop yields, and of reducing unit costs, are making every effort to more effectively utilize their land, water, and labor resources.

Chemical insecticides, herbicides, and fungicides, often aerially applied, are finding increasing acceptance among area growers (Plate 27). Although these chemical agents, along with multi-row planters, larger and more powerful tractors, improved cultivation and irrigation equipment, and mechanical harvesting aids, have greatly reduced the need for labor, labor costs still consume approximately 40 per cent of the average vegetable farmer's pre-harvest production budget.[20]

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[20]John D. Carpenter, personal interview.

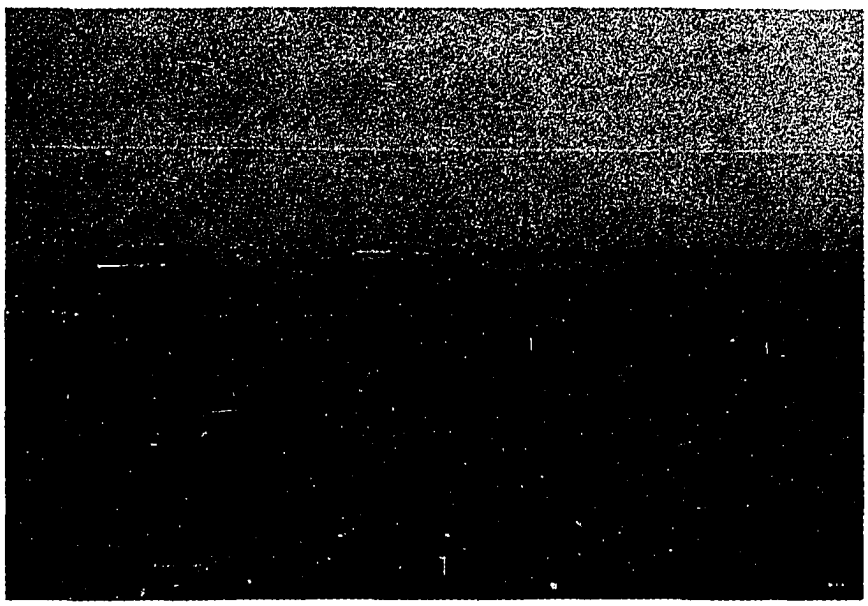

Plate 27--Chemical pesticide being aerially applied to a field of spinach approximately ten miles northeast of Crystal City. Note sprinkler system in background.

In the past, broccoli, cabbage, cauliflower, lettuce, and onions were generally transplanted from seedbeds by hand (Plate 28); however, rising labor costs in recent years have convinced many growers that direct seeding is the more economical method of planting these crops. Opponents of direct seeding contend that, although costs are high, transplanting produces healthier plant populations. Then, too, the smaller seedbeds reduce fertilizer, cultivation, and irrigation costs. Both sides have valid arguments, but the trend is toward direct seeding. As labor costs continue to rise, there is no reason to believe this trend will not continue.

Such innovations are necessary, for the production of vegetables for fresh market is a highly competitive and

extremely risky vocation. In order to better comprehend the problems confronting area growers, it is first necessary to understand in some detail the processes required to produce and prepare for market each of the principal cool season crops. Although slight variations do occur among the individual growers, the following discussion reflects the prevailing practices utilized by vegetable producers in the Winter Garden in 1968.[21]

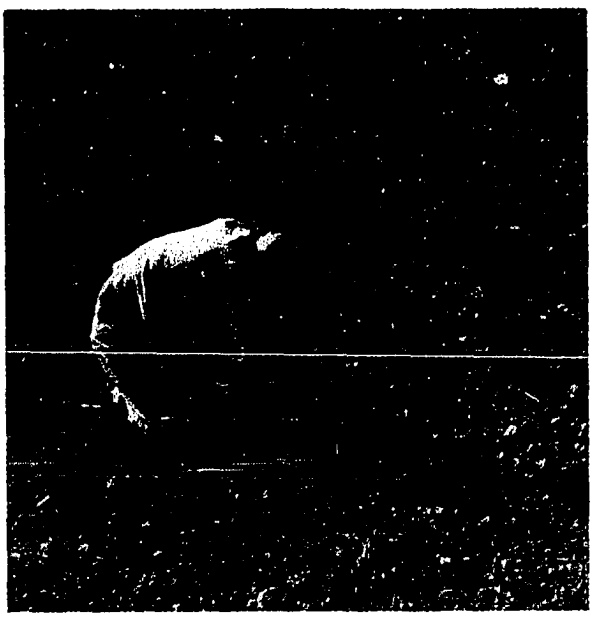

Plate 28--Transplanting onions by hand requires both considerable skill and a strong back. (Photograph courtesy of Dale Barker.)

The planting guide depicted in Table 17 represents the planting and harvesting dates most commonly used in the

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[21]Unless otherwise specified, information regarding the cultivation practices for the various vegetable crops is based on numerous interviews with area growers and shippers.

TABLE 17

USUAL PLANTING AND HARVESTING DATES FOR SELECTED VEGETABLE CROPS IN THE WINTER GARDEN AREA, 1968

	Planting Time			Harvest Time		
Vegetable	Begin	End	Days to harvest from seed	Begin	End	Period of most active harvest
Beets	Oct. 15	Dec. 20	60 to 80	Dec.	Feb.	Jan.
Broccoli	Sept. 15	Nov. 1	75 to 100	Dec.	Jan.	Dec. 15-Jan. 15
Cabbage	Sept. 1	Dec. 15	75 to 100	Oct. 15	March	Nov. 15-Jan. 15
Carrots	Sept. 1	Jan. 1	60 to 80	Nov.	March	Jan.
Cauliflower	Oct.	Nov.	60 to 75	Dec.	Jan.	Dec. 15-Jan. 15
Lettuce	Sept.	Nov. 15	70 to 80	Nov.	Jan.	Dec.
Onions	Oct.	Dec. 20	100 to 150	March	May	April 15-May 15
Spinach	Sept.	Dec.	60 to 80	Nov.	Feb.	Dec. 20-Jan. 15

Source: Personal interviews with John D. Carpenter, Farm Foreman III, Texas A&M University, Rio Grande Plains Research-Demonstration Station, Winter Haven, Texas, and numerous Winter Garden area vegetable growers and shippers.

Winter Garden region. Variations of from one to two weeks may occur depending upon the weather and the individual grower. Rains may delay planting for several days or even weeks. Some growers, hoping to harvest and market their produce during less competitive periods, may plant their crops several weeks earlier or, in a few instances, later than the average dates indicated.

Beets (Beta vulgaris) are usually planted in rows a quarter to a half an inch apart. Processors require a small product; therefore, fields are seldom if ever thinned. Periodic cultivation is practiced to keep the fields as free of weeds and other noxious plants as possible. Mechanically harvested, the mature crop is lifted and topped, conveyed into trucks, and taken to the nearby cannery for processing. Relatively little labor is required in the production of beets, as mechanical devices are employed in almost all phases of the operation.

The least important vegetable crop produced in the Winter Garden is broccoli (Brassica oleracea var. italica). This vegetable has never been popular in the area due to its highly perishable nature and heavy labor requirements. A great deal of labor is needed during the four to six weeks harvest period as cuttings are necessary every two to three days. In addition to high labor requirements, broccoli is one of the more perishable vegetables. The crop must be harvested immediately upon maturity or blossoming may result. Broccoli is cut by hand, graded, bunched, and crated in the

field. It is then loaded into trucks and taken to the packing shed where it is iced and prepared for shipment.

All cauliflower (Brassica oleracea var. botrytis), is transplanted from seedbeds to the field by hand. There is no direct seeding of cauliflower in the Winter Garden at the present time. Plants are generally set in rows fifteen to twenty-four inches apart. Irrigation, begun immediately after transplanting activities are completed, is continued as required up to harvest time. Cauliflower is cultivated frequently to control weed growth and prevent surface crusting.

As consumers demand pure white heads, it is necessary to protect the developing curds from the discoloring effects of rain, dust, and the sun. This is done by drawing the long outside leaves of the plant about the head and securing them with rubber bands.

Unless cauliflower is harvested quickly upon maturity, the curds will loosen or "rice" thereby producing an unmarketable head. During harvest experienced labor becomes a necessity. The experienced harvester can tell at a glance whether or not the concealed heads are mature. The inexperienced laborer, never sure, often must remove the rubber band and visually inspect each head. Valuable time is lost if the head is mature. If the head is immature more time is lost as the encircling leaves must be replaced and secured lest the curds become discolored in the broiling sun. As a rule, cauliflower is cut, trimmed, graded, and crated in

the field. The crates are then loaded into trucks and sent to the packing shed for icing and shipment.

Cabbage (Brassica oleracea var. capitata) is generally planted two rows to the forty inch bed (as measured from furrow center to furrow center). Irrigation is required following seeding to insure germination and proper plant development. Beds are kept moist until a healthy stand is assured. After thinning, individual plants are spaced from eight to ten inches apart. Due to the shallow root system of the young plant, frequent light irrigations are necessary during the early stages of growth, but, once the root system is fully developed, heavier applications are desirable. Because of the tender nature of the plant's leaves, cultivation generally ceases with head development.

Harvesting operations begin as heads reach marketable size. Although consumer demands vary with market area, two to three pound heads are preferred. As cabbage requires selective harvesting, labor requirements are considerable. Depending upon the weather and the care given the crop, two to three cuttings are possible during the course of a season. The heads are cut, trimmed, and sacked (twenty-four heads to the bag) by workers in the field (Plates 29 and 30). The bags, or heads if sold bulk, are then loaded into trucks for shipment (Plate 31). Cabbage may or may not be iced prior to shipment depending upon the weather and length of haul to market.

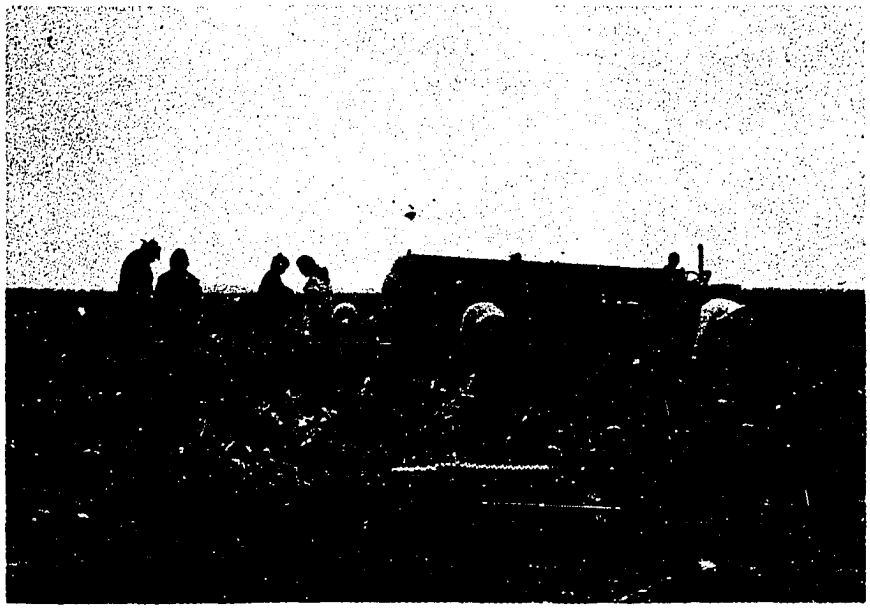

Plate 29--Harvesting cabbage on a farm approximately two miles west of Uvalde.

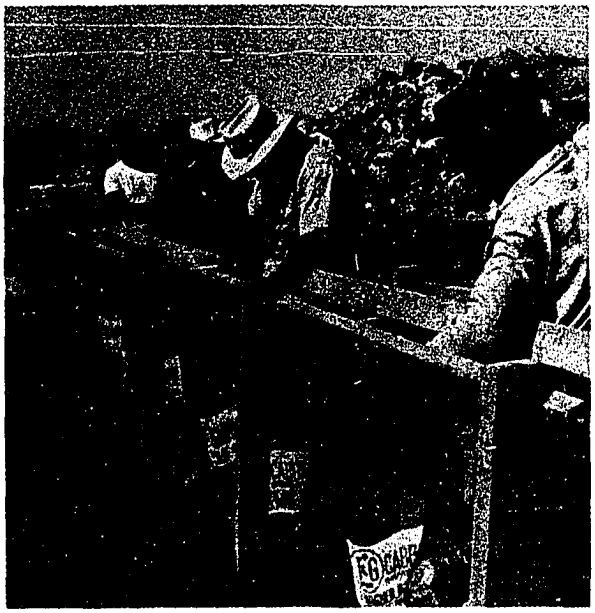

Plate 30--Most cabbage is field packed into mesh bags. (Photograph courtesy of Dale Barker.)

Plate 31--Cabbage is frequently field loaded into trucks for speedy delivery. (Photograph courtesy of Dale Barker.)

As a rule, carrots (Daucus carota var. sativa) are precision planted, two rows to the forty inch bed. Irrigation follows planting and continues intermittently for approximately fifteen days or until a healthy stand is in evidence. Carrots are "oiled" (a local term denoting the application of either naptha or Stoddard Solvent to the soil) several times during the early stages of growth to control weeds. Mechanical cultivation is relatively unimportant in carrot production.

Although some area vegetable farmers make use of mechanical carrot harvesters, most of the crop is still harvested by hand. Tractors, equipped with chisels which loosen the surrounding soil and lift the root, enter the field as harvest begins (Plate 32). Crews following the

tractor pull, top, and sack the carrots which are then dumped into waiting trucks and hauled to nearby packing sheds. Upon arriving at the shed the carrots are washed, graded, and packaged into either one or two pound cellophane bags (Plates 33 and 34). These "cellos" are then packed into mesh shipping bags (48 pound capacity) for shipment to market.

Lettuce (Lactuca sativa) is direct seeded, two rows to the forty inch bed. Once a stand has been achieved, the crop is blocked and thinned to four plants per linear foot. Cultivation requirements are very similar to those of cabbage (Plate 35).

The crop is ready to be harvested as the heads become firm to the touch. Like broccoli, cauliflower, and cabbage, lettuce is selectively harvested--the average crop requiring two to three cuttings. The heads are cut, trimmed, graded, and field packed (twenty-four heads to the carton). The cartons are then hauled by truck to Uvalde or Crystal City where they are vacuum cooled to approximately 33°F. With field heat and excess moisture thus removed, the cartons are loaded into precooled trucks or refrigerator cars for shipment to market.

Onions (Allium cepa) are transplanted from seedbeds into rows fifteen to twenty inches apart. Newly transplanted fields are kept moist until the seedlings have started to grow. The established stand generally requires

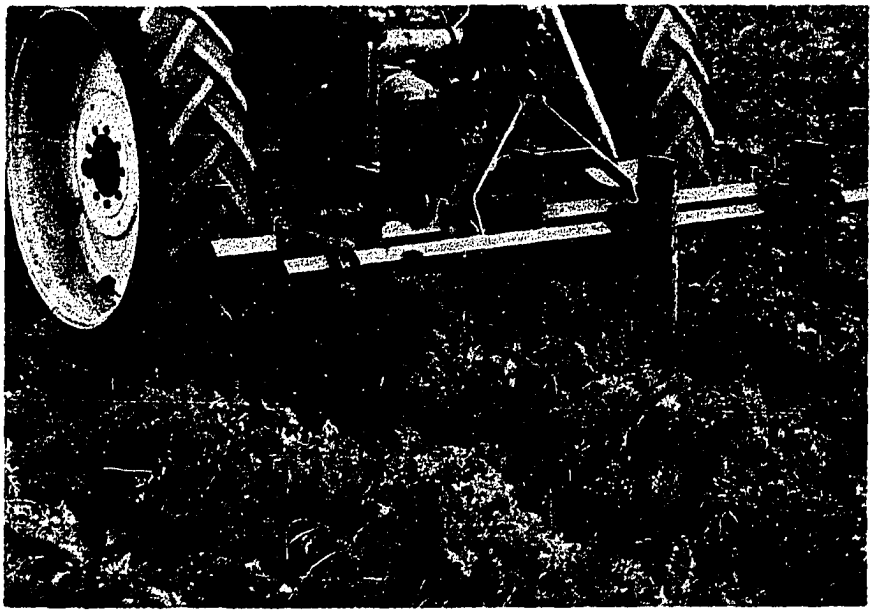

Plate 32--Harvest activities begin with the use of tractor drawn carrot chisels.

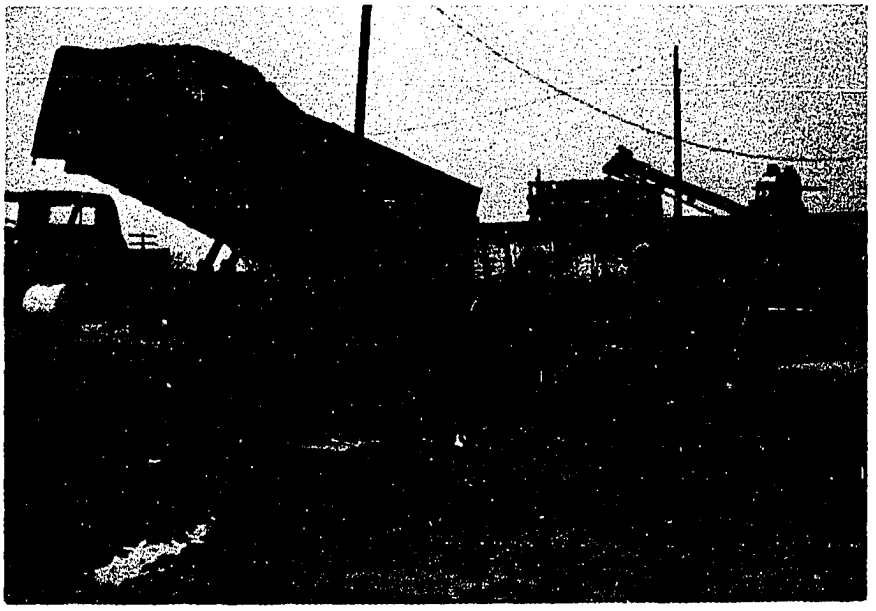

Plate 33--Carrots are dumped into vats and washed and conveyed to mechanical graders (not visible).

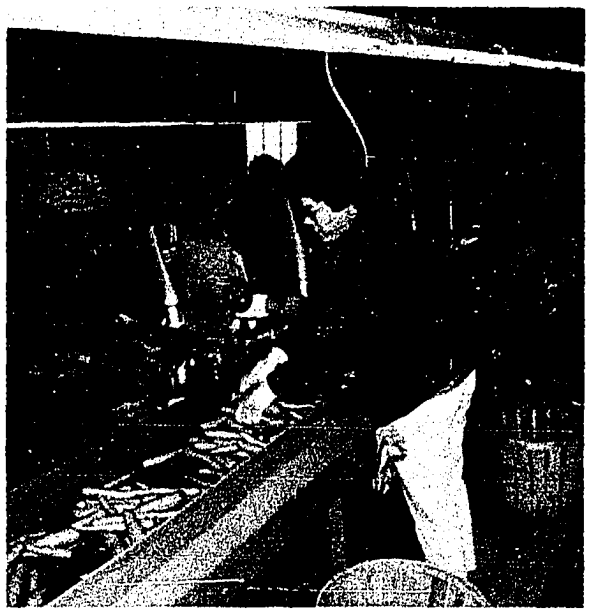

Plate 34--In the packing shed proper carrots are further graded (worker to the right of the conveyor belt), weighed, and bagged (note scales between workers to the left of the conveyor belt). (Photograph courtesy of Dale Barker.)

Plate 35--Cultivating lettuce with short handled hoes approximately three miles south of Batesville.

five to eight additional applications of water prior to harvest. Thinning is not required in properly transplanted fields. Because of the crop's slow growth rate and shallow root system, onions must be kept as free of weeds as possible.

Depending upon the weather, market price, crop condition, and the individual grower, harvesting will usually commence when from 30 to 60 per cent of the tops have fallen over. Actual harvesting activities begin as tractor drawn plows sever the plant's tap root and set the onion up in the bed. Laborers following the plows pull up the plants and clip the roots. The onions are then shingled (for protection from the sun) and allowed to dry from one to two days depending upon weather conditions. Following this initial curing period, workers re-enter the fields and remove the tops, leaving only the bulb. After an additional three to four day drying period, the onions are placed in burlap bags and taken to area sheds for grading. Graded onions are then re-sacked and loaded into trucks or rail-cars for shipment (Plate 36).

Most of the spinach (Spinacia oleracea) grown for the fresh market in the Winter Garden is seeded broadcast and flood irrigated (Plate 37). Del Monte, which mechanically harvests its entire crop except on rare occasions when wet weather prohibits machinery from entering the fields, precision plants all of its crop in rows (Plate 38). Regardless of whether the crop is broadcast or precision planted, spinach is rarely thinned. The crop is susceptible

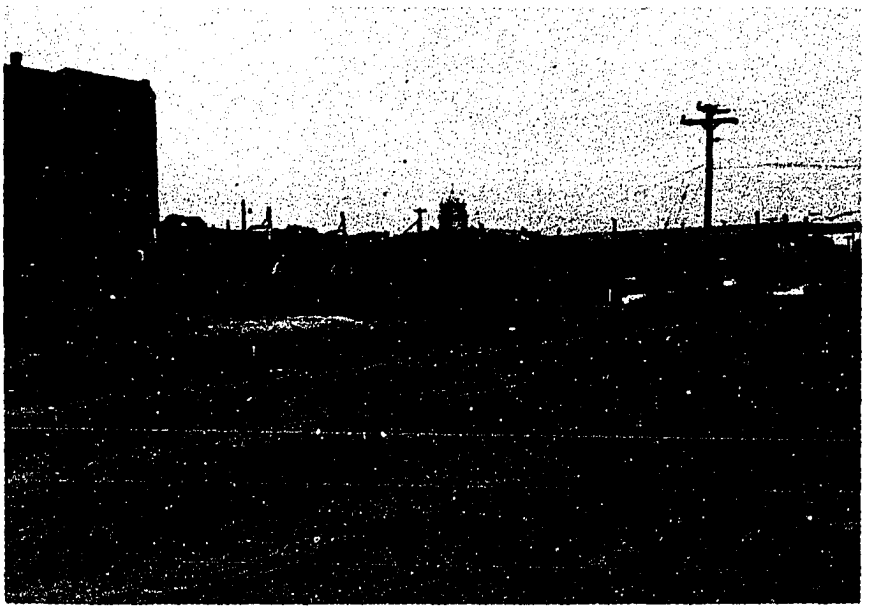

Plate 36--Loading onions into railcars prior to shipment to market. Trucks in the foreground, loaded with sacks of ungraded onions, await their turn to unload.

Plate 37--Broadcast seeding spinach on a farm approximately five miles north of Big Wells.

to a variety of diseases; therefore, an intensive pesticide control program is practiced by most area growers.

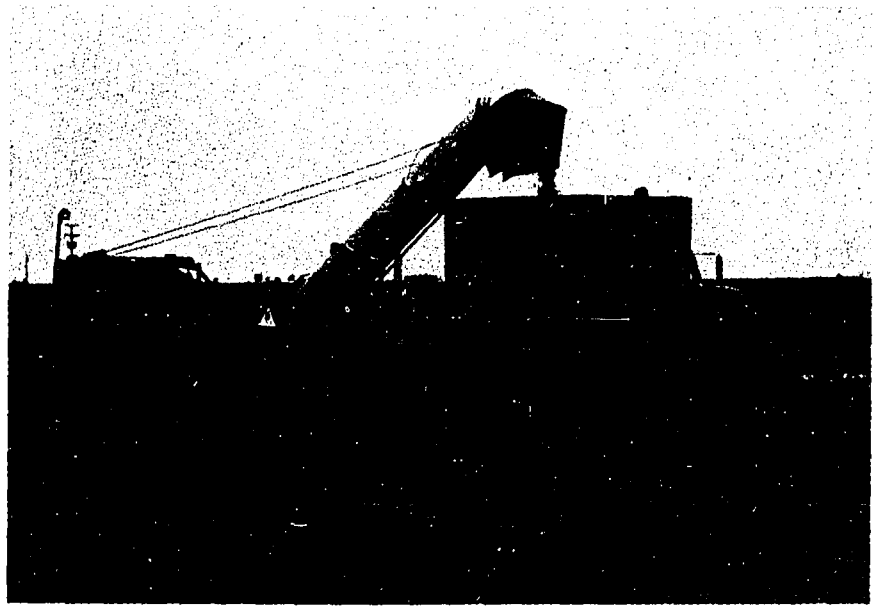

Plate 38--All mechanically harvested spinach is processed in Del Monte's Crystal City cannery.

All fresh market spinach grown in the Winter Garden is harvested by hand. Workers cut and trim the individual plants and field pack them into baskets (Plate 39). The spinach is then hauled to area packing sheds where it is iced (Plate 40). Finally, the baskets are loaded into either railcars or trucks and top iced for shipment to market.

Grower Complaints

Although much of the need for pre-harvest labor has been eliminated by chemical pesticides and more efficient

Plate 39--Harvesting fresh market spinach on a farm approximately two miles east of Crystal City. The curved knife is used to cut the plant's tap root below the ground surface.

Plate 40--Individual baskets of spinach being iced prior to shipment. Once the truck or railcar is loaded, the shipment is top iced with blocks of ice similar to that seen in the ice crushing machine at the left of the photograph.

mechanical devices, labor requirements are considerable during the harvest period. Since the termination of Public Law 78, area vegetable farmers have depended almost entirely upon the domestic worker for their labor needs. Growers are almost unanimous in agreeing that the quality of labor available today is markedly inferior to that of previous years. Although area producers cited many reasons for this deterioration of the labor situation, those most consistently mentioned were: (1) the availability of unemployment benefits, (2) eligibility for free commodities, (3) the growing desire among Mexican-Americans to acquire more education, (4) the tendency of the young to seek employment outside the area, and (5) less demanding labor contractors.

Approximately 500 migrant workers draw unemployment benefits in the Uvalde, Zavala, and Dimmit county area.[22] These individuals, who comprise about 8 per cent of the region's migratory laborers, work at relatively high paying (up to $2.50 an hour) skilled or semi-skilled jobs in northern canneries. Upon their return to the Winter Garden, most of these people, unable to find similar employment, become eligible to draw unemployment compensation. The vast majority of migrants are field laborers and, because similar work is available in the Winter Garden during the winter months, these individuals are not qualified to draw unemployment compensation.

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[22]Del Harp and Eufemio Duran, personal interviews.

Unemployment checks which average approximately forty-five dollars a week may range as high as sixty dollars a week depending upon the recipients earnings and length of employment. Few individuals receiving such benefits would work for the wages paid in the Winter Garden. During the latter part of 1968, stoop labor and irrigators in the Winter Garden commonly drew the minimum wage of $1.15 an hour. Truck and tractor drivers generally drew between $1.25 and $1.50 an hour.[23]

Growers complain that many of the local Mexican-Americans will not work on a continuous basis for fear of losing their eligibility for free commodities. These commodities are made available to low income families each month through the State Department of Public Welfare. Eligibility for these foodstuffs is determined by the family group's net monthly income. Each member of a family of three with a monthly net income of less than $170 is eligible for commodities. The allowable net income is increased twenty dollars for each additional family member up to a maximum of ten persons, after which the income increments are reduced to fifteen dollars per additional member (Table 18).[24]

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[23]Del Harp, personal interview, September 19, 1968.

[24]Personal interview with Lorena M. Rice, Commodity Supervisor and Worker, Crystal City, Texas, February 5, 1969.

TABLE 18

REQUIREMENTS FOR COMMODITY ELIGIBILITY

No. of Persons in Family	4	6	8	10	12	14
Net Monthly Income	$190	$230	$270	$310	$340	$370

Source: Personal interview with Lorena M. Rice, Commodity Supervisor and Worker, Crystal City, Texas, February 5, 1969.

Growers contend that many of their laborers will earn the maximum possible for their particular family group, but will stop short of disqualifying themselves for free commodities. Other interested parties argue that the average worker has no idea of the financial requirements necessary to qualify for the foodstuffs.[25]

In recent years there has been a growing awareness among Mexican-American migrants of the importance of formal education. Today, as in the past, most migrants, due to their lack of education, are able to secure and hold only the most menial jobs. Because the migrant agricultural laborer must move in order to find work, his children have invariably received little formal education. Rarely attending school for more than six months, migrant children have

[25] Ibid.

tended to fall behind their age mates and eventually become dropouts. The cycle is completed as these individuals enter the migratory labor stream.

In an effort to help alleviate some of the problems encountered by migrant children, the Texas Education Agency in 1963 instituted the Texas Project for the Education of Migrant Children. There are two basic programs within the Project. The "complete" program, such as that found at Crystal City, compresses the school year into a six month period (Table 19). The migrant children are in self-contained classrooms on a separate campus. Emphasis is on the English language arts. The children in the "modified" program such as that found at Carrizo Springs and Uvalde attend classes

TABLE 19

TEXAS MIGRANT SCHOOL PROJECTS[a] 1967-1968
(Winter Garden Area)

School	Grades	Est. No. of Students	Open Date	Total Staff	Years in Project
Carrizo Springs[b]	1-8	702	Aug. 28	12	3
Crystal City	1-8	795	Oct. 16	63	3
Uvalde[b]	1-6	281	Aug. 28	15	2

[a]Source: Texas Good Neighbor Commission, Texas Migrant Labor - The 1967 Migration, Chapter 3 (n.p.: Texas Good Neighbor Commission, n.d.), p. 6.

[b]Modified program.

during the regular nine month school session. These children, who are often in classes with non-migrant students, benefit from a class day extended by from one to two hours. As in the "complete" program, emphasis is on the English language arts. Although results are as yet inconclusive, area school administrators are confident that this project will considerably reduce the migrant dropout rate and ultimately increase the number of migrant students who graduate from high school.[26]

The young Mexican-American of today is better educated and certainly more socially aware than were his parents at a similar age. Many of these individuals, who are often unwilling to work as agricultural laborers and unable to find other employment locally, migrate to surrounding cities in search of work. As indicated by area vegetable growers and confirmed through observation, relatively few field hands are between twenty and thirty-five years old. The old, who have no other place to go, and the young, as yet unable to sever family ties, comprise an inordinate share of the area's agricultural labor force.

The Mexican-American labor contractor has always been an integral part of the Winter Garden vegetable industry. These individuals, who act as intermediaries between the farmer and the worker, are responsible for locating,

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[26]Personal interview with R. C. Tate, Migrant Coordinator, Crystal City, Texas, October 9, 1968.

transporting, and supervising field labor. The grower pays the contractor who, after deducting social security fees and his commissions, pays the individual workers. Most growers deal solely with contractors, and frequently have little or no knowledge of the individuals whom the contractor is working.

In the past labor contractors were demanding men. They quickly removed individuals from their crews who did not wish to work lest they acquire a bad reputation among area farmers. The situation is quite different today. Because labor often is hard to find, the grower must take what the crew leader offers. Contractors who attempt to push their workers too hard soon find that they have no crew, for most workers realize that regardless of whether they work or not they will not starve. In order to keep his crew together the contractor, and consequently the grower, overlook conduct which ten years ago would not have gone unnoticed.[27]

The grower's labor problems have been somewhat ameliorated by the use of "green card" workers. "Green carders" are "alien citizens who hold a permanent entrance visa on their Alien Registration Card (green in color)".[28] These individuals, who are required to register with the Immigration and Naturalization Service each January, can live and

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[27]Personal interview with Norment Foley, vegetable grower, Batesville, Texas, September 29, 1968.

[28]Texas Good Neighbor Commission, Labor, Chapter 3, p. 12.

work anywhere in the United States. Of an estimated 201,400 "green carders" in Texas in 1965, approximately 10,000 were involved in some phase of agriculture.[29]

Due to the lower cost of living, many of these individuals live in Mexico and cross the border daily to work in the United States. During harvest season it is a common sight to see bus loads of "green carders" coming from Eagle Pass to work in area vegetable fields. Many growers prefer "green carders" to the domestic laborers as they believe these individuals to be more efficient and dependable workers.

Although some growers expressed concern over the Independent Workers Association led strikes in the Lower Rio Grande Valley during 1967, labor unions, as yet, have had little success in their efforts to organize migrant labor in the Winter Garden area. Union failures have largely been attributed to the transient and temporary nature of the migrant's work, marginal wages, and a general lack of desire among field laborers to organize.

The development of the Winter Garden as a vegetable producing area was due in large part to an abundance of cheap Mexican and Mexican-American labor. These individuals, unable to find adequate employment during the summer months, left their homes to work in the sugar beet and vegetable fields of the north central United States. Aided

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[29] Ibid., p. 13.

by state and private employment agencies, these annual migrations continue to be a part of contemporary Mexican-American culture.

Today, as in the past, the vegetable farmer is dependent upon the Mexican-American for his labor supply. The minimum wage laws of recent years have forced the grower to make extensive use of chemical pesticides and mechanical devices, thereby eliminating many of his pre-harvest labor requirements. Despite grower complaints of rising labor costs and decreasing efficiency, the demand for harvest labor continues practically unabated.

CHAPTER VI

MARKETING WINTER GARDEN VEGETABLES

Trends Within the Produce Industry

Prior to the Civil War the commercial vegetable industry was confined to the more heavily populated northeastern United States. Vegetables, grown on small plots in and around the cities, were taken daily to area produce markets and sold to various wholesalers, small grocers, and street vendors. Urban populations grew rapidly during the late 19th century as foreign and rural American immigration to the cities increased. The small market gardeners were soon unable to meet consumer demands.

Although refrigerated railcars permitted commodities to be shipped across areas of the United States where natural ice was available, it was not until the late 1880's and early 1890's, with the development of the ammonia process for making artificial ice, that transcontinental shipment of perishable products became a reality. The ice plant revolutionized the fruit and vegetable industry. It became possible to ship commodities great distances with minimum deterioration. Fresh produce, once available only during the warmer seasons of the year, could now be obtained year

round from producers in the mild winter sections of California, Florida, and Texas.[1]

The small truck farmers in the producing areas of the South quickly found that it was far easier to produce than to market vegetable crops. Early growers, unfamiliar with the operation of the produce industry and lacking contacts with northern buyers, frequently saw their crops rot in the field for lack of a market. The small grower, rarely able to ship in carlots, and having only a minimal concept of packaging, and producing crops of widely varying quality in unpredictable quantities, was of little use to the northern produce buyer.

Production area organization was eventually accomplished by the shippers.[2] These individuals, financed by northern wholesalers, graded, packed, sold, and shipped, in carlot quantity, area produce. Shippers dictated planting dates, provided growers with quality seed, and, when required, financed a portion of the growers' costs. In return, the grower agreed to allow the shipper to pack and sell his produce. The advantages for both sides are apparent. The shipper and the northern buyer were assured

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[1]Wells A. Sherman, Merchandising Fruits and Vegetables (Chicago: A. W. Shaw Company, 1928), pp. 32-34.

[2]The term shipper, as used in this study, refers to those individuals or firms who first handle the harvested produce. Shippers generally harvest, grade, pack, sell, and ship vegetables.

of continuous supplies of a product of standardized quality. The grower was assured of a market for his mature crop.

As the years passed, the more prosperous shippers gradually broke the dominance of the northern buyers and began financing area growers themselves. Regardless of the degree of the shipper's independence, however, shippers and buyers continued to rely heavily upon one another. As these individuals generally knew each other personally, verbal agreements were common. An expression of the trust evident between shippers and buyers may be seen in the fact that virtually all produce was sold f.o.b. shipping point. In addition to their northern contacts, shippers frequently sold produce to the numerous transient buyers and brokers who followed the vegetable crops. Prior to World War II buyers were numerous, competition was keen, and, except for the Depression years, prices were generally good.[3]

The post World War II years have brought tremendous changes to the fresh vegetable industry. Although per capita consumption of fresh vegetables has risen from a 1920-1924 average of 77.6 pounds to 92.6 pounds for the 1961-1965 period, per capita consumption has continually declined since the mid-1940's as processed vegetables have made noticeable inroads into the American diet (Table 20). Per capita consumption of processed vegetables has risen from 19.1 pounds (1920-1924) to a 1961-1965 average of 53.1 pounds. The most

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[3]A. F. Childress, personal interview.

TABLE 20

PER CAPITA VEGETABLE CONSUMPTION IN THE UNITED STATES, 1920-1965[a]
(in pounds)

Year	Fresh	Processed	Frozen[b]
1920	79.9	18.2	--
1921	69.3	16.6	--
1922	78.2	16.8	--
1923	75.9	21.2	--
1924	84.9	22.7	--
1925	85.2	25.4	--
1926	85.0	25.7	--
1927	89.4	22.1	--
1928	88.0	22.8	--
1929	95.0	25.7	--
1930	94.7	28.3	--
1931	91.6	25.2	--
1932	92.0	22.0	--
1933	88.5	21.9	--
1934	97.2	23.2	--
1935	94.2	26.1	--
1936	95.1	27.6	--
1937	93.8	29.7	1.0
1938	96.9	31.4	1.0
1939	98.3	32.2	1.2
1940	98.9	34.8	1.4
1941	96.0	37.3	1.6
1942	100.5	40.6	2.6
1943	98.4	37.4	1.7
1944	104.8	35.7	3.8
1945	113.5	44.8	4.4
1946	109.3	48.0	4.7
1947	103.0	42.3	6.1
1948	103.8	40.3	7.0
1949	97.9	41.2	6.8
1950	97.3	44.5	7.4
1951	94.1	45.6	9.3
1952	93.8	45.7	11.3
1953	92.7	47.3	11.7
1954	91.4	46.6	12.2
1955	90.7	48.1	13.1
1956	93.4	48.8	13.6
1957	93.9	49.2	14.0
1958	92.3	50.1	14.7
1959	91.7	50.4	14.9
1960	96.1	50.5	15.3
1961	94.8	50.6	15.4
1962	93.4	52.8	16.8
1963	93.4	53.3	16.0
1964	90.8	53.5	17.1
1965	90.6	55.3	18.4

[a]Source: U.S Department of Agriculture, Economic Research Service, Food Consumption, Prices, and Expenditures, Agricultural Economic Report No. 138 (Washington, D. C.: Government Printing Office, 1968), p. 74.

[b]Other than tomatoes.

significant increase has been in the area of frozen vegetables where per capita consumption has risen from 1.2 pounds (1937-1941) to 16.7 pounds (1961-1965).

The decline in the consumption of fresh fruits and vegetables since 1950 appears to be related to increased retail prices of these items. Between 1950 and 1966 at home food prices rose 29 per cent. Retail prices of fresh fruits and vegetables increased over 60 per cent during this period (Figure 24).[4] As fresh produce prices have risen, consumption has declined in favor of processed commodities. Although still more expensive than fresh produce, convenience, and the fact that processed fruits and vegetable prices rose only 35 per cent during the 1950-1966 period, make these commodities increasingly attractive to the consumer.[5]

For the vegetable farmer a far more significant development has been the change in the buying habits of retail food stores. Prior to World War II most produce was sold to retail outlets via wholesale agents operating out of the local produce markets. These middlemen were necessary as most grocery stores were small, low volume firms and, as such, were unable to accommodate merchandise in carlot quantities. High volume national food chains and larger regional chains

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[4]U.S., Department of Agriculture, Economic Research Service, Food Consumption, Prices, and Expenditures, Agricultural Economic Report No. 138 (Washington, D.C.: Government Printing Office, 1968), p. 17.

[5]Ibid., p. 18.

FRESH FRUITS AND VEGETABLES: PRICE AND CONSUMPTION INDEXES

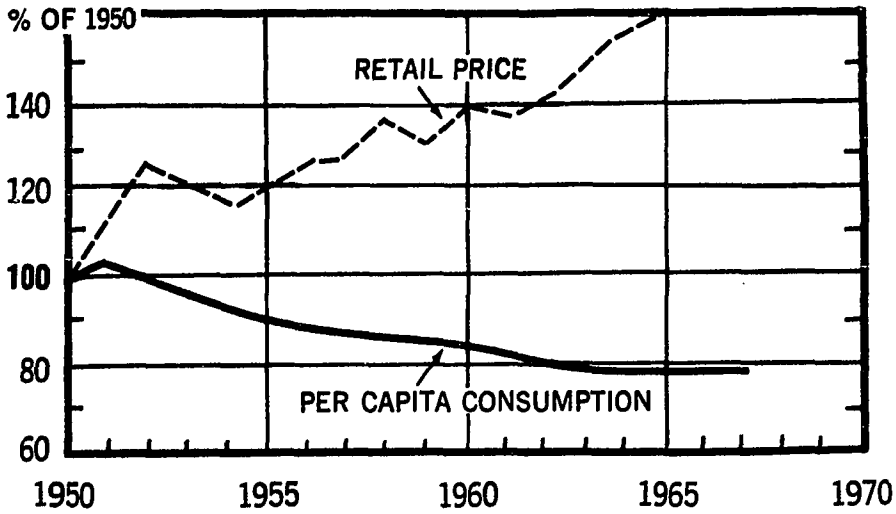

Fig. 24

SOURCE: U. S. DEPARTMENT OF AGRICULTURE, AGRICULTURAL ECONOMIC REPORT NO. 138

1920's and early 1930's.[6]

The percentage of produce purchased directly from the shipper increased appreciably after World War II with the growth of large supermarkets and the absorption of the small independent grocer by local, regional, or national chains. A study of Philadelphia's wholesale produce market indicated that,

> . . . direct receipts by chains accounted for an increasing proportion of total market receipts from 1936 through 1964--9 percent in 1936, 33 percent in 1958, and 42 percent in 1964. Meanwhile, the proportion of Philadelphia chains' purchases in the local market declined from 42 percent of their total purchases in 1936 to 33 percent in 1958, and to 18 percent in 1964.[7]

Although increased direct buying by chains has provided some shippers with volume sales, the net reduction of competing buyers brought about by the removal of the small independent grocer has in general worked to the grower's disadvantage.

The importance of the retail outlet in the distribution of fresh produce should not be underemphasized. In 1958-1959 these organizations accounted for between 80 and 85 per cent of the fresh produce sold to final consumers.[8]

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[6]U.S., Department of Agriculture, Economic Research Service, The Structure of Wholesale Produce Markets, by Alden C. Manchester, Agricultural Economic Report No. 45 (Washington, D.C.: Government Printing Office, 1964), p. 100.

[7]U.S., Department of Agriculture, The Changing Structure of the Philadelphia Wholesale Fruit and Vegetable Market, by Alfred J. Burns, Marketing Research Report No. 816 (Washington, D.C.: Government Printing Office, 1968), p. 11.

[8]Most of the remaining fresh produce was sold through restaurants, cafes, and institutions.

Almost 47 per cent of this figure, or approximately 40 per cent of the total fresh produce sales to the consuming public, was accounted for by chains with two or more stores.[9] Naturally the national, larger regional, and local chains, which represent a sizable buying power within the industry, make their presence felt in the shipping point markets. Their ability to purchase in volume and their reputation for prompt payment have earned the chains a respected and often preferred position among produce shippers.

Grower-Shipper Relations

The opinions expressed by area vegetable producers indicate that, although many growers are annually plagued by unfavorable weather conditions, insects, disease, declining water levels, and expensive, low quality labor, as a group, their most significant problem is that of marketing the mature crop. Regardless of production costs, unless the crop can be profitably sold, the season's work will have been in vain.

Although vegetable farmers almost to the man indicated marketing to be their major problem, virtually nothing has been done to try and improve this situation. There is a general lack of interest among the producers in quality control and, with the exception of a few of the younger producers in the Northern District, an almost total rejection

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[9]U.S., Department of Agriculture, Wholesale Produce Markets, p. 59.

of marketing co-operatives. As a group, area vegetable growers are gamblers. Most realize that to remain in the vegetable business requires an above average number of successful seasons. Winter Garden farmers commonly say they make money about one year in five. As one individual observed, most growers can expect "two plow ups, two break evens, and one bell ringer"[10] within an average five year period. Those who miss the bell too many times soon find other vocations.

As most growers have neither the facilities nor the knowledge to handle or sell their own crops, these individuals are, with few exceptions, entirely dependent upon area shippers. Winter Garden shipping point handlers may be classed as either shippers or grower-shippers. Shippers, although frequently financing area farmers, produce no crops of their own. The shipper's business is based upon the fees and commissions he receives from handling another's crop. The grower-shipper, as the name implies, is both a grower and a shipper. Although both shippers and grower-shippers are found within the Winter Garden area, there are no grower-shippers in the Northern District nor resident shippers in the Southern District.

Grower-shipper relationships in the Northern District are very similar to those of the pre-World War II era. Many of the farmers have had little experience in growing vegetables.

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[10]Personal interview with H. J. Henkel, vegetable grower, Knippa, Texas, September 23, 1968.

As individuals, few are able to finance their vegetable acreages, and almost none have a means of disposing of their crops. Shippers, capitalizing upon these weaknesses, have largely succeeded in organizing the growers under their direction. Unable to survive alone, practically all Northern District growers have entered into contractual arrangements with area shippers.

Although contract terms vary widely with the individual shippers, all more or less have one point in common--the grower is placed at a distinct disadvantage. Such would not seem the case when one considers a typical Northern District contractual agreement. In the Northern District the shipper generally furnishes his growers with all of their seed, fertilizer, pesticide, and labor requirements. The grower provides the land, water, and all pre-harvest equipment needs. After payment has been received by the shipper for a grower's produce, the shipper deducts all of his production costs as well as shed fees and commissions. Remaining monies, if such exist (and frequently they do not), are then paid to the grower at the rate of forty dollars per acre of land under contract. Net profits are then divided equally between the vegetable farmer and the shipper.

The non-resident shipper, operative in both the Northern and Southern districts, is found in the Winter Garden only during the harvest season. These individuals usually work for large produce companies which specialize in the sale of one or two commodities. Although some operate sheds

during their stay in the area, many, due to the limited number of vegetable crops handled, prefer to let resident shippers handle their growers' produce. Contractual terms among these individuals and their growers vary widely; however, there is a tendency for the grower to be paid a specified amount per cultivated acre. Other non-resident shippers prefer to give the grower a percentage of the value of the crop.

Excluding the non-resident shipper, all shipping point handlers in the Southern District are grower-shippers. In the older, more established vegetable growing areas of this region, a great preponderance of the winter vegetable acreage is produced by grower-shippers. During the 1967-1968 season eleven grower-shippers produced 6,218 acres of the 10,148 acres of winter vegetables grown in the Southern District. Some 2,500 acres of the remaining 3,900 acres was grown by or contracted to Del Monte. In addition to being experienced vegetable farmers, many of the area's independent growers are financed by northern produce interests. As they lack neither money nor experience there is little need for the type of grower-shipper arrangement so prevalent in the Northern District. The only arrangements made between the independent producers and the shippers are the pre-season agreements by the shipper to handle the growers' crops. As a rule a grower-shipper will handle another grower's crop for the usual packing charges and commissions.

Regardless of their financial arrangement, practically all vegetable farmers depend to some degree upon the services offered by area packing sheds. These services--grading, packing, selling, and shipping--have changed little since the early 1900's. Advances in packaging have allowed some crops, notably cabbage and lettuce, to physically by-pass the shed; however, unless the grower sells his crop directly to a chain store or to a broker, he must depend upon the shipper to sell his produce.

Buyer-Shipper Relations

For the duration of the harvest season the unimposing one story wood and/or tin packing sheds are a beehive of activity (Plate 41). Trucks loaded with harvested vegetables begin arriving at the sheds between 9:00 and 10:00 A.M. Numerous laborers work long hours unloading trucks, grading, and repacking the harvested produce into shipping containers and loading these containers into railcars or trucks for shipment to market.

During harvest season it is not uncommon for shippers to work from twelve to fourteen hours a day. Depending upon the market situation, a shipper's day may begin as early as 6:00 A.M. and, on occasion, may end well after midnight. One of the first things a shipper does upon arriving at his office is to call his contact men in the key terminal produce markets (generally St. Louis, Chicago, New York, and Atlanta). These individuals, usually trusted personal friends, advise the

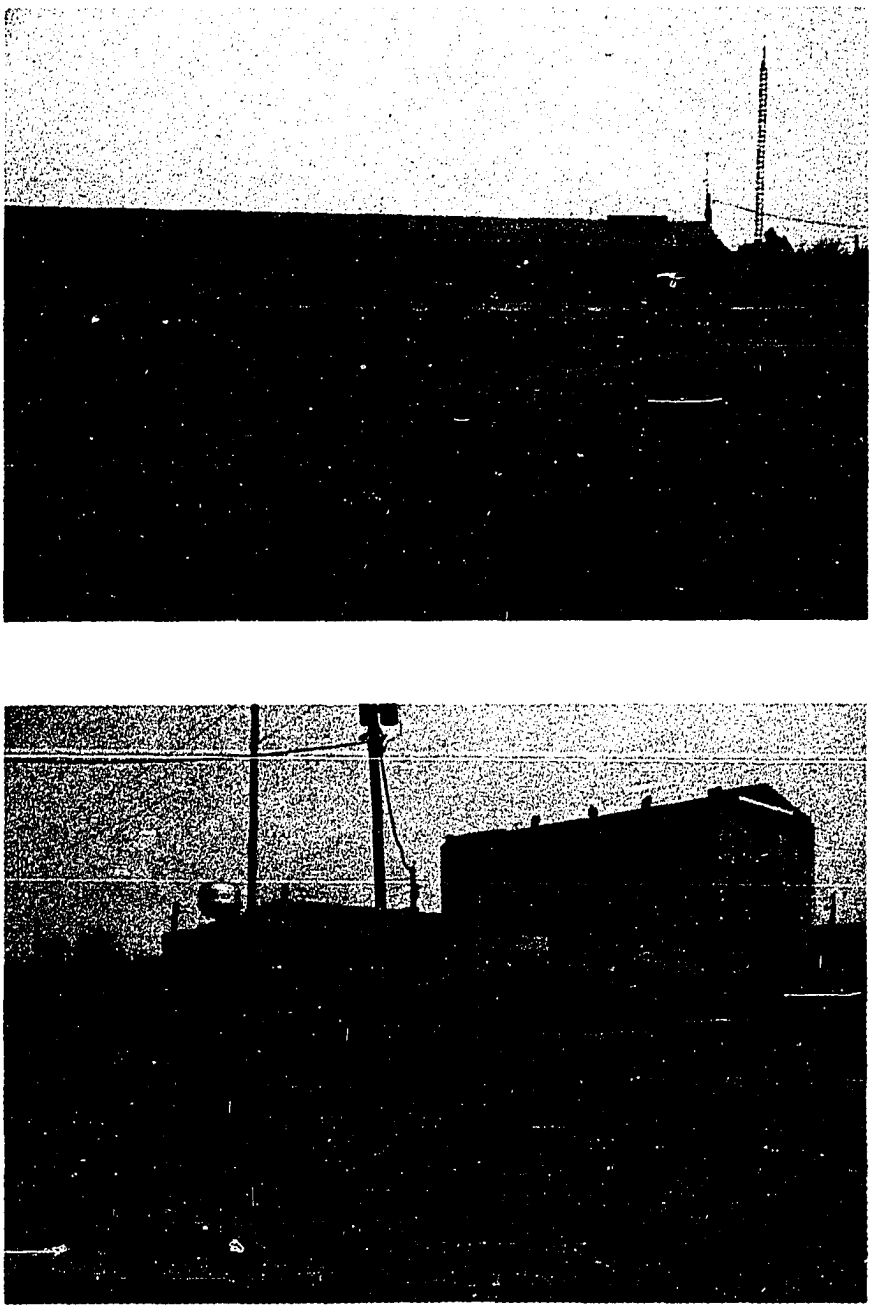

Plate 41--Typical Winter Garden area packing sheds. Both of these Crystal City sheds are located adjacent to the railroad. The large concrete building seen in the background of the lower photograph is used to store block ice.

shipper of the local prices, potential supplies, and the general outlook for the day's business. Based upon these data and his personal knowledge of local supplies, the shipper sets his asking price for the day's transactions. Barring commodity shortages in other producing areas which invariably lead to a "seller's market" with prospective buyers frantically calling shippers seeking available supplies, the shipper then begins calling his buyers and brokers. During the course of the telephone conversation with these individuals, the shipper describes his produce as to its quantity, grade, and price. Direct buyers then either accept or reject the sales offer.

Sales through brokers are considerably more complicated and, more often than not, less profitable to the shipper and his growers. Direct buying is becoming increasingly important in the Winter Garden, but at the present time most area produce is still sold through brokers. Brokers, although they do not physically handle the commodities, perform the indispensable function of bringing the buyer and seller together. As a rule, shippers will have brokers representing them in all of the larger market areas. Except in instances of direct buying, the shipper depends upon his broker to make all of his sales in that particular market area.

Through his various contacts and extensive use of the telephone, the broker attempts to find a buyer for his shipper's merchandise. Once a potential buyer has been

located, the broker repeats the information given him by the shipper regarding available produce. If the buyer accepts the quoted price, the broker then calls the shipper and informs him a sale has been made. If the buyer believes the price to be excessive, he may bargain with the shipper through the broker until a mutually agreeable price is established. Although brokerage commissions vary slightly depending upon geographic area, commodity perishability, and value, most brokers charge a straight $.10 per shipping unit. Sales are generally confirmed by telegram.[11]

Due to the highly perishable nature of the commodities handled, the produce industry, unlike most other businesses, relies almost exclusively upon the telephone. Because both buyers and shippers are so dependent upon brokers, there is little personal contact between individuals of these two groups. Today, as in the past, business is transacted largely upon a man's word. Over the years the produce industry and the federal government have made great strides toward eliminating the dishonest merchant.

Buyers, shippers, and brokers deal with individuals all over the United States; however, they tend to do most of their business with a small group of men they have known for a number of years. Although not as binding as in the past, buyer-shipper-broker loyalty is still in evidence.

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[11]Personal interview with J. R. Walpole, fresh fruit and vegetable broker, J&N Brokerage Company, Oklahoma City, Oklahoma, January 6, 1969.

When the opportunity arises for a shipper or broker to do business outside of his "circle of trust," the industry's Packer-Red Book (the Red Book) and/or the Fruit and Produce Credit Book (the Blue Book) become invaluable. Both books, published semiannually with weekly supplements, list every licensed buyer, broker, and shipper operating in the United States. Each individual or firm's name, address, and telephone number are given along with the commodities handled. In addition, both books rate each entrant as to his financial status, paying habits, and general business character. Although the two books are similar in content, shippers generally prefer the Red Book as they believe it to give slightly better coverage of buyers and brokers. Most brokers use the Blue Book.

One of the produce industry's biggest problems today is that of shipper-buyer relations. Despite the use of U.S. grades, the Red Book, and the Blue Book, there are from time to time disagreements between buyers and shippers over the quality of merchandise received. Buyers, in order to protect themselves, demand that all sales be made on either a delivered or f.o.b.i.a.a.[12] basis. Shippers have been

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[12]"'Delivered' or 'delivered sale' means that the produce is to be delivered by the seller on board car, or truck or on dock if delivered by boat, at the market in which the buyer is located, or at such other market as is agreed upon, free of any and all charges for transportation or protective service. The seller assumes all risks of loss and damage in transit not caused by the buyer. For example, a sale of "U.S. No. 1 potatoes delivered Chicago" means that

forced to comply with these demands because, with few exceptions, they are dealing in a "buyer's market".

F.o.b.i.a.a. and/or delivered purchases allow the buyer to see his merchandise before final payment is made. Such sales frequently work to the shipper's disadvantage. If the market price has dropped since the sale was consummated, buyers are very likely to find some deterioration within the shipment, thereby giving them cause to ask the shipper to reduce the previously agreed upon price. Such deterioration, real or not, is known to shippers as "market decay," for should the price be higher than that initially agreed upon the same shipment would likely pass the buyer's inspection with little or no difficulty. In instances of market decay, prices are generally adjusted downward to

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the potatoes, when tendered for delivery at Chicago, shall meet all the requirements of the U.S. No. 1 grade as to quality and condition."

"'F.o.b. inspection and acceptance arrival' means that the produce quoted or sold is to be placed by the seller free on board car or other agency of through transportation at shipping point, the cost of transportation to be borne by the buyer, but the seller to assume all risks of loss and damage in transit not caused by the buyer, who has the right to inspect the goods upon arrival and to reject them if, upon such inspection, they are found not to meet the specifications of the contract of sale at destination. The buyer may not reject without reasonable cause. Such a sale is f.o.b. only as to price and is on a delivered basis as to grade, quality, and condition." Preceding information taken from U.S., Department of Agriculture, Consumer and Marketing Service, Regulations (other than Rules of Practice) Under the Perishable Agricultural Commodities Act, 1930 and Perishable Agricultural Commodities Act (Regulations effective January 1, 1965) (Washington, D.C.: Government Printing Office, n.d.), pp. 26 and 28.

accommodate the buyer. Legally the shipper is not required to sell at a lower price; however, efforts by a shipper to force a buyer to pay the initially agreed upon price would almost certainly remove that particular shipping firm from the buyer's list of potential suppliers.

If the buyer and shipper are not able to agree upon a mutually acceptable price, or if one of the parties fails to comply with the terms of their contract, a complaint may be lodged with the Regulatory Branch, Fruit and Vegetable Division, Consumer and Marketing Service, U.S. Department of Agriculture under the terms of the Perishable Agricultural Commodities Act (PACA). PACA encourages fair trading practices in the produce industry.

> This Federal Law prohibits unfair and fraudulent practices in the marketing of fresh and frozen fruits and vegetables and sets penalties for violation. It provides for collecting damages from anyone who fails to live up to his contract obligations.[13]

PACA requires virtually all individuals who buy or sell fresh or frozen fruits and vegetables in interstate or foreign commerce to be licensed. Failure to comply with the provisions of PACA can result in fines or the suspension or revocation of one's license.

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[13]U.S., Department of Agriculture, Consumer and Marketing Service, Fruit and Vegetable Division, The Perishable Agricultural Commodities Act--Fair Trading in the Fruit and Vegetable Industry, PA 804 (Washington, D.C.: Government Printing Office, 1967), p. 1.

The Decision to Purchase

Although several items influence a buyer's decision as to where to purchase his produce, the commodities' quality, quantity available, and time of arrival are by far the major factors involved. Price is generally a secondary consideration. Quality produce has less waste and more rapid turnover at the retail level than does lower quality merchandise. In addition to quality, buyers seek produce in sufficient quantities to satisfy their needs. Finally, consideration must be given to the length of time required to move the produce from the shipping point to the buyer's warehouse. If these requirements are met in full, most buyers will pay an additional 5 to 10 per cent for the produce and absorb the higher freight rates from even the most distant shipping points.[14]

Quality

Texas, which has a less than desirable reputation within the produce industry, is notorious for its low quality vegetables. Much of this problem stems from grower-shipper arrangements in the Lower Rio Grande Valley. In the Valley there are relatively few grower-shippers. Most growers are contracted to shippers, much as is the case in the Northern District of the Winter Garden. Competition among Valley shippers is keen. Buyers, especially those who purchase in volume, are frequently able to lower a shipper's

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[14] J. R. Walpole, personal interview.

price 20 to 30 per cent with a few phone calls to competing shippers. Under such conditions profits are minimal. As shipper emphasis is placed on volume, produce is often inadequately graded.

The commodities shipped from the Valley, Texas' largest winter vegetable producing area, set the standard by which the rest of the state's produce is judged. Buyers, noting the poor quality of the Valley's produce, often assume the rest of the state's vegetables to be of similar quality, and consequently hesitate or refuse entirely to purchase Texas merchandise.[15]

During the 1967-1968 season efforts by Texas shippers to standardize the quality of produce marketed were limited to federal marketing orders on onions and lettuce. Commodity marketing orders, which in part regulate commodity grade, size, maturity, and shipping containers, are basically quality control programs. Marketing orders, instituted only upon the request of a majority of the growers, are upon issuance binding on all producers of that particular commodity within a designated area. All violations are investigated by the local administrative committee and turned over to the Department of Justice for legal action. Marketing orders seek to improve returns to growers by keeping low quality produce from depressing market prices and prejudicing the consumer

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[15]Personal interview with W. H. Ladley, Sales Manager, Cargil Produce Company, Uvalde, Texas, September 20, 1968.

against the remainder of the crop. Although the marketing order on onions was applied to thirty-five South Texas counties (including those of the Winter Garden), the lettuce order regulated only the crop grown in the Lower Rio Grande Valley.

In the absence of marketing orders, most shippers attempt to form a system of grades by the use of brand names or U.S. grades. For instance, Brand X may represent the shipper's top quality produce and Brand Y produce of a lesser quality. The strength of the brand name is based upon the consistency with which merchandise is packaged. Buyers who deal with the various shippers are generally familiar with the quality they can expect from each of a shipper's brands. Shippers who year after year pack merchandise of similar quality are usually able to find markets for their produce. Those who occasionally dilute the quality of their brands with substandard merchandise soon find they have difficulty selling by brand name. In such instances the possibility of market decay increases appreciably.[16]

U.S. grades exist for all of the winter vegetables studied. These official standards provide a uniform basis for description of a particular commodity. Each grade requires that a commodity conform to certain regulations regarding appearance, shape, maturity, color, size, weight,

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[16]Personal interview with Wallace Martin, vegetable grower-shipper, Carrizo Springs, Texas, October 3, 968.

and decay. Although shippers frequently refer to federal grades when describing their produce to buyers and brokers, it is unlawful to place a U.S. grade upon a shipping container unless the produce has been inspected by authorized personnel.

Transportation

The buyer's decision as to which mode of transportation is to be used is generally based upon warehouse inventory. If supplies are low and the merchandise is urgently needed, it is probable that trucks will be used to move the produce from the shipping point to the buyer's warehouse. If sufficient supplies are on hand and there is no immediate need for the vegetables, the produce will more than likely be transported by rail. Market areas distant from the shipping points try to move most of their produce by rail as the long haul rates are generally less for rail than for truck.

A survey of ninety-three California and Arizona produce shippers conducted by the U.S. Department of Agriculture's Economic Research Service during the early 1960's requested in part that these firms

> . . . enumerate the main advantages and disadvantages of shipping fruits and vegetables by rail and by truck. Their comments are presented below in terms of advantages and disadvantages in the use of trucks, and reflect the opposite viewpoint expressed toward rail service.
>
> The following advantages were reported by shippers. They are stated in the order of their importance, based on the number of firms mentioning them:
>
> (1) Due to more rapid service, fruits and vegetables shipped by truck often arrive in better condition.

Risk of a price change while in transit is reduced by the shorter transit time of trucks.

(2) Multiple pickups and deliveries can be accomplished by truck, and are not practical by rail.

(3) Motor carriers provide more uniform refrigeration, and the incidence of loss or damage is below that of rail. Claims against truckers can usually be settled immediately, while the process is more time consuming with rail.

(4) In many instances, a truck can be loaded at less cost than a rail car and can be obtained faster than some types of rail equipment. Expensive stripping and bracing material and heavy containers needed in rail transit are not used as much in loading truck shipments.

(5) Truck charges are lower for short hauls of full lots, and are well below rail charges for part lots whatever the distance.

(6) Rail regulations governing the size and type of containers or methods of loading have no parallel among truckers. Truckers will accept practically any shipment regardless of how it is packaged.

The disadvantages reported by the firms, in order of importance, were as follows:

(1) Truck operators cannot be depended upon to meet prearranged loading schedules. This disrupts shipping routine, and creates labor problems by requiring irregular hours. Truckers insist on immediate departure and this places the shipper at a disadvantage in meeting his other loading commitments.

(2) As truck charges for hauling exempt products are not regulated, a bargaining situation exists. Shippers said that limited knowledge of truck availability impairs their ability to judge whether a charge quoted is reasonable.

(3) The financial responsibility of some truck operators is uncertain.

(4) The lack of uniformity in truck equipment, as opposed to rail equipment, causes more of a problem when scheduling equipment for large loads.

(5) Trucks, more than railroads, have delaying emergencies in route such as accidents, breakdown of

equipment, delays resulting from traffic or weight violations, etc.

(6) Diversion in route is not practical with trucks, because such service as a general rule is very costly.[17]

Distribution of Winter Garden Produce, 1967-1968 Season

The factors of produce quality, time-in-transit, and freight rates all affected the distribution of vegetables from the Winter Garden during the 1967-1968 season. Although Winter Garden produce was sent to virtually every state east of the Rocky Mountains during this period, Figure 25 and Table 21 indicate that over half of the produce shipped from the Winter Garden moved to market areas in the Southeastern or Northeastern sections of the United States, while less than 1 per cent of the area's produce moved to points west of the Rocky Mountains.

Little Winter Garden produce moves into the Northwestern and Western sections of the United States as California-Arizona shippers are generally able to supply these areas with their fresh vegetable needs. Prohibitive freight rates (Table 22) and longer times-in-transit (Table 23) prevent Texas and Florida produce from competing successfully in these areas. Trucks, virtually all carrying backhaul

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[17] U.S., Department of Agriculture, Economic Research Service, Interstate Hauling of California-Arizona Fresh Fruits and Vegetables by Rail and Truck, Marketing Research Report No. 673 (Washington, D.C.: Government Printing Office, 1964), p. 23.

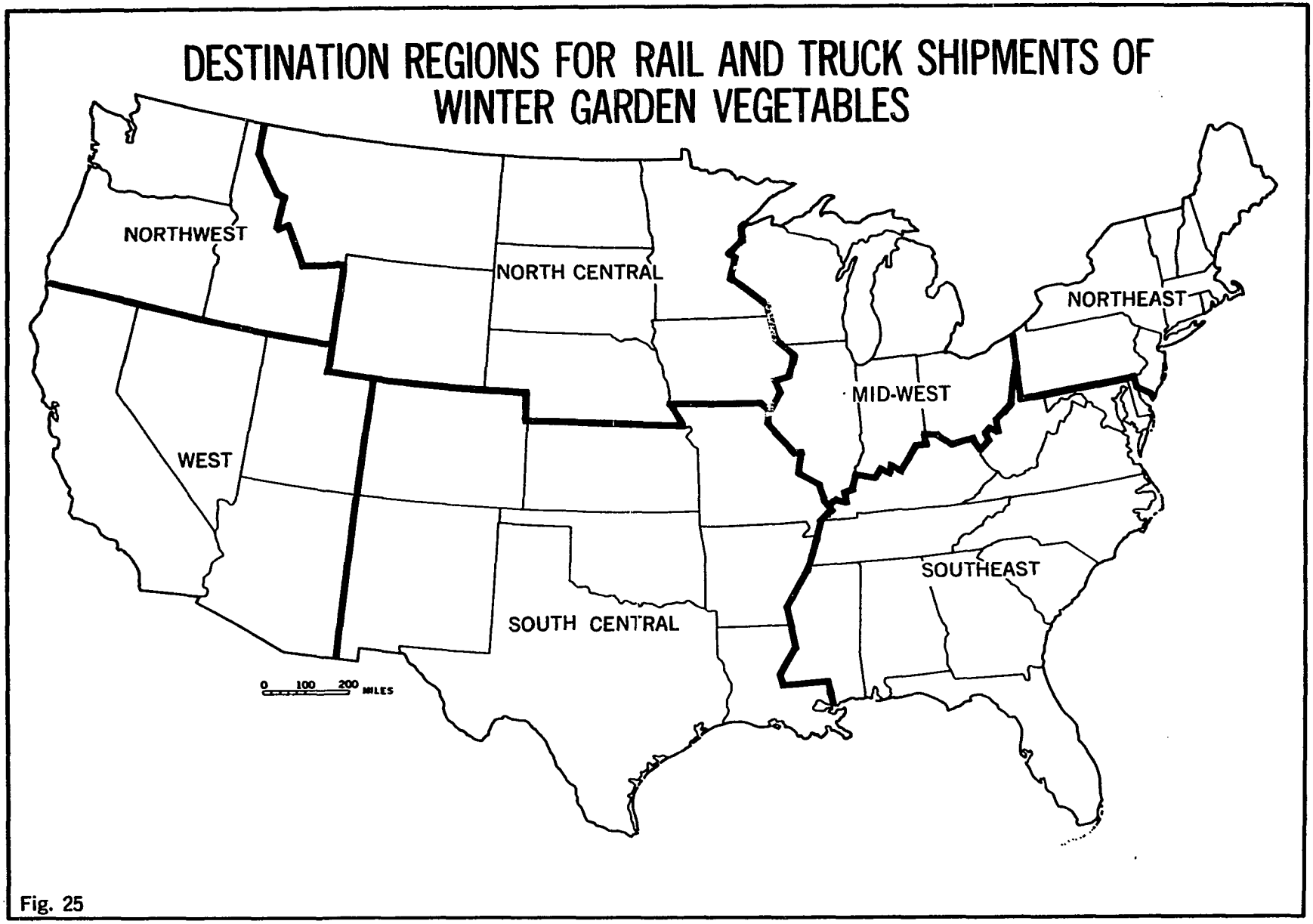
DESTINATION REGIONS FOR RAIL AND TRUCK SHIPMENTS OF WINTER GARDEN VEGETABLES
NORTHWEST
NORTH CENTRAL
NORTHEAST
MID-WEST
WEST
SOUTHEAST
SOUTH CENTRAL
0 100 200 MILES

Fig. 25

TABLE 21

REGIONAL DESTINATION OF WINTER GARDEN PRODUCE, 1967-1968[a]

Shipping Firm	Acreage Grown or Handled for the Fresh Market	% of Produce Handled by Five Selected Shippers Interviewed	% of Total Produce Shipped (Interview Response)						
			NW	W	NC	SC	Mid-W	SE	NE
A	8,500	62	0	0	5	20	10	50	15
B	2,500	18	0	0	10	5	40	0	45
C	1,500	11	2	0	0	18	15	55	10
D	1,000	7	0	5	5	30	20	10	30
E	300	2	0	15	10	40	25	0	10
Gross % Shipped by Areas of Destination[b]			.21	.64	5.43	18.12	17.19	37.63	20.73

[a]Source: Data presented in this Table regarding shipments of Winter Garden produce were obtained through personal interviews with selected area shippers (February 3-7, 1969). The five shippers interviewed handled approximately 75 per cent of the winter vegetables sold for the fresh market during the 1967-1968 season.

[b]Gross percentages by areas of destination were determined in the following manner: (1) the "Per Cent of Produce Handled by Five Selected Area Shippers Interviewed" was multiplied by each respondents "Per cent of Total Produce Shipped" (figure a), (2) figure a totals were than summed by areas of destination (figures b-h), (3) figures b-h were totaled (figure i), (4) figure i was then divided into each of the sums of the individual destination areas (figures b-h).

TABLE 22

FREIGHT RATES[b] FROM WINTER VEGETABLE[c] PRODUCING AREAS TO SELECTED MARKETS, 1968[a]

To	From					
	California-Arizona		Texas		Florida	
	El Centro-Phoenix[d]	El Centro-Phoenix[e]	Carrizo Springs	Harlingen	Hastings[e]	Belle Glade[f]
Atlanta	210	208	109	109	103	153
Boston	210	214	160	164	170	215
Chicago	169	173	117	120	169	209
Cleveland	208	173	127	131	168	208
Dallas	151	165	61	70	186	218
Denver	126	140	111	116	225	274
Los Angeles	438	438	187h	187h	234	234
Minneapolis	1918	1918	120	125	201	227
New Orleans	169	173	74	74	139	181
New York	210	214	152	153	161	203
St. Louis	169	173	103	107	161	201

[a]Source: Personal interview with Richard E. Warman, Chief Rate Clerk, Santa Fe Railway Company, Oklahoma City, Oklahoma, January 8, 1969; letters from H. E. McNaught, Manager, Perishable Freight Traffic, Southern Pacific Company, San Francisco, California, January 21, 1969 and November 13, 1968; and letter from W. A. Adams, Regional Manager, Florida East Coast Railway Company, Miami Springs, Florida, January 15, 1969.

[b]Commodity rates (in cents per cwt.) from point of origin to point of destination for carload lots, minimum weight 40,000 pounds unless otherwise specified.

[c]Unless otherwise specified rates apply to beets, broccoli, cabbage, carrots, cauliflower, lettuce, onions, and spinach.

[d]Rates do not apply to cabbage.

[e]Rates apply to cabbage only.

[f]Rates apply to lettuce only.

[g]Not a commodity rate.

[h]Carload lot, minimum weight 30,000 pounds.

TABLE 23

APPROXIMATE TIME REQUIREMENTS FOR FRESH VEGETABLES TO REACH SELECTED DESTINATIONS, 1968
(in days)

Destination	Area of Origin					
	California-Arizona		Texas		Florida	
	Truck	Rail	Truck	Rail	Truck	Rail
Northwest	1-3	4-6	3-4	6-9	5-6	9-12
West	1-2	1-4	2-3	4-7	3-5	6-9
North Central	2-4	3-6	2-4	3-6	3-5	5-7
South Central	2-3	3-6	1-2	3-4	2-3	4-7
Mid-West	3-5	4-6	2-3	4-7	2-3	4-8
Southeast	4-5	4-7	2-4	3-6	1-2	1-4
Northeast	4-6	6-8	3-5	6-8	3-4	4-7

Source: Personal interviews with Tim E. Nunnery, Tracing and Diversion Clerk, Southern Pacific Company, Dallas, Texas, January 20, 1969; Howard Ludden, Chief Clerk, Missouri Pacific Railroad Company, Dallas, Texas, January 20, 1969; and Virgil Grogan, fresh fruit and vegetable broker, J&N Brokerage Company, Oklahoma City, Oklahoma, January 6, 1969; and letter from W. A. Adams, Regional Manager, Florida East Coast Railway Company, Miami Springs, Florida, January 15, 1969.

(primarily to Los Angeles and Seattle), were responsible for all Winter Garden produce movements in these two western regions (Table 24).

A little over 5 per cent of the Winter Garden's produce was shipped into the North Central section during the 1967-1968 season. Time-in-transit from Texas to that section is comparable with that from the California-Arizona region and from one (truck) to two (rail) days faster than from Florida areas. Freight rates from Texas to Minneapolis are considerably lower than those from California-Arizona or Florida. Vegetable movements via backhaul (especially into the Minneapolis area) are of considerable importance. During the study period approximately 77 per cent of the produce sent into the North Central region was carried by truck.

Almost 38 per cent of the produce harvested in the Winter Garden during the 1967-1968 season was sent into the heavily populated Mid-Western (17 per cent) and Northeastern (21 per cent) sections of the United States. Within these two areas lie many of the nation's largest produce terminals. Competition is keen in these northern markets. Area consumers, paying premium prices and long accustomed to quality produce, demand the best merchandise available. Although all grades of produce are sent into the Mid-Western and Northeastern areas, shippers are generally aware of buyer requirements. Attempts to move low quality vegetables into these markets almost invariably results in considerable market decay.

TABLE 24

METHOD OF TRANSPORTATION USED TO SHIP PRODUCE FROM THE WINTER GARDEN, 1967-1968[a]

Shipping Firm	% of Produce Handled by Five Selected Shippers Interviewed	% Shipped by Truck and/or Railroad (Interview Response)													
		NW		W		NC		SC		Mid-W		SE		NE	
		T	R	T	R	T	R	T	R	T	R	T	R	T	R
A	62	b	b	b	b	90	10	100	0	20	80	70	30	0	100
B	18	b	b	b	b	25	75	99	1	25	75	b	b	1	99
C	11	100	0	b	b	b	b	100	0	15	85	95	5	15	85
D	7	b	b	100	0	90	10	100	0	10	90	90	10	0	100
E	2	b	b	100	0	100	0	100	0	40	60	b	b	0	100
Gross % Shipped by Mode		100	0	100	0	77	23	99	c	20	80	75	25	2	98

Total percentage of produce shipped by truck - 55.3

Total percentage of produce shipped by rail - 44.7

[a]Source: Data collection and computation method identical to that described in Table 21.

[b]Shipper indicated no produce sent into this area by his firm during the 1967-1968 season.

[c]Less than 1 per cent.

Texas shippers enjoy favorable freight rates into the Mid-Western and Northeastern sections. Times-in-transit into this large consuming region vary only slightly between competing areas. California-Arizona shippers, more distant than their Texas and Florida counterparts, generally require an additional day for truck delivery. Rail shipments into these areas from California-Arizona and Texas are somewhat slower than those from Florida due to distance and system inefficiencies respectively.

During the 1967-1968 season approximately 56 per cent of the produce shipped from the Winter Garden moved to markets in the South Central (18 per cent) and Southeastern (38 per cent) sections of the United States. Although these two southern regions are not as heavily urbanized as the Mid-Western or Northeastern sections, market potential within these areas is considerable. Consumers in these two southern sections are, as a group, unwilling to pay the premium prices required to acquire high quality produce. Accepting this fact buyers have, through the years, gradually conditioned consumers to accept a less desirable product than that purchased by consumers in the northern states.

Competition

Florida, a minor producing area, overall provides little competition for Texas shippers. Freight rates from California-Arizona points into the larger southern terminals are often double those paid by Texas shippers. Certainly

produce is received into this area from California-Arizona, but it is frequently merchandise unacceptable to Mid-Western or Northeastern buyers. Times-in-transit favor Florida and Texas shippers. California-Arizona produce generally requires from one to two additional days for truck and/or rail deliveries.

Texas' major domestic competitors are California (cabbage, carrots, lettuce, and spinach), Arizona (broccoli, cabbage, cauliflower, and lettuce), and Florida (cabbage and lettuce) (Table 25). Foreign competition for the winter vegetable market is practically non-existent. Mexico exports some cool season vegetables into the United States during the winter months; however, the vast majority of Mexican produce imported during this period consists of tomatoes, cantaloupes, cucumbers, and peppers. Mexican vegetables generally encounter little competition as climatic conditions in the United States prohibit the domestic production of these crops during the winter months. High freight rates, import duties, and the highly competitive nature of the market tend to discourage winter vegetable importation. There is some export of storage commodities (notably carrots and onions) from Canada into the Mid-Western and Northeastern sections of the United States.[18]

The variety of fresh vegetables available to the American consumer throughout the year is indicative of the

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[18]Letter from E. J. Holcomb, Chief, Vegetable Branch, U.S. Department of Agriculture, Consumer and Marketing Service, Washington, D.C., September 19, 1968.

TABLE 25

WINTER VEGETABLE PRODUCTION IN THE UNITED STATES, BY INDIVIDUAL CROP AND PRODUCING AREA, AVERAGE 1961-1967[a]

	Acres Harvested	% of Crop	Yield per Acre (cwt.)
Beets			
Texas	1,814	100.0	89
Broccoli			
Texas	2,629	83.3	31
Arizona	527	16.7	66
Cabbage			
Florida	15,414	36.8	186
Texas	19,914	47.5	121
Arizona	1,386	3.3	194
California	5,200	12.4	219
Carrots			
Texas	32,571	81.8	116
California	7,286	18.2	241
Cauliflower			
Texas	1,471	71.0	54
Arizona	600	29.0	71
Lettuce			
Florida	3,429	4.9	89
Texas	6,643	9.5	91
Arizona	16,571	23.6	166
California	43,557	62.0	186
Onions[b]			
Texas	21,629	100.0	132
Spinach			
Texas	6,643	80.7	34
California	1,586	19.3	125

[a]Source: U.S. Department of Agriculture, Statistical Reporting Service, Crop Reporting Board, Vegetables-Fresh Market 1967 (Washington, D.C.: Government Printing Office, 1967), pp. 22-25, 30-33, 42-45, and 49-50.

[b]Early spring harvest.

progress which has taken place within the produce industry since the turn of the century. Because of the advances made in the areas of production, transportation, preservation, and marketing, highly perishable commodities can now be moved across the nation in a matter of days with minimal deterioration. In addition to technological advances, stringent controls now applied by both the federal government and the industry itself have largely succeeded in eliminating the overtly dishonest merchant.

Texas shippers enjoy the advantages of location and favorably competitive freight rates, but, unfortunately, they are somewhat restricted by their reputation within the produce industry for low quality merchandise. Although considerable quantities of Texas vegetables move into northern markets, the majority of the area's produce is presently shipped into the potentially less profitable southern markets.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

Because of the United States' rapidly expanding affluent urban population, there has been an ever-increasing demand for fresh vegetables. Climatic factors, which limit the vast majority of the nation to vegetable production during the warmer months of the year, and man are largely responsible for the creation of the numerous winter vegetable producing areas in the southern portions of California, Arizona, Texas, and Florida.

One such area in Texas is the Winter Garden. Located on the South Texas Plain, approximately seventy-five miles southwest of San Antonio, the Winter Garden region is a volume producer of cabbage, carrots, onions, and spinach during the winter and early spring months. In 1964 the Winter Garden area accounted for approximately 18 per cent of Texas' total winter vegetable production. Although area production is minor when compared with that of the Lower Rio Grande Valley, the economic importance of the vegetable industry to the local population should not be underestimated. In the Winter Garden's Southern District virtually every family

and business establishment is either directly or indirectly dependent upon the produce industry.

Although the boundaries of the Winter Garden are defined in relation to its winter vegetable production, certainly the most important source of agricultural income would be the area's livestock industry. Cattle represent the primary livestock form, although sheep and goats are found in the uplands and/or more rugged areas and especially in the sectors closer to the Edwards Plateau. Non-vegetable cropland is devoted primarily to grain sorghum, small grain, and hay acreages.

With respect to land use the Winter Garden has always been livestock oriented. Prior to the beginning of the twentieth century practically all land within the area was devoted to large cattle or sheep ranches. Railroad expansion into the region, which began about 1880, brought area residents fast, convenient transportation to the more distant parts of the country. Land speculators, emphasizing the agricultural potential of the area, subdivided some of the ranch land and subsequently sold many individuals small acreages of the once near-worthless range. Cheap labor, a mild climate, railroad connections with the nation's major markets, and an abundance of water brought many settlers into the Winter Garden during the first thirty years of the present century. Although a variety of fall, winter, and spring vegetables was grown during this early period, the region

became best known for its winter vegetables--notably onions and spinach.

The Depression of the 1930's effectively retarded further development of the Winter Garden's produce industry. Prosperity returned to the area with the advent of World War II. Since the end of World War II growers have found it increasingly difficult to profitably produce and market their vegetable crops. The major problems confronting Winter Garden vegetable producers today are those related to water, labor, and markets.

Although water requirements vary for the individual crops, all vegetable growers in the Winter Garden make extensive use of irrigation. Irrigation waters are drawn primarily from three formations--the long exploited Carrizo sand, the Edwards and associated limestones, and the Leona formation. The great majority of vegetable producers are dependent upon waters taken from the Carrizo sand; however, expanding acreages and droughts have combined in recent years to seriously lower the piezometric surface in this water-bearing formation. Utilizing relatively shallow wells, Uvalde County farmers draw their irrigation waters from the virtually untapped Edwards and associated limestones. Of lesser importance for irrigation are the waters taken from the Leona formation between Batesville and Uvalde. The use of surface water for irrigation is insignificant throughout the Winter Garden region except along the Nueces River east of Crystal City.

In recent years due to the abolition of the bracero program and the establishment of minimum wage laws, Winter Garden producers have experienced mounting labor costs. Mechanization, begun in the early 1940's, is becoming increasingly important in the area. Pre-harvest labor requirements have been greatly reduced by the increased use of chemical pesticides. In the Winter Garden, as in most sections of the United States, the cost-price squeeze has eliminated many of the smaller farmers. The numerous small farms once found in the region have either been returned to grazing land or are at present being absorbed by the larger growers.

Regardless of how favorable the water or labor situation might be, these factors are relatively unimportant unless the mature crop can be profitably marketed. Because of rising costs, growers have found it increasingly necessary to assure themselves of a market prior to planting. Practically all vegetable growers make agreements with area shippers before planting their crops.

Although Winter Garden produce was sent to all sections of the United States during the 1967-1968 season, most of the area's shipments moved to points east of the Rocky Mountains. The large population centers of the Mid-West and Northeast, and the cities of the South Central and Southeastern sections of the United States received the bulk of Texas' cool season harvest. Demand variability and

competition from California, Arizona, Florida, and especially the Lower Rio Grande Valley create drastic price fluctuations. Occasionally prices are so low that vegetable growers are forced to plow up sizeable acreages and absorb what they consider to be minimal losses rather than assume the high labor costs involved in harvesting and packing the crop. Today, as in the past, vegetable farming in the Winter Garden, although at times highly profitable, is an extremely risky venture.

Conclusions

The future of the Winter Garden vegetable industry will be determined to a large extent by the degree of success area growers and shippers experience in their efforts to overcome the problems they face. With regard to the problem of water, it is imperative that farmers, especially those in the Southern District, realize the seriousness of the local situation and make every effort to eliminate waste in their respective farming operations. In order to maintain reasonably adequate and economically obtainable water supplies in the Winter Garden area, it is recommended that:

(1) a study by the appropriate agencies be made of the Carrizo and Edwards aquifers to more accurately determine (a) aquifer rechargeability--both natural and artificial, (b) the effects of discharge on the total aquifer, and (c) rate and direction of ground water movement within the respective aquifers;

(2) the Texas State Legislature pass appropriate measures to more effectively regulate ground water withdrawals by landowners;

(3) Southern District farmers give serious consideration to the formation of a regional underground water district. Such a district could function not only "to conserve, preserve, protect, and increase the recharge of and prevent the waste and pollution of the underground" reservoir but act as an agency for the dissemination of data regarding water conservation as well;

(4) the Zavala-Dimmit Counties Water Improvement District No. 1 increase both its area of service and total reservoir capacity;

(5) area growers make (a) increasing use of water conserving and labor saving chemical herbicides and gated aluminum irrigation pipe, (b) every effort to minimize accumulations of tailwater and thus reduce unnecessary water, soil, and fertilizer losses, and (c) extensive use of early maturing varieties of vegetables.

The fact Texas growers have, until recent years, had an abundance of cheap labor at their disposal, has served to retard the implementation of modern scientific farming methods. Texas yields of the various winter vegetable crops are almost without exception considerably below those of competing states. With the elimination of the <u>bracero</u> program and the introduction of minimum wage laws, most area growers realized that continued use of old substandard

farming practices would only result in the further reduction of net profits. Although Winter Garden vegetable farmers have recently begun to make more efficient use of their water, land, and labor resources, a considerable gap still exists between their achievements and those of their competitors.

Production costs and the marketing situation are now such that area growers can only expect a profit about one year in five. The number of profitable years could be appreciably increased if area growers directed their efforts toward improving their yields of high quality produce and reducing per unit production costs. To reach these objectives it is recommended that area farmers:

(1) practice a sensible crop rotation, fertilization, and soil improvement program;

(2) utilize mechanical planting methods for all vegetable crops;

(3) by the use of high quality capsulized seed,[1] eliminate the practice of thinning vegetable crops such as lettuce and cabbage;

(4) consider the use of mechanically placed polyethylene film (this film, placed over the individual rows, provides growing plants with protection and warmth

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[1] In addition to seed each capsule generally contains sufficient amounts of fertilizer and pesticides to insure germination and early growth.

while practically eliminating the problem of weeds and appreciably decreasing evaporation rates);

(5) make increasing use of the various chemical pesticides;

(6) consider the supervised use of such biological control techniques as sexually sterile organisms, chemosterilants, and selective insect attractants;[2]

(7) utilize mechanical harvesters and/or harvesting aids where possible.

Although there is considerable room for improvement in the production sector of the Winter Garden vegetable industry, the most urgent problems facing growers are those related to the marketing of produce. The industry's two greatest needs include upgrading the quality of area produce and the establishment of the Winter Garden region as a force in the market. In order to improve the vegetable marketing situation, it is recommended that growers:

(1) work for the adoption of federal marketing orders for all winter vegetable crops;

(2) consider the formation of a fresh vegetable marketing co-operative to (a) promote Winter Garden produce to wholesale buyers, (b) rigidly inspect, uniformly package, and sell in volume area produce, and (c) further aid in reducing grower marketing costs through centralization of functions and volume transactions.

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[2]U.S., Department of Agriculture, Yearbook of Agriculture, 1966 (Washington, D.C.: Government Printing Office, 1966), p. 368.

The future of the Winter Garden's produce industry will be determined by decisions made in the coming decade. A continuation of present farming practices and marketing policies will inevitably result in the dissolution of the area's fresh market vegetable industry. Although in more economically diversified Uvalde County the effects of such a loss would be minimal, a similar loss would spell economic disaster for Dimmit and Zavala counties. Area towns would gradually die as people moved away in search of employment. Crystal City and Carrizo Springs would in time join Catarina and Bermuda as relics of a once more prosperous period.

If, however, local growers and shippers make sincere and concerted efforts to solve the problems facing them, the Winter Garden vegetable industry may look forward to a long and prosperous future. In the final analysis, tomorrow's produce industry will be the direct result of the decisions made by area growers and shippers today.

APPENDIX I

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES, WINTER GARDEN AREA, TEXAS

SYSTEM	SERIES	GROUP	FORMATION OR MEMBER	MAXIMUM OBSERVED THICKNESS (FEET)	LITHOLOGY	WATER-BEARING PROPERTIES
QUATERNARY	RECENT		ALLUVIUM		SILT, SAND, AND GRAVEL IN THE STREAM VALLEYS.	LOCALLY YIELDS SMALL SUPPLIES OF WATER TO WELLS FOR DOMESTIC USE.
	PLEISTOCENE		LEONA FORMATION	75	ALLUVIAL SILT, SAND, AND GRAVEL FORMING WIDE, NEARLY FLAT TERRACES IN THE STREAM VALLEYS.	MANY DOMESTIC STOCK WELLS DERIVE POTABLE WATER FROM THE LEONA FORMATION IN VALLEYS OF THE LEONA AND NUECES RIVERS.
TERTIARY	PLIOCENE (?)		UVALDE GRAVEL	20	MOSTLY CHERT GRAVEL, BUT CONTAINS SOME SILT. CAPS THE HILLS AND DIVIDES.	YIELDS NO WATER TO WELLS IN THE AREA.
	EOCENE	CLAIBORNE	COOK MOUNTAIN FORMATION	700	CHIEFLY MEDIUM-GRAINED SANDSTONE, INTER-BEDDED WITH DARK CLAYS AND LENSES OF GRAY LIMESTONE.	YIELDS SMALL SUPPLIES OF WATER IN SOUTHEASTERN ZAVALA COUNTY.
			MOUNT SELMAN FORMATION — POST-BIGFORD BEDS	700	MOSTLY DARK CLAYS BUT A FEW THIN BEDS OF SAND AND LIMESTONE CONTAINING NUMEROUS CONCRETIONS.	YIELDS SMALL SUPPLIES OF HIGHLY MINERALIZED WATER FROM A FEW RANCH WELLS IN EASTERN DIMMIT AND ZAVALA COUNTIES.
			MOUNT SELMAN FORMATION — BIGFORD MEMBER	800	DOMINANTLY GYPSIFEROUS SANDY CLAY; CONTAINS MANY LENSES OF SANDSTONE NEAR THE BASE; ALSO CONTAINS CONCRETIONS AND A FEW LAYERS OF LIMESTONE.	YIELDS SMALL SUPPLIES OF GOOD WATER IN PART OF NORTHERN ZAVALA COUNTY. ELSEWHERE THE WATER IS TOO HIGHLY MINERALIZED FOR USE.
			CARRIZO SAND	360	MOSTLY FINE TO COARSE CROSS-BEDDED SAND; CONTAINS CLAY LENSES, SANDSTONE, LIGNITE, PYRITE, AND IRONSTONE CONCRETIONS.	YIELDS MORE THAN 90 PER CENT OF THE WATER PUMPED IN DIMMIT AND ZAVALA COUNTIES AND FRIO TOWN AREA. YIELDS SMALL SUPPLIES OF WATER IN UVALDE COUNTY.
		WILCOX	INDIO FORMATION	1,320	DOMINANTLY GYPSIFEROUS CLAY, BUT CONTAINS MANY LENSES AND PERSISTENT LAYERS OF SANDSTONE. CALCIUM CARBONATE AND IRONSTONE CONCRETIONS ARE ABUNDANT.	SOME STOCK AND DOMESTIC WELLS YIELD SMALL SUPPLIES OF POTABLE WATER. HOWEVER, THE WATER IS GENERALLY HIGHLY MINERALIZED AND IN SOME WELLS IS UNFIT FOR STOCK.
	PALEOCENE	MIDWAY	KINCAID FORMATION	550	CHIEFLY DARK SHALE, BUT CONTAINS LENSES AND LAYERS OF SANDSTONE, LIMESTONE, AND CLAY. THIN CONGLOMERATE AT BASE.	YIELDS NO WATER TO WELLS IN AREA.
CRETACEOUS	GULF		ESCONDIDO FORMATION	285+	HARD FINE-GRAINED SANDSTONE AND INTER-BEDDED SHALE AND CLAY; SOME LIMESTONE. IN PLACES IMPREGNATED WITH ASPHALT.	YIELDS SMALL SUPPLIES OF SALINE WATER IN UVALDE COUNTY.
			OLMOS FORMATION	920	SHALE, SANDY SHALE, COAL, AND THIN BEDS OF SANDSTONE.	YIELDS NO WATER TO WELLS.
			SAN MIGUEL FORMATION	800	SAND AND SANDY LIMESTONE GRADING UPWARD INTO CLAY AND SANDY SHALE.	YIELDS NO WATER TO WELLS.
			TAYLOR MARL	100	CALCAREOUS CLAY AND MARL.	YIELDS NO WATER TO WELLS.
			ANACACHO LIMESTONE	470	FINE TO COARSE-GRAINED LIMESTONE ALTERNATING WITH RED BENTONITIC CLAY.	YIELDS SMALL SUPPLIES OF SALINE WATER.
			AUSTIN CHALK	580	WHITE TO BUFF CHALK, MARL AND LIMESTONE.	YIELDS SMALL TO MODERATE SUPPLIES OF WATER.
			EAGLE FORD SHALE	240	FLAGGY LIMESTONE AND INTER-BEDDED CARBONACEOUS SHALE.	YIELDS SMALL SUPPLIES OF SALINE WATER.
			BUDA LIMESTONE	100	HARD MASSIVE FINE-GRAINED WHITE TO PINK LIMESTONE.	YIELDS SMALL TO MODERATE SUPPLIES OF WATER.
	COMANCHE	WASHITA	GRAYSON SHALE	120	BLUE CLAY, WEATHERS YELLOW. CONTAINS SOME THIN LIMESTONE.	YIELDS NO WATER TO WELLS.
		FREDERICKSBURG AND ASSOCIATED LIMESTONES	GEORGETOWN LIMESTONE	400	HARD MASSIVE CHERTY LIMESTONE.	PRINCIPAL AQUIFER IN UVALDE COUNTY. YIELDS LARGE QUANTITIES OF WATER OF GOOD CHEMICAL QUALITY.
			KIAMICHI LIMESTONE	210	FLAGGY, CHERTY LIMESTONE, BLACK PETROLIFEROUS SHALE, AND SOME DOLOMITE.	
			EDWARDS LIMESTONE	100	HARD MASSIVE CHERTY LIMESTONE AND SOME DOLOMITE.	
			COMANCHE PEAK LS.	90	HARD NODULAR LIGHT-GRAY LIMESTONE.	

SOURCE: U.S., DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, GEOLOGY AND GROUND-WATER RESOURCES OF UVALDE COUNTY, TEXAS, BY F.A. WELDER AND R.D. REEVES, GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1584, PREPARED IN CO-OPERATION WITH THE TEXAS BOARD OF WATER ENGINEERS AND THE CITY OF SAN ANTONIO (WASHINGTON, D.C.: GOVERNMENT PRINTING OFFICE, 1964), pp. 8 and 9; AND GEOLOGY AND GROUND-WATER RESOURCES OF THE WINTER GARDEN DISTRICT TEXAS, 1948, BY SAMUEL F. TURNER, THOMAS W. ROBINSON AND WALTER N. WHITE, REVISED BY DONALD E. OUTLAW, W.O. GEORGE AND OTHERS, GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1481, PREPARED IN CO-OPERATION WITH THE TEXAS BOARD OF WATER ENGINEERS (WASHINGTON, D.C.: GOVERNMENT PRINTING OFFICE, 1960), pp. 24-26.

APPENDIX II

CLIMATOLOGICAL DATA FOR UVALDE AND CARRIZO SPRINGS, TEXAS, 1928-1968

Uvalde, Texas

Average Temperature (°F)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	52.6	57.0	67.2	69.0	75.6	83.6	86.8	86.2	79.5	75.4	62.0	54.5	70.8
1929	56.6	53.1	68.4	76.7	79.2	86.4	86.0	87.9	82.2	72.9	55.6	52.8	71.5
1930	46.6	63.6	61.6	73.9	77.0	80.4	84.2	86.3	82.6	69.8	58.7	50.6	69.6
1931	51.8	57.7	57.8	64.1	71.4	79.8	81.9	80.9	82.6	78.0	66.0	52.3	68.7
1932	55.4	61.8	58.8	70.8	75.4	84.0	82.5	83.2	75.5	67.0	55.8	51.4	68.5
1933	58.9	55.6	64.8	69.0	78.8	80.8	85.4	83.9	83.0	74.5	63.0	58.8	71.4
1934	55.6	57.1	62.0	73.0	78.5	87.4	86.9	86.2	81.0	75.5	66.2	55.6	72.1
1935	57.4	57.0	69.9	73.1	76.0	80.7	83.6	84.2	76.5	72.6	90.9	53.1	70.4
1936	50.6	55.4	66.8	69.4	76.2	83.4	82.9	84.8	80.2	65.8	57.2	54.4	68.9
1937	53.0	56.4	60.4	71.6	79.4	84.6	86.2	88.6	81.6	72.8	60.2	53.5	70.7
1938	55.6	62.0	69.4	69.0	77.6	85.8	86.7	86.0	81.5	74.2	60.0	53.8	71.8
1939	55.4	55.6	68.0	73.4	80.6	85.6	87.0	82.8	81.2	73.2	58.3	55.8	71.4
1940	45.2	55.8	63.6	70.0	77.2	80.2	84.4	86.0	79.7	72.8	58.7	57.4	69.2
1941	56.0	55.1	57.8	69.1	75.8	81.0	85.0	86.9	81.8	77.4	61.6	55.6	70.3
1942	52.3	54.0	61.5	72.5	78.6	85.6	83.9	86.0	76.9	71.6	62.4	54.5	70.0
1943	51.0	58.4	61.0	74.4	79.8	83.5	86.6	88.7	78.4	68.6	58.6	49.2	69.8
1944	50.4	58.6	62.9	69.6	75.8	82.8	87.4	85.2	78.0	70.0	61.6	50.1	69.4
1945	53.6	57.4	66.2	68.9	77.2	83.8	85.2	86.7	82.0	69.4	63.0	50.7	70.3
1946	49.5	56.8	66.7	74.2	76.6	82.2	86.3	85.9	80.5	72.9	60.8	55.6	70.7
1947	48.4	49.8	57.8	69.2	77.2	83.3	83.5	83.3	81.2	78.5	58.4	54.3	68.8
1948	47.2	53.0	62.1	74.4	79.6	85.0	84.8	86.2	77.8	69.7	58.6	55.7	69.5
1949	48.4	58.9	63.0	64.6	78.0	81.9	84.3	82.8	80.8	70.8	61.8	55.6	69.2
1950	60.0	58.5	62.8	69.9	78.0	81.3	84.0	83.1	80.5	74.6	59.7	53.4	78.8
1951	51.4	55.8	64.7	70.6	75.8	82.3	87.3	87.3	82.5	75.7	58.3	55.1	70.6
1952	59.4	58.4	60.8	68.4	74.5	82.3	85.2	87.4	79.6	67.9	59.5	51.2	69.5
1953	55.4	56.3	69.9	72.3	79.7	88.1	88.2	85.2	76.7	70.4	59.3	48.0	70.8
1954	54.5	60.8	62.8	74.0	76.2	83.0	85.2	85.4	83.3	73.0	59.8	57.1	71.3
1955	51.9	56.2	64.7	74.7	78.9	82.3	83.3	84.5	81.6	69.6	59.3	52.1	70.0
1956	51.4	56.1	64.0	70.9	80.2	85.5	84.8	84.4	80.3	73.9	57.6	55.3	70.4
1957	53.7	63.1	62.2	66.8	74.3	80.5	86.0	85.8	78.5	67.1	56.3	53.3	69.0
1958	47.5	49.4	55.9	67.2	73.9	82.9	84.7	84.1	80.0	67.4	59.4	49.4	66.8
1959	48.2	53.6	60.0	65.9	76.8	82.3	82.0	84.1	81.1	69.9	53.7	53.4	67.6
1960	49.4	49.8	55.9	70.6	74.5	83.5	84.0	83.0	78.4	73.8	61.1	48.3	67.7
1961	46.4	54.0	65.0	68.7	78.9	82.4	81.0	80.7	79.8	69.2	56.3	52.9	67.9
1962	45.0	63.4	58.9	70.0	78.5	82.8	86.5	86.7	81.4	75.6	59.7	51.3	70.0
1963	45.3	50.9	66.1	75.5	76.8	83.2	85.2	86.2	80.8	72.5	60.9	43.9	69.0
1964	47.7	49.0	60.4	71.7	77.2	81.6	85.3	84.1	78.9	65.5	61.1	50.7	67.8
1965	54.0	49.9	56.0	71.1	74.8	81.5	84.1	82.8	80.3	66.8	64.0	55.4	68.4
1966	46.2	50.6	61.0	70.8	75.1	80.3	85.9	82.6	78.9	68.9	64.2	51.9	68.0
1967	50.4	53.1	67.6	76.5	77.7	84.1	86.1	81.7	74.6	67.1	59.0	49.4	68.9
1968	49.2	48.6	57.1	68.6	74.6	79.6	81.6	83.0	73.9	70.3	58.2	53.2	65.0

Uvalde, Texas

Total Precipitation (Inches)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	.58	2.17	.63	.84	3.87	4.68	.30	1.90	4.94	.40	.12	.78	21.21
1929	.45	.27	2.07	.74	5.60	2.03	1.90	.10	5.45	2.30	.82	1.60	23.23
1930	.83	.14	1.83	2.15	1.46	8.27	1.00	.71	.88	6.04	2.48	.65	26.44
1931	5.82	1.40	.50	6.74	9.08	2.35	3.85	3.25	Tr.	.10	.64	2.61	36.34
1932	.67	1.85	1.40	1.70	2.19	1.18	21.01	4.55	8.62	.12	.58	1.15	45.02
1933	2.71	2.06	.20	.85	2.80	.86	1.57	2.25	.30	.95	.27	.40	15.22
1934	2.95	.22	.88	1.08	1.88	.15	3.53	.42	2.52	.08	.28	2.71	16.70
1935	.36	1.98	.22	2.49	17.67	4.93	4.54	.05	5.27	.38	.15	3.13	41.17
1936	.25	.08	1.45	.45	4.97	3.52	1.39	1.70	6.75	2.36	1.19	.42	24.53
1937	.73	.14	1.50	.45	1.29	3.05	.77	.00	2.05	1.82	.22	5.86	17.88
1938	2.00	.62	1.37	1.43	1.17	Tr.	4.34	.27	.23	.33	.08	1.28	13.12
1939	2.18	.31	.24	.36	2.44	.44	2.01	7.42	1.38	4.47	1.89	1.16	25.30
1940	.43	2.11	1.29	2.42	4.73	4.14	.29	3.09	.31	3.71	2.23	2.91	27.66
1941	1.93	3.17	4.17	5.15	4.11	2.58	2.91	.31	4.57	2.01	.44	.44	31.79
1942	.27	1.32	.35	2.80	1.73	.30	4.43	2.78	4.04	.30	.06	--	--
1943	.39	.32	.82	2.11	3.18	2.18	.76	Tr.	6.17	2.19	1.35	1.26	20.73
1944	2.14	2.24	1.89	.40	3.97	4.45	.26	10.18	1.33	1.95	1.88	2.07	32.76
1945	2.60	1.22	4.27	2.61	.77	2.91	.68	1.05	3.78	1.44	.34	.70	22.37
1946	1.93	.78	.40	1.68	5.71	2.70	1.18	2.32	7.07	2.08	.37	.18	26.40
1947	2.76	.45	1.26	2.15	1.34	7.61	.56	2.38	.08	1.31	2.20	.57	22.67
1948	.20	1.77	.15	1.98	2.13	1.68	2.58	.77	3.95	1.82	.93	.35	18.31
1949	2.54	4.85	1.14	3.53	.00	4.23	1.80	2.37	5.36	5.69	.00	2.38	34.41
1950	.44	1.04	.18	1.32	3.12	2.63	2.56	3.54	3.04	.31	.09	Tr.	18.27
1951	.06	.68	1.59	.45	5.62	1.49	.03	1.05	.49	3.79	.44	.38	16.07
1952	.27	2.74	2.05	1.73	4.63	.57	.56	.00	2.07	.00	2.20	1.42	18.24
1953	.11	.54	.59	.24	.68	.90	Tr.	5.88	5.26	3.30	.03	.81	18.34
1954	.43	Tr.	.04	1.60	3.56	3.94	.67	1.66	.13	3.36	.21	Tr.	15.60
1955	.79	2.00	.94	.15	3.15	2.47	5.18	2.16	.38	.41	1.71	.50	20.34
1956	.50	.58	.02	.36	.33	.45	1.32	1.24	.11	3.80	.16	.42	9.29
1957	.40	1.53	1.67	9.31	7.19	1.96	.00	.70	5.36	6.53	2.94	1.71	39.30
1958	5.30	2.64	1.74	.76	3.69	8.68	1.08	2.35	5.64	5.98	.57	.60	15.09
1959	.41	1.18	.03	1.81	4.52	7.17	3.88	1.45	1.72	6.37	1.79	1.18	31.51
1960	.76	.74	1.95	.38	1.82	.67	5.26	4.96	.73	3.18	1.10	2.43	23.98
1961	1.28	2.63	.06	1.59	.30	4.36	7.75	.96	.23	5.84	.60	.66	26.26
1962	.39	.42	.57	2.58	.64	1.81	Tr.	3.43	1.69	1.15	.87	.57	14.12
1963	.11	2.26	.07	2.26	5.04	1.99	.14	Tr.	2.10	1.30	.76	.67	16.70
1964	1.20	.84	1.18	1.18	2.63	.09	1.65	2.02	8.36	1.88	.66	.61	22.30
1965	.47	3.85	2.67	2.60	3.96	.92	.45	2.39	2.54	1.56	1.10	3.70	26.21
1966	1.96	1.51	.57	4.31	3.65	.83	.25	5.18	1.95	.62	Tr.	.04	20.87
1967	.25	.86	.42	2.48	.12	1.53	.32	2.85	5.14	2.42	2.81	.90	20.10
1968	3.66	1.72	2.00	2.83	3.88	1.41	1.77	.21	3.96	1.02	1.71	1.03	25.20

The future of the Winter Garden's produce industry will be determined by decisions made in the coming decade. A continuation of present farming practices and marketing policies will inevitably result in the dissolution of the area's fresh market vegetable industry. Although in more economically diversified Uvalde County the effects of such a loss would be minimal, a similar loss would spell economic disaster for Dimmit and Zavala counties. Area towns would gradually die as people moved away in search of employment. Crystal City and Carrizo Springs would in time join Catarina and Bermuda as relics of a once more prosperous period.

If, however, local growers and shippers make sincere and concerted efforts to solve the problems facing them, the Winter Garden vegetable industry may look forward to a long and prosperous future. In the final analysis, tomorrow's produce industry will be the direct result of the decisions made by area growers and shippers today.

APPENDIX I

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES, WINTER GARDEN AREA, TEXAS

SYSTEM	SERIES	GROUP	FORMATION OR MEMBER	MAXIMUM OBSERVED THICKNESS (FEET)	LITHOLOGY	WATER-BEARING PROPERTIES
QUATERNARY	RECENT		ALLUVIUM		SILT, SAND, AND GRAVEL IN THE STREAM VALLEYS.	LOCALLY YIELDS SMALL SUPPLIES OF WATER TO WELLS FOR DOMESTIC USE.
	PLEISTOCENE		LEONA FORMATION	75	ALLUVIAL SILT, SAND, AND GRAVEL FORMING WIDE, NEARLY FLAT TERRACES IN THE STREAM VALLEYS.	MANY DOMESTIC STOCK WELLS DERIVE POTABLE WATER FROM THE *LEONA FORMATION IN VALLEYS* OF THE LEONA AND NUECES RIVERS.
TERTIARY	PLIOCENE (?)		UVALDE GRAVEL	20	MOSTLY CHERT GRAVEL, BUT CONTAINS SOME SILT. CAPS THE HILLS AND DIVIDES.	YIELDS NO WATER TO WELLS IN THE AREA.
	EOCENE	CLAIBORNE	COOK MOUNTAIN FORMATION	700	CHIEFLY MEDIUM-GRAINED SANDSTONE, INTER-BEDDED WITH DARK CLAYS AND LENSES OF GRAY LIMESTONE.	YIELDS SMALL SUPPLIES OF WATER IN SOUTHEASTERN ZAVALA COUNTY.
			MOUNT SELMAN FORMATION — POST-BIGFORD BEDS	700	MOSTLY DARK CLAYS BUT A FEW THIN BEDS OF SAND AND LIMESTONE CONTAINING NUMEROUS CONCRETIONS.	YIELDS SMALL SUPPLIES OF HIGHLY MINERALIZED WATER FROM A FEW RANCH WELLS IN EASTERN DIMMIT AND ZAVALA COUNTIES.
			MOUNT SELMAN FORMATION — BIGFORD MEMBER	800	DOMINANTLY GYPSIFEROUS SANDY CLAY; CONTAINS MANY LENSES OF SANDSTONE NEAR THE BASE; ALSO CONTAINS CONCRETIONS AND A FEW LAYERS OF LIMESTONE.	YIELDS SMALL SUPPLIES OF GOOD WATER IN PART OF NORTHERN ZAVALA COUNTY. ELSEWHERE THE WATER IS TOO HIGHLY MINERALIZED FOR USE.
			CARRIZO SAND	360	MOSTLY FINE TO COARSE CROSS-BEDDED SAND; CONTAINS CLAY LENSES, SANDSTONE, LIGNITE, PYRITE, AND IRONSTONE CONCRETIONS.	YIELDS MORE THAN 90 PER CENT OF THE WATER PUMPED IN DIMMIT AND ZAVALA COUNTIES AND FRIO TOWN AREA. YIELDS SMALL SUPPLIES OF WATER IN UVALDE COUNTY.
		WILCOX	INDIO FORMATION	1,320	DOMINANTLY GYPSIFEROUS CLAY, BUT CONTAINS MANY LENSES AND PERSISTENT LAYERS OF SANDSTONE. CALCIUM CARBONATE AND IRONSTONE CONCRETIONS ARE ABUNDANT.	SOME STOCK AND DOMESTIC WELLS YIELD SMALL SUPPLIES OF POTABLE WATER. HOWEVER, THE WATER IS GENERALLY HIGHLY MINERALIZED AND IN SOME WELLS IS UNFIT FOR STOCK.
	PALEOCENE	MIDWAY	KINCAID FORMATION	550	CHIEFLY DARK SHALE, BUT CONTAINS LENSES AND LAYERS OF SANDSTONE, LIMESTONE, AND CLAY. THIN CONGLOMERATE AT BASE.	YIELDS NO WATER TO WELLS IN AREA.
CRETACEOUS	GULF		ESCONDIDO FORMATION	285+	HARD FINE-GRAINED SANDSTONE AND INTER-BEDDED SHALE AND CLAY; SOME LIMESTONE. IN PLACES IMPREGNATED WITH ASPHALT.	YIELDS SMALL SUPPLIES OF SALINE WATER IN UVALDE COUNTY.
			OLMOS FORMATION	920	SHALE, SANDY SHALE, COAL, AND THIN BEDS OF SANDSTONE.	YIELDS NO WATER TO WELLS.
			SAN MIGUEL FORMATION	800	SAND AND SANDY LIMESTONE GRADING UPWARD INTO CLAY AND SANDY SHALE.	YIELDS NO WATER TO WELLS.
			TAYLOR MARL	100	CALCAREOUS CLAY AND MARL.	YIELDS NO WATER TO WELLS.
			ANACACHO LIMESTONE	470	FINE TO COARSE-GRAINED LIMESTONE ALTERNATING WITH RED BENOTONITIC CLAY.	YIELDS SMALL SUPPLIES OF SALINE WATER.
			AUSTIN CHALK	580	WHITE TO BUFF CHALK, MARL AND LIMESTONE.	YIELDS SMALL TO MODERATE SUPPLIES OF WATER.
			EAGLE FORD SHALE	240	FLAGGY LIMESTONE AND INTER-BEDDED CARBONACEOUS SHALE.	YIELDS SMALL SUPPLIES OF SALINE WATER.
			BUDA LIMESTONE	100	HARD MASSIVE FINE-GRAINED WHITE TO PINK LIMESTONE.	YIELDS SMALL TO MODERATE SUPPLIES OF WATER.
	COMANCHE	WASHITA	GRAYSON SHALE	120	BLUE CLAY, WEATHERS YELLOW. CONTAINS SOME THIN LIMESTONE.	YIELDS NO WATER TO WELLS.
		FREDERICKSBURG AND WASHITA	GEORGETOWN LIMESTONE	400	HARD MASSIVE CHERTY LIMESTONE.	PRINCIPAL AQUIFER IN UVALDE COUNTY. YIELDS LARGE QUANTITIES OF WATER OF GOOD CHEMICAL QUALITY.
			KIAMICHI LIMESTONE	210	FLAGGY, CHERTY LIMESTONE, BLACK PETROLIFEROUS SHALE, AND SOME DOLOMITE.	
			EDWARDS AND ASSOCIATED LIMESTONES — EDWARDS LIMESTONE	100	HARD MASSIVE CHERTY LIMESTONE AND SOME DOLOMITE.	
			COMANCHE PEAK LS.	90	HARD NODULAR LIGHT-GRAY LIMESTONE.	

SOURCE: U.S., DEPARTMENT OF THE INTERIOR, GEOLOGICAL SURVEY, GEOLOGY AND GROUND-WATER RESOURCES OF UVALDE COUNTY, TEXAS, BY F.A. WELDER AND R.D. REEVES, GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1584, PREPARED IN CO-OPERATION WITH THE TEXAS BOARD OF WATER ENGINEERS AND THE CITY OF SAN ANTONIO (WASHINGTON, D.C.: GOVERNMENT PRINTING OFFICE, 1964), pp. 8 and 9; AND GEOLOGY AND GROUND-WATER RESOURCES OF THE WINTER GARDEN DISTRICT TEXAS, 1948, BY SAMUEL P. TURNER, THOMAS W. ROBINSON AND WALTER N. WHITE, REVISED BY DONALD E. OUTLAW, W.O. GEORGE AND OTHERS, GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1481, PREPARED IN CO-OPERATION WITH THE TEXAS BOARD OF WATER ENGINEERS (WASHINGTON, D.C.: GOVERNMENT PRINTING OFFICE, 1960), pp. 24-26.

APPENDIX II

CLIMATOLOGICAL DATA FOR UVALDE AND CARRIZO SPRINGS, TEXAS, 1928-1968

Uvalde, Texas

Average Temperature (°F)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	52.6	57.0	67.2	69.0	75.6	83.6	86.8	86.2	79.5	75.4	62.0	54.5	70.8
1929	56.6	53.1	68.4	76.7	79.2	86.4	86.0	87.9	82.2	72.9	55.6	52.8	71.5
1930	46.6	63.6	61.6	73.9	77.0	80.4	84.2	86.3	82.6	69.8	58.7	50.6	69.6
1931	51.8	57.7	57.8	64.1	71.4	79.8	81.9	80.9	82.6	78.0	66.0	52.3	68.7
1932	55.4	61.8	58.8	70.8	75.4	84.0	82.5	83.2	75.5	67.0	55.8	51.4	68.5
1933	58.9	55.6	64.8	69.0	78.8	80.8	85.4	83.9	83.0	74.5	63.0	58.8	71.4
1934	55.6	57.1	62.0	73.0	78.5	87.4	86.9	86.2	81.0	75.5	66.2	55.6	72.1
1935	57.4	57.0	69.9	73.1	76.0	80.7	83.6	84.2	76.5	72.6	90.9	53.1	70.4
1936	50.6	55.4	66.8	69.4	76.2	83.4	82.9	84.8	80.2	65.8	57.2	54.4	68.9
1937	53.0	56.4	60.4	71.6	79.4	84.6	86.2	88.6	81.6	72.8	60.2	53.5	70.7
1938	55.6	62.0	69.4	69.0	77.6	85.8	86.7	86.0	81.5	74.2	60.0	53.8	71.8
1939	55.4	55.6	68.0	73.4	80.6	85.6	87.0	82.8	81.2	73.2	58.3	55.8	71.4
1940	45.2	55.8	63.6	70.0	77.2	80.2	84.4	86.0	79.7	72.8	58.7	57.4	69.2
1941	56.0	55.1	57.8	69.1	75.8	81.0	85.0	86.9	81.8	77.4	61.6	55.6	70.3
1942	52.3	54.0	61.5	72.5	78.6	85.6	83.9	86.0	76.9	71.6	62.4	54.5	70.0
1943	51.0	58.4	61.0	74.4	79.8	83.5	86.6	88.7	78.4	68.6	58.6	49.2	69.8
1944	50.4	58.6	62.9	69.6	75.8	82.8	87.4	85.2	78.0	70.0	61.6	50.1	69.4
1945	53.6	57.4	66.2	68.9	77.2	83.8	85.2	86.7	82.0	69.4	63.0	50.7	70.3
1946	49.5	56.8	66.7	74.2	76.6	82.2	86.3	85.9	80.5	72.9	60.8	55.6	70.7
1947	48.4	49.8	57.8	69.2	77.2	83.3	83.5	83.3	81.2	78.5	58.4	54.3	68.8
1948	47.2	53.0	62.1	74.4	79.6	85.0	84.8	86.2	77.8	69.7	58.6	55.7	69.5
1949	48.4	58.9	63.0	64.6	78.0	81.9	84.3	82.8	80.8	70.8	61.8	55.6	69.2
1950	60.0	58.5	62.8	69.9	78.0	81.3	84.0	83.1	80.5	74.6	59.7	53.4	78.8
1951	51.4	55.8	64.7	70.6	75.8	82.3	87.3	87.3	82.5	75.7	58.3	55.1	70.6
1952	59.4	58.4	60.8	68.4	74.5	82.3	85.2	87.4	79.6	67.9	59.5	51.2	69.5
1953	55.4	56.3	69.9	72.3	79.7	88.1	88.2	85.2	76.7	70.4	59.3	48.0	70.8
1954	54.5	60.8	62.8	74.0	76.2	83.0	85.2	85.4	83.3	73.0	59.8	57.1	71.3
1955	51.9	56.2	64.7	74.7	78.9	82.3	83.3	84.5	81.6	69.6	59.3	52.1	70.0
1956	51.4	56.1	64.0	70.9	80.2	85.5	84.8	84.4	80.3	73.9	57.6	55.3	70.4
1957	53.7	63.1	62.2	66.8	74.3	80.5	86.0	85.8	78.5	67.1	56.3	53.3	69.0
1958	47.5	49.4	55.9	67.2	73.9	82.9	84.7	84.1	80.0	67.4	59.4	49.4	66.8
1959	48.2	53.6	60.0	65.9	76.8	82.3	82.0	84.1	81.1	69.9	53.7	53.4	67.6
1960	49.4	49.8	55.9	70.6	74.5	83.5	84.0	83.0	78.4	73.8	61.1	48.3	67.7
1961	46.4	54.0	65.0	68.7	78.9	82.4	81.0	80.7	79.8	69.2	56.3	52.9	67.9
1962	45.0	63.4	58.9	70.0	78.5	82.8	86.5	86.7	81.4	75.6	59.7	51.3	70.0
1963	45.3	50.9	66.1	75.5	76.8	83.2	85.2	86.2	80.8	72.5	60.9	43.9	69.0
1964	47.7	49.0	60.4	71.7	77.2	81.6	85.3	84.1	78.9	65.5	61.1	50.7	67.8
1965	54.0	49.9	56.0	71.1	74.8	81.5	84.1	82.8	80.3	66.8	64.0	55.4	68.4
1966	46.2	50.6	61.0	70.8	75.1	80.3	85.9	82.6	78.9	68.9	64.2	51.9	68.0
1967	50.4	53.1	67.6	76.5	77.7	84.1	86.1	81.7	74.6	67.1	59.0	49.4	68.9
1968	49.2	48.6	57.1	68.6	74.6	79.6	81.6	83.0	73.9	70.3	58.2	53.2	65.0

Uvalde, Texas

Total Precipitation (Inches)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	.58	2.17	.63	.84	3.87	4.68	.30	1.90	4.94	.40	.12	.78	21.21
1929	.45	.27	2.07	.74	5.60	2.03	1.90	.10	5.45	2.30	.82	1.60	23.23
1930	.83	.14	1.83	2.15	1.46	8.27	1.00	.71	.88	6.04	2.48	.65	26.44
1931	5.82	1.40	.50	6.74	9.08	2.35	3.85	3.25	Tr.	.10	.64	2.61	36.34
1932	.67	1.85	1.40	1.70	2.19	1.18	21.01	4.55	8.62	.12	.58	1.15	45.02
1933	2.71	2.06	.20	.85	2.80	.86	1.57	2.25	.30	.95	.27	.40	15.22
1934	2.95	.22	.88	1.08	1.88	.15	3.53	.42	2.52	.08	.28	2.71	16.70
1935	.36	1.98	.22	2.49	17.67	4.93	4.54	.05	5.27	.38	.15	3.13	41.17
1936	.25	.08	1.45	.45	4.97	3.52	1.39	1.70	6.75	2.36	1.19	.42	24.53
1937	.73	.14	1.50	.45	1.29	3.05	.77	.00	2.05	1.82	.22	5.86	17.88
1938	2.00	.62	1.37	1.43	1.17	Tr.	4.34	.27	.23	.33	.08	1.28	13.12
1939	2.18	.31	.24	.36	2.44	.44	2.01	7.42	1.38	4.47	1.89	1.16	25.30
1940	.43	2.11	1.29	2.42	4.73	4.14	.29	3.09	.31	3.71	2.23	2.91	27.66
1941	1.93	3.17	4.17	5.15	4.11	2.58	2.91	.31	4.57	2.01	.44	.44	31.79
1942	.27	1.32	.35	2.80	1.73	.30	4.43	2.78	4.04	.30	.06	--	--
1943	.39	.32	.82	2.11	3.18	2.18	.76	Tr.	6.17	2.19	1.35	1.26	20.73
1944	2.14	2.24	1.89	.40	3.97	4.45	.26	10.18	1.33	1.95	1.88	2.07	32.76
1945	2.60	1.22	4.27	2.61	.77	2.91	.68	1.05	3.78	1.44	.34	.70	22.37
1946	1.93	.78	.40	1.68	5.71	2.70	1.18	2.32	7.07	2.08	.37	.18	26.40
1947	2.76	.45	1.26	2.15	1.34	7.61	.56	2.38	.08	1.31	2.20	.57	22.67
1948	.20	1.77	.15	1.98	2.13	1.68	2.58	.77	3.95	1.82	.93	.35	18.31
1949	2.54	4.85	1.14	3.53	.00	4.23	1.80	2.37	5.36	5.69	.00	2.38	34.41
1950	.44	1.04	.18	1.32	3.12	2.63	2.56	3.54	3.04	.31	.09	Tr.	18.27
1951	.06	.68	1.59	.45	5.62	1.49	.03	1.05	.49	3.79	.44	.38	16.07
1952	.27	2.74	2.05	1.73	4.63	.57	.56	.00	2.07	.00	2.20	1.42	18.24
1953	.11	.54	.59	.24	.68	.90	Tr.	5.88	5.26	3.30	.03	.81	18.34
1954	.43	Tr.	.04	1.60	3.56	3.94	.67	1.66	.13	3.36	.21	Tr.	15.60
1955	.79	2.00	.94	.15	3.15	2.47	5.18	2.16	.38	.41	1.71	.50	20.34
1956	.50	.58	.02	.36	.33	.45	1.32	1.24	.11	3.80	.16	.42	9.29
1957	.40	1.53	1.67	9.31	7.19	1.96	.00	.70	5.36	6.53	2.94	1.71	39.30
1958	5.30	2.64	1.74	.76	3.69	8.68	1.08	2.35	5.64	5.98	.57	.60	15.09
1959	.41	1.18	.03	1.81	4.52	7.17	3.88	1.45	1.72	6.37	1.79	1.18	31.51
1960	.76	.74	1.95	.38	1.82	.67	5.26	4.96	.73	3.18	1.10	2.43	23.98
1961	1.28	2.63	.06	1.59	.30	4.36	7.75	.66	.23	5.84	.60	.66	26.26
1962	.39	.42	.57	2.58	.64	1.81	Tr.	3.43	1.69	1.15	.87	.57	14.12
1963	.11	2.26	.07	2.26	5.04	1.99	.14	Tr.	2.10	1.30	.76	.67	16.70
1964	1.20	.84	1.18	1.18	2.63	.09	1.65	2.02	8.36	1.88	.66	.61	22.30
1965	.47	3.85	2.67	2.60	3.96	.92	.45	2.39	2.54	1.56	1.10	3.70	26.21
1966	1.96	1.51	.57	4.31	3.65	.83	.25	5.18	1.95	.62	Tr.	.04	20.87
1967	.25	.86	.42	2.48	.12	1.53	.32	2.85	5.14	2.42	2.81	.90	20.10
1968	3.66	1.72	2.00	2.83	3.88	1.41	1.77	.21	3.96	1.02	1.71	1.03	25.20

APPENDIX II-Continued

Carrizo Springs, Texas

Average Temperature (°F)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	--	--	--	70.7	77.6	86.8	88.1	87.6	79.4	76.8	--	--	--
1929	--	55.6	69.0	76.4	78.6	84.4	85.4	87.1	82.5	72.6	57.0	54.6	--
1930	47.3	64.2	62.3	73.0	77.2	80.0	85.3	87.4	83.4	70.9	59.8	51.0	70.2
1931	52.4	57.8	57.4	65.0	72.4	81.3	82.6	81.6	82.8	78.2	66.3	54.3	69.3
1932	55.2	62.6	59.2	71.6	77.2	85.7	85.8	85.8	77.0	68.2	55.6	52.0	69.7
1933	58.6	54.0	66.5	71.5	81.8	83.1	87.6	84.6	83.7	75.9	64.2	60.8	72.7
1934	55.9	57.4	61.8	73.1	70.6	86.9	86.8	86.7	81.4	76.1	65.9	56.6	72.4
1935	58.3	57.6	70.4	74.4	77.7	81.6	85.0	86.4	78.7	74.1	62.0	53.8	71.7
1936	52.2	56.2	67.7	69.2	76.8	85.4	84.0	85.5	80.4	67.0	58.9	57.0	70.0
1937	53.2	59.0	61.4	72.4	80.0	85.9	86.1	89.1	82.5	74.4	61.2	54.4	71.6
1938	56.4	63.0	71.4	70.0	78.8	86.0	87.8	86.7	81.8	74.4	61.4	55.5	72.8
1939	56.9	56.2	68.9	74.0	80.0	84.8	87.4	84.9	82.0	73.6	59.6	57.8	72.2
1940	46.2	57.3	65.1	71.0	76.0	80.1	84.2	85.4	79.2	72.0	60.3	57.4	69.5
1941	56.4	55.8	58.4	70.7	76.8	82.6	86.6	87.2	82.8	77.8	61.9	56.4	71.1
1942	53.0	55.0	62.5	72.8	78.6	86.2	85.2	86.8	77.4	73.2	64.7	57.6	71.1
1943	52.6	61.3	63.2	75.6	81.4	83.9	87.5	89.3	78.8	69.4	60.2	50.4	71.1
1944	51.8	60.8	64.8	72.9	77.2	84.7	89.2	86.8	81.0	72.5	63.1	52.0	71.4
1945	55.0	58.2	69.2	71.4	78.8	86.4	88.4	88.4	82.8	71.2	65.0	53.0	72.3
1946	51.9	58.0	67.8	75.4	79.0	82.8	87.8	86.6	82.1	75.0	62.8	57.9	72.3
1947	49.9	50.6	59.9	72.4	79.0	84.8	87.0	84.2	82.6	79.2	60.6	55.2	70.4
1948	49.6	55.2	63.7	76.1	82.4	86.8	87.2	88.8	80.0	70.6	59.6	57.8	71.5
1949	48.9	59.6	63.8	66.4	80.2	84.1	86.2	85.1	83.1	72.6	63.4	57.6	70.9
1950	61.7	60.7	65.5	73.0	81.4	84.1	86.9	86.1	83.0	76.0	61.8	54.9	73.0
1951	54.1	56.4	65.7	72.3	78.4	85.6	89.0	88.8	83.0	75.3	59.6	57.0	72.1
1952	60.7	59.8	63.6	70.3	77.2	83.9	--	89.1	81.5	69.9	64.5	56.4	--
1953	61.2	61.5	72.9	76.9	81.8	89.5	90.2	86.5	79.5	70.9	59.8	49.7	73.4
1954	57.5	63.9	66.6	76.0	77.9	84.9	86.3	87.3	84.2	74.2	61.0	59.0	73.3
1955	53.6	57.4	66.8	76.6	81.9	84.1	85.5	86.7	83.2	72.1	62.1	55.2	72.1
1956	57.5	63.9	66.6	76.0	77.9	84.9	86.3	87.3	84.2	74.2	61.0	59.0	73.3
1957	56.3	65.8	66.1	70.1	77.4	84.1	88.5	87.8	80.9	70.0	57.9	57.2	71.8
1958	51.9	53.5	58.8	71.4	76.6	85.1	86.6	87.9	82.9	69.8	63.4	52.7	70.1
1959	51.7	56.2	63.3	69.4	--	--	83.1	85.1	84.7	74.1	58.9	57.5	--
1960	53.0	54.6	57.0	74.0	78.9	86.2	86.9	85.7	80.1	76.1	54.4	51.0	70.6
1961	49.9	58.6	68.0	71.7	81.4	83.7	83.6	83.6	83.5	73.8	61.5	56.4	71.3
1962	48.3	67.4	62.7	74.5	82.5	84.7	88.9	88.9	83.8	79.1	63.9	53.2	73.1
1963	47.7	55.1	68.9	77.6	79.0	85.3	86.9	88.5	83.3	--	65.8	48.1	--
1964	52.5	54.7	65.3	76.4	80.5	85.5	88.3	87.6	82.5	68.9	65.3	55.9	72.0
1965	57.9	54.0	59.9	74.5	78.2	83.7	86.2	85.2	83.7	69.1	67.1	57.2	71.4
1966	49.0	53.6	64.3	74.3	75.9	81.5	86.4	85.5	81.2	71.9	66.7	54.7	70.4
1967	54.2	57.0	70.9	78.6	80.7	85.5	87.3	83.4	76.8	69.7	62.9	54.7	71.8
1968	53.0	52.8	60.1	72.1	78.0	82.8	84.1	86.1	77.5	75.3	62.6	56.1	70.0

Carrizo Springs, Texas

Total Precipitation (Inches)

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann'l
1928	1.16	1.22	.80	.94	3.24	1.01	2.13	1.52	5.48	.10	.30	1.16	19.06
1929	.23	.11	2.02	1.23	3.21	.85	.79	.00	1.05	2.62	.14	.55	12.80
1930	.16	.03	1.64	4.67	1.53	3.82	.33	.02	.29	4.04	2.66	.31	19.50
1931	4.74	.65	1.42	2.52	8.22	4.25	3.88	4.66	.00	.00	.20	3.33	33.87
1932	.61	3.48	.82	.46	1.19	.11	6.35	4.81	9.93	.54	.67	.57	29.54
1933	1.44	2.65	.34	1.12	1.33	.67	2.67	1.52	1.52	1.04	.21	.36	14.87
1934	3.49	.19	.61	3.21	2.02	.18	3.12	.78	2.56	1.32	1.96	2.49	21.93
1935	.27	.70	.93	1.19	1.35	4.27	2.69	2.03	2.80	.57	.45	2.21	19.46
1936	.18	.09	.32	1.30	3.93	4.52	1.78	2.16	8.22	1.46	1.40	.82	26.18
1937	.47	.20	1.23	.12	.95	2.14	1.42	.07	1.06	.80	.49	5.75	14.70
1938	1.17	.28	.34	1.61	1.29	1.70	1.68	.79	.55	.01	.05	1.29	10.76
1939	.85	.33	.19	.00	9.09	.40	2.25	2.69	1.92	3.22	1.55	1.13	23.62
1940	.43	1.72	1.10	3.43	6.58	5.62	.27	3.20	.19	.76	.86	1.68	25.84
1941	1.57	1.17	1.67	4.88	3.13	.79	1.01	1.97	3.82	1.39	.69	.55	22.64
1942	.69	1.11	1.86	.95	2.87	.85	2.64	2.34	8.32	.86	.26	.76	23.51
1943	1.06	.09	.13	.18	3.40	4.58	.96	.01	3.00	3.55	2.09	1.07	20.12
1944	.94	.67	1.04	.01	5.76	1.14	.04	11.38	.63	.33	1.51	2.01	25.46
1945	.95	.93	3.19	5.07	1.51	.61	.50	.37	7.34	8.54	.50	.28	29.79
1946	1.39	.22	.34	7.15	4.17	3.38	.68	2.83	3.12	3.15	.24	.84	27.51
1947	1.51	.05	.25	.98	5.29	3.23	.58	2.95	.16	1.20	.76	.74	17.70
1948	.18	1.37	.27	.74	3.26	4.57	.68	.02	3.20	6.69	.90	.92	22.80
1949	1.09	2.56	.62	4.45	1.22	6.12	1.53	2.52	2.74	2.81	.00	1.90	27.56
1950	.66	1.34	.10	.84	4.95	4.31	3.92	2.35	2.91	.10	.03	.00	21.51
1951	.08	.73	2.46	.37	6.25	1.12	.23	.19	4.86	.14	.17	.18	16.78
1952	.07	.71	.95	.14	7.16	.86	.14	.00	.00	.00	1.93	1.09	13.05
1953	.00	.86	.66	.05	2.26	.05	.00	2.50	2.28	4.43	.09	.38	13.56
1954	.60	.18	.02	2.49	4.03	3.21	.10	.74	Tr.	4.10	.26	Tr.	15.73
1955	.85	1.55	.05	.44	2.38	2.21	--	5.67	.46	.90	1.01	.45	--
1956	.30	.34	.01	.17	.20	--	3.56	3.12	1.53	1.89	.21	.10	--
1957	.37	1.82	2.16	4.64	3.70	2.57	.00	.42	3.71	4.18	3.02	.80	27.39
1958	3.01	2.10	.42	.13	2.47	5.15	2.45	1.43	3.86	5.07	.60	.70	27.39
1959	.59	1.70	.05	.85	5.65	6.11	2.85	.79	.44	5.31	1.24	.50	26.08
1960	1.16	1.22	.50	.90	1.72	.47	4.81	4.92	3.47	4.19	1.55	2.28	27.19
1961	1.37	1.00	.02	.60	.30	4.56	3.06	.38	.21	1.08	.63	.86	14.07
1962	.35	.01	.31	1.76	.10	2.42	.06	.74	2.34	.16	1.35	.66	10.26
1963	.14	2.20	.14	3.99	1.62	2.16	.82	.00	3.58	1.47	1.35	1.14	18.61
1964	.44	1.52	1.42	.63	3.53	.00	.17	7.40	8.72	1.48	.33	.23	25.87
1965	.20	1.90	1.21	2.03	6.67	.32	.00	.96	3.60	.57	1.26	3.11	21.83
1966	1.25	1.10	.42	5.34	6.94	.68	Tr.	1.86	2.94	.80	Tr.	.00	21.30
1967	.10	.57	1.90	2.65	.31	.67	.16	3.07	11.00	1.46	1.92	1.67	25.48
1968	2.40	2.29	.96	3.39	1.84	.93	1.80	1.75	4.47	2.02	.91	1.10	23.86

Source: Data compiled from records of the Office of the Texas State Climatologist, Austin, Texas.

CARLOT SHIPMENTS OF COOL SEASON VEGETABL

Dimmit County												
Year	Beets	Broc.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Beets	Broc.	Cab.
1916	0	0	4	0	0	4	1,068	8	1,084	0	0	0
1920	0	0	50	0	0	34	1,479	148	1,711	0	0	0
1921	0	0	13	0	0	17	1,630	337	1,997	0	0	0
1922	0	0	16	0	0	11	1,349	397	1,773	0	0	0
1923	0	0	19	0	0	9	908	611	1,547	0	0	0
1924	0	0	45	0	0	4	987	521	1,557	0	0	0
1925	0	0	6	0	0	17	1,073	569	1,665	0	0	0
1926	0	0	15	17	0	31	1,727	462	2,252	0	0	0
1927	0	0	0	2	0	4	1,292	287	1,585	0	0	0
1928	0	0	2	16	0	3	2,188	528	2,737	0	0	0
1929	0	0	21	34	0	15	1,849	635	2,554	0	0	0
1930	0	0	19	0	0	26	1,646	651	2,342	0	0	0
1931	0	0	20	0	0	31	639	529	1,219	0	0	0
1932	0	0	12	0	0	0	589	418	1,019	0	0	0
1933	0	0	2	0	0	0	513	257	772	0	0	0
1934	0	0	0	0	0	0	396	203	599	0	0	0
1935	0	0	0	0	0	0	225	51	276	0	0	0
1936	0	0	0	0	0	0	505	38	543	0	0	0
1937	0	0	0	14	0	0	292	53	345	0	0	0
1938	0	0	0	16	0	0	254	36	306	0	0	0
1939	0	0	0	11	0	0	236	36	283	0	0	0
1940	0	0	0	185	0	0	191	28	404	0	0	0
1941	2	0	0	260	0	0	184	40	486	0	0	0
1942	0	0	1	462	0	6	486	11	966	0	0	0
1943	4	0	3	839	0	0	289	0	1,135	0	0	0
1944	36	0	3	588	0	3	318	0	948	0	0	0
1945	25	0	0	582	0	0	88	0	695	0	0	0
1946	37	0	0	549	0	0	261	90	937	0	0	0
1947	12	2	0	649	0	0	122	19	804	0	0	0
1948	0	0	0	557	0	0	87	27	671	0	0	0
1949	19	1	0	968	0	0	164	3	1,155	0	0	0
1950	9	0	0	652	0	99	223	0	983	0	0	0
1951	0	0	0	400	12	83	215	1	711	0	0	0
1952	0	0	3	419	30	222	287	16	977	0	0	0
1953	0	0	15	502	135	96	590	180	1,518	0	0	0
1954	0	0	0	277	303	58	567	98	1,303	0	0	0
1955	0	0	4	269	386	0	483	162	1,304	0	0	0
1956	0	1	12	204	490	0	478	172	1,357	0	0	6
1957	1	2	16	207	278	0	427	179	1,110	0	0	31
1958	1	0	18	112	96	0	487	231	945	0	0	0
1959	3	0	32	38	66	0	748	210	1,097	0	0	0
1960	4	0	41	66	17	0	485	218	831	0	0	0
1961	4	4	25	62	57	0	591	171	914	0	0	0
1962	0	0	25	37	1	0	711	210	984	0	0	0
1963	0	0	12	56	0	0	654	170	892	0	0	0
1964	0	0	19	61	0	0	503	287	870	0	0	0
1965	0	17	0	69	0	0	369	117	572	0	0	0
1966	0	0	15	189	1	0	166	104	475	0	0	0
1967	0	0	8	53	0	0	607	138	806	0	0	0

APPENDIX III

CARLOT SHIPMENTS OF COOL SEASON VEGETABLES FROM THE WINTER GARDEN AND ADJACENT AREAS, 19

County					Frio County									
Caul.	Let.	On.	Spin.	Total	Beets	Broc.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Be
0	4	1,068	8	1,084	0	0	0	0	0	0	256	0	256	
0	34	1,479	148	1,711	0	0	0	0	0	0	368	0	368	
0	17	1,630	337	1,997	0	0	0	0	0	0	209	17	226	
0	11	1,349	397	1,773	0	0	0	0	0	0	209	11	220	
0	9	908	611	1,547	0	0	0	0	0	0	75	12	87	
0	4	987	521	1,557	0	0	0	0	0	0	88	13	101	
0	17	1,073	569	1,665	0	0	0	0	0	0	31	59	90	
0	31	1,727	462	2,252	0	0	0	0	0	0	92	104	196	
0	4	1,292	287	1,585	0	0	0	0	0	0	82	114	196	
0	3	2,188	528	2,737	0	0	0	0	0	0	150	140	290	
0	15	1,849	635	2,554	0	0	0	0	0	0	69	134	203	
0	26	1,646	651	2,342	0	0	0	0	0	0	31	85	116	
0	31	639	529	1,219	0	0	0	0	0	0	19	107	126	
0	0	589	418	1,019	0	0	0	0	0	0	39	57	96	
0	0	513	257	772	0	0	0	0	0	0	31	61	92	
0	0	396	203	599	0	0	0	0	0	0	67	33	100	
0	0	225	51	276	0	0	0	0	0	0	79	3	82	
0	0	505	38	543	0	0	0	0	0	0	92	15	107	
0	0	292	53	345	0	0	0	0	0	0	58	0	58	
0	0	254	36	306	0	0	0	0	0	0	23	0	23	
0	0	236	36	283	0	0	0	0	0	0	0	10	10	
0	0	191	28	404	0	0	0	0	0	0	3	5	8	
0	0	184	40	486	0	0	0	0	0	0	16	0	16	
0	6	486	11	966	0	0	0	0	0	0	37	0	37	
0	0	289	0	1,135	0	0	0	0	0	0	0	0	0	
0	3	318	0	948	0	0	0	7	0	0	41	0	48	
0	0	88	0	695	0	0	0	0	0	0	44	11	55	
0	0	261	90	937	0	0	0	0	0	0	9	14	23	
0	0	122	19	804	0	0	0	0	0	0	5	0	5	
0	0	87	27	671	0	0	0	0	0	0	0	27	27	
0	0	164	3	1,155	0	0	0	0	0	0	22	26	48	
0	99	223	0	983	0	0	0	0	0	0	0	3	3	
12	83	215	1	711	0	0	0	0	0	0	0	0	0	
30	222	287	16	977	0	0	0	0	0	0	0	1	1	
135	96	590	180	1,518	0	0	0	8	0	0	1	0	9	
303	58	567	98	1,303	0	0	0	12	10	0	0	11	33	
386	0	483	162	1,304	0	0	0	0	22	0	0	0	22	
490	0	478	172	1,357	0	0	6	5	19	0	14	11	55	
278	0	427	179	1,110	0	0	31	0	30	0	19	0	80	
96	0	487	231	945	0	0	0	0	0	0	0	0	0	
66	0	748	210	1,097	0	0	0	0	0	0	0	0	0	
17	0	485	218	831	0	0	0	33	0	0	0	0	33	
57	0	591	171	914	0	0	0	31	0	0	0	0	31	
1	0	711	210	984	0	0	0	20	0	0	0	0	20	
0	0	654	170	892	0	0	0	67	0	0	0	0	67	
0	0	503	287	870	0	0	0	74	0	0	0	0	74	
0	0	369	117	572	0	0	0	59	0	0	0	0	59	
1	0	166	104	475	0	0	0	44	0	0	0	0	44	
0	0	607	138	806	0	0	0	12	0	0	0	2	14	

DEN AND ADJACENT AREAS, 1916, 1920-1967

			La Salle County									
On.	Spin.	Total	Beets	Broo.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Year
256	0	256	0	0	0	0	0	32	167	0	199	1916
368	0	368	0	0	16	4	0	0	308	20	348	1920
209	17	226	0	0	0	11	0	0	180	40	231	1921
209	11	220	0	0	4	0	0	0	348	29	381	1922
75	12	87	0	0	6	2	0	0	212	50	270	1923
88	13	101	0	0	16	0	0	0	189	70	275	1924
31	59	90	0	0	0	0	0	0	177	172	349	1925
92	104	196	0	0	21	0	0	0	269	254	544	1926
82	114	196	0	0	6	0	0	0	219	175	400	1927
150	140	290	0	0	0	0	0	0	419	187	606	1928
69	134	203	0	0	0	0	0	0	223	176	399	1929
31	85	116	0	0	0	0	0	0	171	176	347	1930
19	107	126	0	0	0	0	0	0	71	265	336	1931
39	57	96	0	0	0	0	0	0	96	240	336	1932
31	61	92	0	0	0	0	0	0	105	237	342	1933
67	33	100	0	0	0	0	0	0	209	229	438	1934
79	3	82	0	0	0	0	0	0	235	208	443	1935
92	15	107	0	0	0	0	0	0	432	185	617	1936
58	0	58	0	0	0	0	0	0	157	172	329	1937
23	0	23	0	0	0	0	0	0	85	223	308	1938
0	10	10	0	0	0	0	0	0	37	65	102	1939
3	5	8	0	0	0	0	0	0	31	14	45	1940
16	0	16	0	0	0	0	0	0	35	52	87	1941
37	0	37	0	0	0	0	0	0	114	46	160	1942
0	0	0	0	0	0	0	0	0	23	47	70	1943
41	0	48	0	0	0	0	0	0	50	79	129	1944
44	11	55	0	0	0	0	0	0	96	62	158	1945
9	14	23	0	0	0	0	0	0	51	44	95	1946
5	0	5	0	0	0	0	0	0	37	26	63	1947
0	27	27	0	0	0	6	0	0	28	19	53	1948
22	26	48	0	0	0	15	0	0	25	35	75	1949
0	3	3	0	0	0	0	0	0	18	33	51	1950
0	0	0	0	0	0	6	0	0	2	2	10	1951
0	1	1	0	0	0	4	0	0	0	0	4	1952
1	0	9	0	0	0	0	0	0	3	0	3	1953
0	11	33	0	0	0	0	0	0	0	0	0	1954
0	0	22	0	0	0	0	0	0	0	0	0	1955
14	11	55	0	0	0	0	0	0	58	0	58	1956
19	0	80	0	0	0	0	0	0	24	0	24	1957
0	0	0	0	0	0	0	0	0	48	0	48	1958
0	0	0	0	0	0	0	0	0	61	0	61	1959
0	0	33	0	0	0	0	0	0	31	0	31	1960
0	0	31	0	0	0	0	0	0	9	0	9	1961
0	0	20	0	0	0	0	0	0	0	0	0	1962
0	0	67	0	0	0	0	0	0	0	0	0	1963
0	0	74	0	0	0	0	0	0	0	0	0	1964
0	0	59	0	0	0	0	0	0	0	0	0	1965
0	0	44	0	0	0	0	0	0	0	0	0	1966
0	2	14	0	0	0	0	0	0	0	0	0	1967

	Maverick County									Uva			
Year	Beets	Broc.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Beets	Broc.	Cab.	Ca
1916	0	0	0	0	0	0	16	0	16	0	0	0	
1920	0	0	0	0	0	0	55	0	55	0	0	0	
1921	0	0	0	0	0	0	44	0	44	0	0	0	
1922	0	0	0	0	0	0	91	0	91	0	0	0	
1923	0	0	0	0	0	0	139	0	139	0	0	0	
1924	0	0	0	0	0	0	167	23	190	0	0	0	
1925	0	0	0	0	0	0	166	66	232	0	0	0	
1926	0	0	13	0	0	0	165	128	306	0	0	0	
1927	0	0	2	0	0	0	120	88	210	0	0	0	
1928	0	0	0	38	0	0	356	160	554	0	0	0	
1929	0	0	0	27	0	0	287	234	548	0	0	0	
1930	0	0	0	27	0	0	316	251	594	0	0	0	
1931	0	0	0	0	0	0	242	310	552	0	0	0	
1932	0	0	0	0	0	0	388	435	823	0	0	0	
1933	0	0	0	0	0	0	3	1,047	1,050	0	0	0	
1934	0	0	0	0	0	0	68	1,107	1,175	0	0	0	
1935	0	0	0	0	0	0	182	606	788	0	0	0	
1936	0	0	0	0	0	0	282	833	1,115	0	0	0	
1937	0	0	0	0	0	0	420	1,057	1,477	0	0	0	
1938	0	0	0	0	0	0	216	1,200	1,416	0	0	0	
1939	0	0	0	0	0	0	351	1,556	1,907	0	0	0	
1940	0	0	0	0	0	0	143	2,017	2,160	0	0	0	
1941	0	0	0	0	1	0	174	1,947	2,122	0	0	0	
1942	0	0	16	0	9	0	106	2,117	2,248	0	0	0	
1943	0	0	0	14	1	0	164	2,068	2,247	0	0	0	
1944	0	0	0	0	0	0	178	2,008	2,186	0	0	0	
1945	0	0	0	2	4	0	283	1,830	2,119	0	0	0	
1946	0	0	1	0	0	0	410	1,613	2,024	0	0	0	
1947	0	0	0	5	0	0	127	1,063	1,175	0	0	0	
1948	0	2	1	15	45	0	669	750	1,482	0	0	3	
1949	0	0	0	1	87	0	493	596	1,177	0	0	7	
1950	1	1	0	4	91	0	478	413	988	0	0	11	
1951	5	8	0	0	43	0	571	261	888	0	1	0	
1952	0	4	0	15	165	0	447	294	925	0	0	18	
1953	2	0	1	10	38	61	347	271	730	0	0	20	
1954	2	0	1	5	114	147	343	207	819	0	0	15	
1955	2	1	0	0	65	0	180	163	411	0	0	28	
1956	0	4	9	0	86	0	111	227	437	0	7	33	
1957	0	5	4	0	248	0	262	226	745	1	0	30	
1958	0	0	0	0	69	0	65	433	567	0	0	30	
1959	0	0	0	0	34	0	154	412	600	0	0	12	
1960	0	0	0	0	25	0	192	438	655	0	0	3	
1961	0	0	0	0	27	0	165	267	459	0	0	4	
1962	0	0	0	0	0	0	102	283	385	0	0	32	
1963	0	0	0	0	0	0	0	265	265	0	0	17	
1964	0	0	1	0	0	0	14	244	259	0	0	28	
1965	0	0	0	0	0	0	0	283	283	0	0	12	
1966	0	0	2	0	0	0	2	188	192	0	0	22	
1967	0	0	3	0	0	0	0	139	142	0	0	52	

Source: U.S. Department of Agriculture, Car-Lot Shipments of Fruits and Vegetables i
cultural Economics, Carload Shipments of Vegetables from Stations in the United States for the
(Washington, D. C.: Government Printing Office, 1925 and 1927); Car-Lot Shipments of Fruits ar
1928 and 1929 (Statistical Bulletin 35), 1930 and 1931 (Statistical Bulletin 42), 1932 and 193
Office, 1929, 1931, 1933, 1936, and 1937); Agricultural Economics Bureau, Carlot Shipments of F
Government Printing Office, 1938 and 1939); Agricultural Marketing Service, Carlot Shipments o
Government Printing Office, 1940); Car-Lot Shipments of Fruits and Vegetables in Texas During
by States, Commodities, Counties and Stations, Calendar Year (Year) (Published annually 1957
Fruit and Vegetable Shipments, Calendar Year (Year) (Published annually 1964-1967), C&MS 13

APPENDIX III-Continued

	Uvalde County									Zavala Co				
Total	Beets	Broc.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Beets	Broc.	Cab.	Car.	Ca
16	0	0	0	0	0	0	0	0	0	0	0	0	0	
55	0	0	0	0	0	0	0	0	0	0	0	0	0	
44	0	0	0	0	0	0	0	0	0	0	0	0	0	
91	0	0	0	0	0	0	0	0	0	0	0	0	0	
139	0	0	0	0	0	0	0	0	0	0	0	0	0	
190	0	0	0	0	0	0	0	0	0	0	0	0	0	
232	0	0	0	0	0	0	0	0	0	0	0	0	0	
306	0	0	0	0	0	0	0	0	0	0	0	0	8	
210	0	0	0	0	0	0	0	0	0	0	0	0	16	
554	0	0	0	0	0	0	0	92	92	0	0	0	22	
548	0	0	0	0	0	0	0	44	44	0	0	13	23	
594	0	0	0	0	0	0	0	57	57	0	0	0	0	
552	0	0	0	0	0	0	0	33	33	0	0	0	0	
823	0	0	0	0	0	0	0	56	56	0	0	0	0	
1,050	0	0	0	0	0	0	0	8	8	0	0	0	0	
1,175	0	0	0	0	0	0	0	63	63	0	0	11	0	
788	0	0	0	0	0	0	0	15	15	0	0	0	0	
1,115	0	0	0	0	0	0	0	0	0	0	0	0	0	
1,477	0	0	0	0	0	0	0	0	0	0	0	0	0	
1,416	0	0	0	0	0	0	0	94	94	0	0	0	0	
1,907	0	0	0	0	0	0	0	507	507	0	0	0	0	
2,160	0	0	0	0	0	0	219	720	939	0	0	0	0	
2,122	0	0	0	0	0	0	38	728	766	0	0	0	0	
2,248	0	0	0	0	0	0	132	658	790	0	0	0	0	
2,247	0	0	0	0	0	0	28	494	522	0	0	1	55	
2,186	0	0	0	0	0	0	52	321	373	0	0	5	248	
2,119	0	0	0	0	0	0	26	246	272	0	0	0	225	
2,024	0	0	0	0	0	0	43	237	280	0	4	0	132	
1,175	0	0	0	1	0	0	1	438	440	0	0	0	0	
1,482	0	0	3	0	0	22	46	458	529	0	0	0	5	
1,177	0	0	7	19	0	56	102	472	656	2	0	9	128	
988	0	0	11	32	0	204	66	197	510	0	0	31	155	
888	0	1	0	10	0	94	42	61	208	0	0	0	89	
925	0	0	18	16	21	490	41	134	928	0	0	14	0	
730	0	0	20	27	91	404	58	169	769	0	0	8	257	
819	0	0	15	45	154	476	88	98	876	0	0	14	0	
411	0	0	28	46	168	339	47	120	748	0	0	39	30	
437	0	7	33	35	255	572	4	124	1,030	0	0	37	35	
745	1	0	30	100	346	279	51	0	807	0	0	33	74	
567	0	0	30	112	68	167	80	71	528	0	0	28	98	
600	0	0	12	146	27	25	613	29	852	0	0	7	2	
655	0	0	3	309	8	15	111	0	446	0	0	14	5	
459	0	0	4	228	0	48	126	0	406	0	0	32	6	
385	0	0	32	203	2	77	200	0	514	0	0	29	31	
265	0	0	17	176	0	58	220	0	471	0	0	55	21	
259	0	0	28	205	9	94	148	1	485	0	0	56	61	
283	0	0	12	141	4	95	59	5	316	0	0	122	53	
192	0	0	22	144	0	159	49	3	377	0	0	89	102	
142	0	0	52	115	0	146	115	0	428	0	0	72	49	

ments of Fruits and Vegetables in the United States in 1916, Bulletin 667 (Washington, D. C.: Government
ons in the United States for the Calendar Year 1920, 1921, 1922, and 1923 (Statistical Bulletin 9), 1924 a
); Car-Lot Shipments of Fruits and Vegetables From Stations in the United States for the Calendar Years 19
tical Bulletin 42), 1932 and 1933 (Statistical Bulletin 50), 1934 and 1935 (Statistical Bulletin 61) (Wash
ics Bureau, Carlot Shipments of Fruits and Vegetables From Stations in the United States Calendar Year(s)
eting Service, Carlot Shipments of Fruits and Vegetables From Stations in the United States, Calendar Year
and Vegetables in Texas During (Year) (Published annually 1940-1956) (Austin, Texas: n.p., n.d.); Fres
(Year) (Published annually 1957-1963), AMS-41 (Washington, D. C.: Government Printing Office, 1958-1964)
ned annually 1964-1967), C&MS 13 (Washington, D. C.: Government Printing Office, 1965-1968).

			Zavala County									
On.	Spin.	Total	Beets	Broc.	Cab.	Car.	Caul.	Let.	On.	Spin.	Total	Year
0	0	0	0	0	0	0	0	0	316	0	316	1916
0	0	0	0	0	0	0	0	0	328	0	328	1920
0	0	0	0	0	0	0	0	0	307	82	389	1921
0	0	0	0	0	0	0	0	0	419	196	615	1922
0	0	0	0	0	0	0	0	0	320	453	773	1923
0	0	0	0	0	0	0	0	0	325	984	1,309	1924
0	0	0	0	0	0	0	0	0	393	1,337	1,730	1925
0	0	0	0	0	0	8	0	0	631	2,565	3,204	1926
0	0	0	0	0	0	16	0	0	480	2,241	2,737	1927
0	92	92	0	0	0	22	0	0	775	2,640	3,437	1928
0	44	44	0	0	13	23	0	0	1,269	3,775	5,080	1929
0	57	57	0	0	0	0	0	0	1,238	4,729	5,697	1930
0	33	33	0	0	0	0	10	0	417	4,398	4,825	1931
0	56	56	0	0	0	0	74	0	452	4,860	5,386	1932
0	8	8	0	0	0	0	10	0	238	3,038	3,286	1933
0	63	63	0	0	11	0	0	0	230	3,223	3,464	1934
0	15	15	0	0	0	0	0	0	83	1,604	1,687	1935
0	0	0	0	0	0	0	0	0	143	2,966	3,109	1936
0	0	0	0	0	0	0	0	0	225	3,260	3,485	1937
0	94	94	0	0	0	0	0	0	122	1,903	2,025	1938
0	507	507	0	0	0	0	0	0	318	1,425	1,743	1939
219	720	939	0	0	0	0	0	0	265	1,106	1,371	1940
38	728	766	0	0	0	0	0	0	72	707	779	1941
132	658	790	0	0	0	0	0	0	198	732	930	1942
28	494	522	0	0	1	55	0	0	82	754	892	1943
52	321	373	0	0	5	248	0	3	96	917	1,269	1944
26	246	272	0	0	0	225	0	0	36	768	1,029	1945
43	237	280	0	4	0	132	0	0	81	581	798	1946
1	438	440	0	0	0	0	0	0	33	652	685	1947
46	458	529	0	0	0	5	0	0	142	775	922	1948
102	472	656	2	0	9	128	0	18	130	563	850	1949
66	197	510	0	0	31	155	0	111	268	314	879	1950
42	61	208	0	0	0	89	0	11	148	443	691	1951
41	134	928	0	0	14	0	0	7	321	663	1,005	1952
58	169	769	0	0	8	257	0	37	230	569	1,101	1953
88	98	876	0	0	14	0	2	143	386	475	1,020	1954
47	120	748	0	0	39	30	91	98	627	464	1,349	1955
4	124	1,030	0	0	37	35	213	38	832	576	1,731	1956
51	0	807	0	0	33	74	61	7	882	553	1,610	1957
80	71	528	0	0	28	98	8	0	403	715	1,252	1958
613	29	852	0	0	7	2	0	0	315	679	1,003	1959
111	0	446	0	0	14	5	0	0	266	420	705	1960
126	0	406	0	0	32	6	1	0	246	290	575	1961
200	0	514	0	0	29	31	4	0	356	173	593	1962
220	0	471	0	0	55	21	0	0	484	118	678	1963
148	1	485	0	0	56	61	147	0	474	146	884	1964
59	5	316	0	0	122	53	54	0	259	105	593	1965
49	3	377	0	0	89	102	36	0	226	146	599	1966
115	0	428	0	0	72	49	13	0	318	123	575	1967

in 1916, Bulletin 667 (Washington, D. C.: Government Printing Office, 1918); Bureau of Agri-
, 1921, 1922, and 1923 (Statistical Bulletin 9), 1924 and 1925 (Statistical Bulletin 19)
Stations in the United States for the Calendar Years 1926 and 1927 (Statistical Bulletin 27),
letin 50), 1934 and 1935 (Statistical Bulletin 61) (Washington, D. C.: Government Printing
es From Stations in the United States Calendar Year(s) 1936 and 1937 (Washington, D. C.:
ables From Stations in the United States, Calendar Year(s) 1938 and 1939 (Washington, D. C.:
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APPENDIX IV

SELECTED ARTICLES FROM THE MIGRANT LABOR AGREEMENT OF 1951 AND THE STANDARD WORK CONTRACT

The International Agreement

The Migrant Labor Agreement of 1951, as amended, spells out certain fundamental rights of the Mexican National working in the U.S. Among the ones of particular interest enumerated by the International Agreement are these:

The right of the worker to choose the type of farm work he desires is recognized (Article 13).

The National is guaranteed wages at the prevailing rate paid domestic workers for similar work in the area of employment (Article 15).

The wages paid the bracero shall be sufficient to cover his "normal living needs," and the Secretary of Labor shall take proper steps to correct any situation that does not meet this requirement (Article 15).

The worker is guaranteed the opportunity to work not less than three-fourths of the workdays of the total period of his contract, beginning the day after his arrival at the place of employment and ending on the date of the termination of his contract (Article 16).

The worker must be provided with a statement, in Spanish and English, at the end of each pay period, indicating the rate of pay, total earnings for the pay period, hours worked and deductions itemized (Article 18).

When the contractee is not given the opportunity to work at least four hours a day, because of weather or other conditions beyond his control, he is to receive subsistence from the employer, which is to be noted on his pay record (Article 18).

The workers have the right to elect their own representatives who shall be recognized by the employer "as spokesmen" . . . for the purpose of "maintaining the work contract" (Article 21).

If the services of the Mexican worker are not required before the expiration of his contract, he is to be notified in writing by the employer (Article 25).

The bracero shall enjoy impartially and expeditiously the rights which the laws of the United States grant him (Article 35).

In the contracting of Mexican workers private employment or labor contracting agencies operating for a profit shall not be permitted to participate (Article 36).

The Standard Work Contract

Since the terms of the International Agreement are explicitly incorporated in the individual work contract, the foregoing rights are specifically included in the standard work contract. In addition, the contract further specifies that the Mexican National has the following rights:

Hygienic lodgings adequate to the climatic conditions of the area of employment shall be provided free of charge, including blankets, cots and mattresses (Article 2).

Occupational risk insurance, at no cost to the worker, shall be provided by the employer in accordance with State law, or in its absence, with conditions defined in the contract (Article 3).

If the worker is disabled as a result of a physical injury or disease, and is not hospitalized, he is to receive subsistence for each day he is unable to work for a maximum of six weeks (Article 3). This provision is subject to Article 1 of the International Agreement, which limits its application to disease or injury arising in the course of employment.

When higher wages are paid for specialized tasks such as the operation of vehicles or machinery, the worker is to be paid the wages assigned to such tasks (Article 4).

The worker shall be furnished all tools, supplies and equipment required for the performance of his duties (Article 5).

No deductions are to be made from the worker's wages except those provided by law, advances against wages, payment for articles of consumption purchased voluntarily by the worker, meals, overpayment of wages and losses caused by damage or destruction by the worker of property of the employer (Article 6).

Meals are to be served at cost, and in no event shall the charge be more than $1.75 a day (Article 6).

The worker's living quarters shall be adequately heated at no cost to him (Article 8).

After the expiration of his contract, if the worker is obliged to wait for transportation to the reception center, and is not offered employment, he is to receive subsistence at the expense of the employer (Article 9).

Transportation is to be furnished the worker by the employer where the place of employment is not within walking distance of the nearest town (Article 11).

The worker may elect to prepare his own meals, in which case he is to receive a daily subsistence allowance of 25 cents less per day than the sum charged for meals to workers who utilize the restaurant facilities of the employer (Article 12).

Source: Ernesto Galarza, Strangers in Our Fields (2nd ed.; Washington, D.C.: United States Section, Joint United States-Mexican Trade Union Committee, 1956), pp. 13-14.

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