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Soil Survey

Dimmit County Texas

By
HOWARD M. SMITH
United States Department of Agriculture, in Charge
and
J. W. HUCKABEE, Jr.
Texas Agricultural Experiment Station

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Plant Industry
In cooperation with the
Texas Agricultural Experiment Station

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TEXAS AGRICULTURAL EXPERIMENT STATION

A. B. CONNER, *Director*

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SOIL SURVEY OF DIMMIT COUNTY, TEXAS

By HOWARD M. SMITH, Division of Soil Survey,[1] Bureau of Plant Industry, United States Department of Agriculture, in Charge of J. W. HUCKABEE, Jr., Texas Agricultural Experiment Station

Area inspected by WILLIAM T. CARTER, Inspector, District 4

United States Department of Agriculture in cooperation with the Texas Agricultural Experiment Station

CONTENTS

HOW TO USE THE SOIL SURVEY MAP AND REPORT

The soil survey map and report of Dimmit County, Tex., contain information—both general and specific—about the soils, crops, and agriculture of the county. They are prepared for the general public and are designed to meet the needs of a wide variety of readers. The individual reader may be interested in some particular part of the report or in all of it. Ordinarily he will not have to read the whole report to gain the information he needs.

Readers of soil survey reports may be considered to belong to three general groups: (1) Those interested in limited areas, such as communities, farms, and fields; (2) those interested in the county as a whole; and (3) students and teachers of soil science and related agricultural sciences. An attempt has been made to satisfy the needs of these three groups by making the report a comprehensive reference work on the soils and their relation to crops and agriculture.

[1] The field work for this survey was done while the Division was a part of the Bureau of Chemistry and Soils.

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Those readers whose chief interest is in limited areas, such as some particular locality, farm, or field, include the farmers, agricultural technicians interested in planning operations in communities or on individual farms, real estate agents, land appraisers, prospective purchasers and tenants and farm loan agencies. The first step of a reader in this group is to locate on the map the tract with which he is concerned. The second step is to identify the soils on the tract. This is done by locating in the legend on the margin of the map the symbols and colors that represent the soils in the area. The third is to locate the name of each soil in the Contents, which refers the reader to the page or pages in the section on Soils and Crops where each soil is discussed in detail. Under the soil-type heading he will find a description of the soil and information as to its suitability for use and its relationships to crops and agriculture. He also will find useful information in the sections on Productivity Ratings and Land Uses and Agricultural Methods.

The second group includes persons who are interested in the county as a whole, such as those concerned with land use planning, the placement and development of highways, power lines, urban sites, industries, community cooperatives, resettlement projects, private or public forest areas, recreational areas, and wildlife projects. The following sections are intended for such users: (1) County Surveyed, in which such topics as physiography, vegetation, water supply, population, and cultural developments are discussed; (2) Agricultural History and Statistics, in which a brief history of the agriculture of the area is given and the present agriculture is described; (3) Productivity Ratings, in which the productivity of the soils is given and a grouping of soils according to their relative physical suitability for agricultural use is presented; (4) Land Uses and Agricultural Methods, in which the present use and management of the soils are described, their management requirements are discussed, and suggestions for improvement in management are made; and (5) Irrigation, Drainage, and Salinity, in which the problems pertaining to those subjects are treated.

The third group of readers includes students and teachers of soil science and allied subjects, such as crop production, forestry, animal husbandry, economics, rural sociology, geography, and geology. The teacher or student of soils will find the section on Morphology and Genesis of Soils of special interest. He will also find useful information in the section on Soils and Crops, the first part of which represents the general scheme of classification and a discussion of the soils and crops from the point of view of the county as a whole, and the second part of which presents a detailed discussion of each soil. If he is not already familiar with the classification and mapping of soils he will find that discussed in Soil Survey Methods and Definitions. The teachers of other subjects will find the sections County Surveyed, Agricultural History and Statistics, and Productivity Ratings, and the first part of the section on Soils and Crops of particular value in determining the relationships between their special subjects and the soils in the county. Soil scientists or students of soils as such will find their special interest in the section on Morphology and Genesis of Soils.

COUNTY SURVEYED

Dimmit County is in southwestern Texas (fig. 1) and forms a part of the section of the State known as the Winter Garden district. Carrizo Springs, the largest town in the northwestern part of the county on Carrizo Creek, is the county seat. By air line it lies 100 miles southwest of San Antonio, the largest city in the section, and 235 miles northwest of Brownsville, on the Mexican border. Eagle Pass, the nearest port of entry from Mexico, is 45 miles to the northwest by highway, and Laredo, gateway to the Pan-American Highway in Mexico, lies 75 miles to the southeast. The total area of the county is 1,326 square miles, or 848,640 acres.

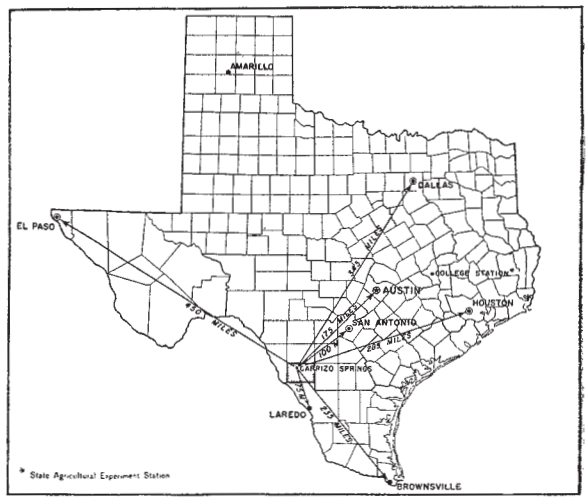

FIGURE 1.—Sketch map showing location of Dimmit County, Tex.

Physiographically, Dimmit County lies within a smoothly undulating to gently rolling subdivision of the West Gulf Coastal Plain known as the Rio Grande plain, sometimes referred to as the Rio Grande embayment. Here the plain slopes rapidly southeastward, extending from the Balcones escarpment of the Edwards Plateau to the Gulf of Mexico. In places within the county the normal plain is interrupted by escarpments caused by unequal weathering, geological contacts, or faulting. The most prominent of these escarpments occur where the Mount Selman and Cook Mountain geological formations come in contact in the southeastern part of the county on the Light ranch. Another prominent one is at the south edge of El Moro Creek Valley just east of Dentonio School. All the escarpments face west or northwest, as do those of Maverick County, but they are not so prominent or numerous as those in that county.

With the exception of a relatively small area in the southwestern part, the county is drained by the Nueces River and its tributaries. The Nueces River enters the county on the north about midway of the eastern and western boundaries, passes through it in a wide-sweeping eastward curve, and leaves at the eastern boundary about midway of the northern and southern boundaries. The tributaries that drain the northwestern part of the county are Comanche, Kaytana, Rocky, Peña, Salt, and Carrizo Creeks. The west-central and south-central parts drain through El Barroso, El Moro, Appurceon, and San Roque Creeks. Las Raices and Sage Creeks drain the southeastern part. A few square miles in the northeastern corner drain into the Frio

River, which is one of the larger tributaries of the Nueces, joining it a short distance southwest of Three Rivers in Live Oak County. The tributaries that traverse the northeastern part are Tortugas and Spear Creeks and Arroyo Negro. About 170 square miles in the southwestern corner are drained by tributaries of the Rio Grande, chief of which are San Ambrosia, Olmos, and San Lorenzo Creeks. In general, drainageways penetrate all parts of the county, their valleys are relatively broad and shallow, with uplands rising gradually and smoothly from them, and their upper courses are dendritic in nature. Streams of the western watershed of the Nueces River are unique in that their lower valleys become excessively broad and are cut by many intersecting channels and lakes or bayous. Locally these are called bayoucas. All streams are intermittent, but the Nueces River, Carrizo, San Pedro, and San Ambrosia Creeks and possibly one or two other streams have a few water holes that are fed by springs or seepage and seldom go dry.

Elevations above sea level range from approximately 400 feet [2] at the Dimmit-La Salle County line on the Nueces River to about 871 feet,[3] the height recorded at the English Primary Triangulation Station near the top of the Nueces-Rio Grande divide in Dimmit County about 2 miles northeast of Hamilton ranch. The elevation of the Nueces River at the Dimmit-Zavala County boundary is 580 feet (*2, p. 112*).[4] At the Citizens State Bank in Carrizo Springs the elevation is about 608 feet;[3] at the Goodmann Building in Asherton it is 548 feet;[3] on top of rail in front of the railroad station in Catarina, 505 feet;[5] and on top of rail in front of the railroad station in Bigwells, 515 feet.[5]

Native vegetation consists of a moderate to dense growth of small trees, shrubs, short grasses, and coarse bunchgrasses common to the subhumid and semiarid regions of southwestern United States and northern Mexico. Some trees and smaller plants indigenous to a humid climate are found in places where moisture conditions are especially favorable. Thus live oak, elm, ash, hackberry, willow, mulberry, chinaberry, pecan, buttonball bush or button willow, and a few others grow on the banks of rivers, creeks, and sloughs. The dominant vegetation on the rest of the valleys and on the uplands consists of mesquite trees, blackbrush, and pricklypear, together with curly mesquite, red grama, and three-awn grasses. The density, vigor, and size of the vegetation vary with the depth and quality of the soil and with the amount of available moisture.

The native vegetation remains unmodified, except for changes induced by the fencing of pastures and grazing. Since the range was fenced it is reported that woody plants are increasing at the expense of grass. This may be attributed to several causes. Fencing ended the practice of burning the range once a year, a custom followed by the Indians and carried on by the early white settlers, who thought it improved grazing. Proper spacing of watering places led to more even distribution of grazing, but at the same time it caused a wider and more uniform dissemination of plant seeds over the range. Again, grazing, especially by only one kind of

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[2] United States Geological Survey topographic sheet, Texas Bart Quadrangle, 1924–25.
[3] Bench marks, United States Coast and Geodetic Survey.
[4] Italic number in parentheses refer to Literature Cited, p. 66.
[5] Data from the Missouri Pacific Railroad.

livestock, tends to reduce or eliminate plants most palatable and valuable for that kind of livestock, while less desirable plants increase (*1*). Overstocking speeds up this tendency.

It is probable that reduction in the carrying capacity of the range, if any, caused by this modification of native cover has been more than offset by the increased availability and potential capacity made possible by fence and water improvements.

Moreover, many woody plants furnish valuable browse. They provide a more constant supply of nourishment and roughage than the grasses, as their larger and deeper root systems enable them to survive the long dry periods common to the region more readily than do the grasses. In this region woody plants probably provide 50 percent or more of the sustenance for livestock, which relish leaves, flowers, fruits, and sometimes even the woody parts of these plants. Guajillo, blackbrush, mesquite, guayacan, huisachillo, catclaw, rockbrush, and others are considered most valuable for browse.

Red grama, curly mesquite, buffalo grass, tobosa, crowfoot, field sandbur or grassbur, hairy grama, and prairie beardgrass or little bluestem provide much of the grazing. Honey daisy and the basal-rosette plantains, all commonly called tallowweed; hoary pea; gaillardia; bladderpod; and many other forbs provide spring forage.

Pricklypear is considered a valuable source of sustenance for cattle to prevent wholesale starvation in severe and prolonged droughts. It is made available by burning off the spines with a torch. Large quantities of the plant are utilized in this manner during the frequent droughts in southern Texas. It is reported locally that animals fed pricklypear over a long period are sometimes killed by undigested fiber of the plant accumulating in the stomach.

Many of the native shrubs and plants have little or no value for livestock, and some are especially toxic to animals, causing death when consumed in large quantities. Of the more common plants the following have been found by investigation to be especially poisonous to livestock: Sneezeweed (*Helenium microcephalum*), western bitterweed or bitter rubberweed (*Actinea odorata*), whorled milkweed (*Asclepias verticillata*), *Baileya multiradiata*, *Psilostrophe gnaphalodes*, carelessweed (*Amaranthus retroflexus*), and some others. Other plants on the range are suspected of being toxic and are being subjected to investigation by the Texas Agricultural Experiment Station.

Table 1 gives a partial list of plants of Dimmit County.[6]

TABLE 1.—*Plants occurring in Dimmit County, Tex.*

GRASSES, RUSHES, AND SEDGES

Symbol[1]	Scientific name	Common name
G1	*Andropogon saccharoides* Swartz	Silver beardgrass.
G2	*Andropogon divergens* (Hack.) Anderss	Prairie beardgrass or little bluestem.
G3	*Andropogon* spp	Beardgrass, broomsedge, or bluestem (several species).
G4	*Aristida purpurea* Nutt	Purple three-awn.
G5	*Aristida* spp	Three-awn (several species).
G6	*Bouteloua breviseta* Vasey	Chino.

[1] See table 2, p. 8.

[6] Compiled largely by V. L. Cory, range botanist, and H. B. Parks, chief of the Division of Agriculture, Texas Agricultural Experiment Station.

TABLE 1.—*Plants occurring in Dimmit County, Tex.*—Continued

GRASSES, RUSHES, AND SEDGES—Continued

Symbol	Scientific name	Common name
G7	*Bouteloua hirsuta* Lag	Hairy grama.
G8	*Bouteloua rigidiseta* (Steud.) Hitchc	Texas grama.
G9	*Bouteloua trifida* Thurb	Red grama.
G10	*Bromus catharticus* Vahl	Rescue grass.
G11	*Buchloë dactyloides* (Nutt.) Engelm	Buffalo grass.
G12	*Carex planostachys* Kunze	Sedge.
G13	*Cenchrus pauciflorus* Benth	Field sandbur or grassbur.
G14	*Chloris cucullata* Bisch	Fingergrass.
G15	*Cynodon dactylon* (L.) Pers.[2]	Bermuda grass.
G16	*Dactyloctenium aegyptium* (L.) Richt	Crowfoot.
G17	*Distichlis stricta* (Torr.) Rydb	Desert saltgrass or carpet saltgrass.
G18	*Eragrostis hypnoides* (Lam.) B.S.P	Lovegrass or smooth creeping meadow grass.
G19	*Eragrostis reptans* (Michx.) Nees	Lovegrass or creeping meadow grass.
G20	*Eragrostis secundiflora* Presl	Lovegrass.
G21	*Festuca octoflora* Walt	Sixweeks fescue.
G22	*Hilaria belangeri* (Steud.) Nash	Curly mesquite.
G23	*Hilaria mutica* (Buckl.) Benth	Tobosa.
G24	*Juncus* sp	Rush.
G25	*Panicum obtusum* H. B. K	Vine mesquite.
G26	*Panicum texanum* Buckl	Texas millet or Colorado grass.
G27	*Pappophorum bicolor* Fourn	Pappusgrass.
G28	*Setaria macrostachya* H. B. K	Plains bristlegrass or tall foxtail.
G29	*Sorghum halepense* (L.) Pers.[2]	Johnson grass.
G30	*Sporobolus airoides* (Torr.) Torr	Alkali sacaton.
G31	*Sporobolus flexuosus* (Thurb.) Rydb	Mesa dropseed or sandgrass.
G32	*Sporobolus wrightii* Munro	Sacaton.
G33	*Stipa* sp	Needlegrass or speargrass.

FORBS AND WEEDS

W1	*Acalypha radians* Torr	Falsenettle.
W2	*Actinea odorata* [3] (DC.) Kuntze	Western bitterweed or bitter rubberweed.
W3	*Allium* sp	Wild onion.
W4	*Ambyolepis setigera* DC. (syn. *Helenium setigera*)	Honey daisy or tallowweed.
W5	*Amaranthus retroflexus* L.[3]	Carelessweed.
W6	*Amaranthus* sp	Do.
W7	*Aphanostephus* sp	Wild daisy.
W8	*Aplopappus drummondii* Blake	
W9	*Argemone* sp	Pricklepoppy.
W10	*Asclepias verticillata* L.[3]	Whorled milkweed.
W11	*Aster exilis* Ell	Aster.
W12	*Aster spinosus* Benth	Aster.
W13	*Astragalus* sp	Milkvetch (nonpoisonous).
W14	*Baileya multiradiata* Haw. and Gray [3]	
W15	*Callirhoe involucrata* (Torr. and Gray) A. Gray	Winecup.
W16	*Callirhoe* sp	Poppy-mallow.
W17	*Cirsium* sp	Thistle.
W18	*Coldenia canescens* DC	
W19	*Croton capitatus* Michx	Goatweed, silver croton, or crotonweed.
W20	*Draba* sp	Whitlowgrass.
W21	*Dyssodia gracilis* (Rydb.) Cory	Dogweed.
W22	*Dyssodia treculii* (A. Gray) Robins	Do.
W23	*Eriogonum* sp	Wild buckwheat.
W24	*Erodium texanum* A. Gray	Texas filaree.
W25	*Euphorbia albomarginata* Torr. and Gray	Rattlesnakeweed.
W26	*Euphorbia* sp	Spurge.
W27	*Evax prolifera* Nutt	Cudweed.
W28	*Evax* sp	Do.
W29	*Froelichia drummondii* Moq	Snake cotton.
W30	*Gaillardia* sp	Gaillardia or Indian blanket.
W31	*Gutierrezia* sp	Annual broomweed.
W32	*Helenium microcephalum* DC [3]	Sneezeweed.
W33	*Helenium* sp	Do.
W34	*Helianthus ciliaris* DC	Plains sunflower.
W35	*Heterotheca subaxillaris* (Lam.) Britt. and Rusby	Camphorweed.
W36	*Jatropha cathartica* Teran and Berland	
W37	*Lepidium* sp	Peppergrass.
W38	*Lespedeza* sp	Lespedeza.
W39	*Lupinus* sp	Lupine or bluebonnet.
W40	*Medicago* sp	Bur-clover.
W41	*Melampodium cinereum* DC	
W42	*Melilotus* sp.[2]	Sweetclover.
W43	*Monarda* sp	Beebalm or horsemint.
W44	*Nama* sp	Nama.
W45	*Oenothera* sp	Evening-primrose.
W46	*Oxalis* sp	Sheep sorrel.

[2] Not native.

[3] Toxic to livestock.

TABLE 1.—*Plants occurring in Dimmit County, Tex.*—Continued

FORBS AND WEEDS—Continued

Symbol	Scientific names	Common name
W47	*Petunia parviflora* Juss	
W48	*Phlox* sp	Phlox.
W49	*Phyla incisa* Small (syn. *Lippia incisa*)	Carpetweed or frog fruit.
W50	*Plantago* sp	Tallowweed.
W51	*Polypteris* sp	
W52	*Psilostrophe gnaphalodes* DC [3]	
W53	*Ratibida* sp	Coneflower.
W54	*Salsola kali* var. *tennifolia* Tausch (syn. *S. pestifer*)	Russian-thistle.
W55	*Salvia* sp	Sage.
W56	*Selloa glutinosa* Spreng [4]	Alkaliweed.
W57	*Senecio* sp	Annual groundsel.
W58	*Tephrosia lindheimeri* A. Gray	Hoary pea.
W59	*Tribulus terrestris* L	Puncturevine.
W60	*Valerianella* sp	Lamb's-lettuce.
W61	*Varilla texana* A. Gray [4]	Saladillo.
W62	*Verbena* sp	Wild verbena.
W63	*Vicia* sp	Peavine.
W64	*Zephyranthes texana* Herb	Yellow rainlily.
W65	*Zexmenia hispida* (H. B. K.) A. Gray	
W66	*Zinnia* sp	Wild zinnia.

SHRUBS

S1	*Acacia amentacea* DC	Blackbrush.
S2	*Acacia berlandieri* Benth	Guajillo.
S3	*Acacia farnesiana* (L.) Willd	Huisache.
S4	*Acacia greggii* A. Gray	Long-flowered catclaw.
S5	*Acacia roemeriana* Scheele	Round-flowered catclaw or tree catclaw.
S6	*Acacia tortuosa* (L.) Willd	Catclaw or huisachillo.
S7	*Acacia* sp	Catclaw.
S8	*Atriplex canescens* (Pursh) Nutt	Fourwing saltbush or chamiza.
S9	*Baccharis salicina* Torr. and Gray [3]	Willow baccharis.
S10	*Bumelia angustifolia* Nutt	Saffron-plum or como.
S11	*Bumelia* spp	Bumelia.
S12	*Calliandra eriophylla* Benth	False mesquite or lamb brush.
S13	*Capsicum baccatum* L	Chillipiquin.
S14	*Castela texana* (Torr. and Gray) Rose	Goatbush or amargosa.
S15	*Celtis pallida* Torr	Desert hackberry or granjeno.
S16	*Cephalanthus occidentalis* L	Buttonball bush or button willow.
S17	*Cercidium texanum* A. Gray	Texas paloverde.
S18	*Chilopsis linearis* (Cav.) DC	Desertwillow.
S19	*Cissus incisa* Desm	Treebine, cow-itch, or yerba del buey.
S20	*Colubrina texensis* (Torr. and Gray) A. Gray	Hog-plum.
S21	*Condalia obovata* Hook	Bluewood or brasil.
S22	*Condalia obtusifolia* (Hook.) Weberb	Texas lotebush or Texas buckthorn.
S23	*Condalia spathulata* A. Gray	Squawbush.
S24	*Ephedra* sp	Jointfir or Mormon tea.
S25	*Eysenhardtia texana* Scheele	Rockbrush.
S26	*Ibervillea tenuisecta* (A. Gray) Small	Snake apple.
S27	*Jatropha spathulata* [3] (Ort.) Muell. Arg	Sangre de drago, dragon's blood, or leatherweed.
S28	*Karwinskia humboldtiana* (Roem. and Schult.) Zucc	Coyotillo.
S29	*Koeberlinia spinosa* Zucc	Allthorn.
S30	*Lantana camara* L	Common lantana.
S31	*Lantana macropoda* Torr	Lantana.
S32	*Larrea divaricata* Cav. (syn. *Covillea tridentata*)	Creosotebush.
S33	*Lesquerella recurvata* (Engelm.) S. Wats	Bladderpod, popweed, or cloth-of-gold.
S34	*Leucophyllum frutescens* (Berl.) Johnst	Cenizo.
S35	*Lippia ligustrina* (Lag.) Britton	Whitebrush.
S36	*Lycium* sp	Tomatillo.
S37	*Mimosa* sp	Catclaw.
S38	*Porlieria angustifolia* (Engelm.) A. Gray	Soapbush or guayacan.
S39	*Rhus microphylla* Engelm	Small-leaf sumac.
S40	*Rivina humilis* L	Rouge-plant or pigeonberry.
S41	*Schaefferia cuneifolia* A. Gray	Desert yaupon.
S42	*Sida lepidota* A. Gray	
S43	*Yucca* sp	Beargrass.
S44	*Yucca treculeana* Carr	Spanish-dagger.

TREES

T1	*Carya pecan* (Marsh.) Asch. and Graebn	Pecan.
T2	*Celtis occidentalis* var. *reticulata* (Torr.) Sarg. (syn. *Celtis reticulata*).	Paloblanco or hackberry.
T3	*Celtis* sp	Hackberry.

[3] Toxic to livestock.

[4] Salt-tolerant.

TABLE 1.—*Plants occurring in Dimmit County, Tex.*—Continued

TREES—Continued

Symbol	Scientific name	Common name
T4	*Diospyros texana* Scheele	Black persimmon or Mexican persimmon.
T5	*Fraxinus berlandieriana* DC	Mexican ash.
T6	*Juglans rupestris* Engelm	Texas walnut or little walnut.
T7	*Morus rubra* L	Red mulberry.
T8	*Parkinsonia aculeata* L	Horsebean, Jerusalem-thorn, or retama.
T9	*Prosopis chilensis* (Molina) Stuntz	Mesquite.
T10	*Prunus minutiflora* Engelm	Texas almond or wild plum.
T11	*Quercus virginiana* Mill	Live oak.
T12	*Quercus* sp	Do.
T13	*Salix* sp	Willow.
T14	*Sapindus drummondii* Hook. and Arn	Western soapberry or wild chinaberry.
T15	*Tamarix gallica* L.[5]	French tamarix or saltcedar.
T16	*Ulmus crassifolia* Nutt	Cedar elm.
	CACTI[6]	
C1	*Opuntia leptocaulis* DC	Tasajillo.
C2	*Opuntia lindheimeri* Engelm	Pricklypear.
C3	*Opuntia* sp	Do.

[5] Not native to this part of the State.
[6] Other species occur, but these are the most common.

Correlation of dominant vegetation with individual soil types is of considerable value in this region, where the production of natural forage for livestock is the chief function of the soils. Some plants are more valuable than others for grazing and browse. Observation has led to the knowledge that certain communities or types of vegetative growth are more or less consistently associated with certain soils, and that soils also influence the density and size of various plant species. A correlation, then, of the dominant vegetation with its density and size, for each soil type, is an index to the relative value of the soil type for livestock-carrying capacity. It is the general opinion of ranchmen that combinations of soil types, each with its characteristic vegetative cover, offer the most desirable range.

Table 2 shows the correlation of soil types with vegetation in Dimmit County. The table is based largely on observations in the field.

TABLE 2.—*Correlation of soil types with vegetation in Dimmit County, Tex.*

Soil type	Principal and characteristic plants[1]		Size and density
	Grasses	Other plants	
Frio silt loam	Red grama (G9) and tall bunchgrasses.	Mesquite, guajillo, catclaw, lotebush, guayacan, huisachillo, brasil (T9, S2, S7 and S36, S22, S37, S6, S21).	Large trees and shrubs, not dense; 5- to 10-percent grass cover.
Frio silty clay loam	Buffalo grass, Bermuda red grama (G11, G15, G9).	Mesquite, brasil, granjeno, Mexican persimmon, live oak, lotebush, whitebrush (T9, S21, S15, T4, T11 and T12, S22, S34).	Dense stand of medium-sized to large trees and shrubs; 30- to 40-percent grass cover.
Uvalde silty clay loam	Red grama, curly mesquite, three-awn, six-weeks fescue (G9, G22, G4, G21).	Mesquite, guajillo, granjeno, brasil, lotebush, guayacan, huisachillo, catclaw, pricklypear, tasajillo (T9, S2, S15, S21, S22, S37, S6, S7, S36, C3, C1).	Medium-sized to large trees and shrubs, not dense; 15- to 20-percent grass cover.

[1] Grasses and other plants are listed in approximate order of density or importance for each soil. Symbols in parentheses refer to botanical names, listed in table 1 (pp. 5-8).

TABLE 2.—*Correlation of soil types with vegetation in Dimmit County, Tex.*—Continued

Soil type	Principal and characteristic plants		Size and density
	Grasses	Other plants	
Uvalde silty clay loam, shallow phase.	Red grama, three-awn, curly mesquite (G9, G4, G22).	Mesquite, guajillo, paloverde, guayacan, tasajillo, pricklypear, lotebush, brasil (T9, S2, S17, S37, C1, C3, S22, S21).	Medium-sized trees and shrubs, not dense; 10- to 15-percent grass cover.
Monteola clay loam	Red grama, three-awn, curly mesquite, tobosa, pappusgrass, sixweeks fescue (G9, G4, G22, G23, G27, G21).	Mesquite, huisachillo, blackbrush, catclaw, lotebush, brasil, pricklypear, tasajillo, tallowweed (T9, S6, S1, S7 and S36, S22, S21, C3, C1, W50).	Medium-sized trees and shrubs, scattered to dense; 20- to 30-percent grass cover.
Maverick clay loam, smooth phase.	Red grama, three-awn, curly mesquite, tobosa, pappusgrass, sixweeks fescue (G9, G4, G22, G23, G27, G21).	Mesquite, blackbrush, guayacan, brasil, lotebush, huisachillo, desert yaupon, allthorn, crotonweed, tallowweed, bitterweed (T9, S1, S37, S21, S6, S40, S28, W19, W50, W2).	Medium-sized trees and shrubs, scattered to dense; 20- to 30-percent grass cover.
Reagan loam	Three-awn, red grama, curly mesquite (G4, G9, G22).	Cenizo, guajillo, *Coldenia*, cudweed, paloverde, lotebush, mesquite, catclaw, guayacan, broomweed (S34, S2, W18, W27, S17, S22, T9, S7 and S36, S37, W31).	Small scattered trees and shrubs; 30- to 40-percent grass cover.
Reagan loam, colluvial phase.	Red grama, three-awn, curly mesquite, tobosa, pappusgrass (G9, G4, G22, G23, G27).	Mesquite, guayacan, *Coldenia*, cudweed, paloverde, pricklypear, guajillo, lotebush (T9, S37, W18, W27, S17, C3, S2, S22).	Moderately large and dense growth of trees and shrubs; open grassy areas with 30- to 40-percent grass cover.
Zavala fine sandy loam.	Crowfoot, red grama, sacaton, grassbur, Bermuda grass (G16, G9, G32, G13, G15).	Mesquite, live oak, whitebrush, guayacan, brasil, Mexican persimmon, catclaw, lotebush (T9, T11, S34, S37, S21, T4, S7 and S36, S22).	Moderately large and dense growth of trees and shrubs; 10- to 15-percent grass cover.
Webb fine sandy loam	Red grama, three-awn, crowfoot, pappusgrass, curly mesquite, rescue grass (G9, G4, G16, G27, G22, G10).	Blackbrush, mesquite, huisachillo, brasil, guayacan, granjeno, desert yaupon, amargosa, pricklypear, leatherweed, Mormon tea, tallowweed (S1, T9, S6, S21, S37, S15, S40, S14, C3, S26, S24, W50).	Medium-sized to large trees and shrubs; 25- to 35-percent grass cover.
Duval fine sandy loam.	Three-awn, crowfoot, red grama, grassbur (G4, G16; G9, G13).	Mesquite, brasil, Mexican persimmon, como, leatherweed, lotebush, coyotillo, broomweed, pricklypear, hoary pea, guayacan, crotonweed (T9, S21, T4, S10, S26, S22, S27, W31, C3, S37, W58, W19).	Scattered large trees and brush; 20- to 25-percent grass cover.
Maverick fine sandy loam.	Red grama, three-awn, pappusgrass, sixweeks fescue (G9, G4, G27, G21).	Mesquite, brasil, granjeno, huisachillo, lotebush, guajillo, *Coldenia*, cudweed, blackbrush, pricklypear, tasajillo (T9, S21, S15, S6, S22, S2, W18, W27, S1, C3, C1).	Moderately large and dense growth of trees and shrubs; 25-percent grass cover.
Crystal fine sandy loam.	Three-awn, grassbur, crowfoot, hairy grama, rescue grass (G4, G13, G16, G7, G10).	Mesquite, brasil, granjeno, hog-plum, lantana, verbena, leatherweed, poppymallow, winecup, gaillardia, evening-primrose, coyotillo (T9, S21, S15, S20, S29, S30, W62, S26, W16, W15, W45, S27).	Scattered large trees and shrubs; 40-percent grass cover.
Uvalde silty clay	Curly mesquite, red grama, three-awn (G22, G9, G4).	Mesquite, guajillo, guayacan, lotebush, catclaw, pricklypear, tasajillo (T9, S2, S37, S22, S7 and S36, C3, C1).	Dense growth of medium-sized trees and shrubs; 20- to 30-percent grass cover.
Monteola clay	Curly mesquite, tobosa, red grama (G22, G23, G9).	Mesquite, pricklypear, lotebush, guayacan, tasajillo, huisachillo, amargosa, *Jatropha cathartica* (T9, C3, S22, S37, C1, S6, S14).	Dense growth of medium-sized trees and shrubs to semiprairie; 40- to 50-percent grass cover.

TABLE 2.—*Correlation of soil types with vegetation in Dimmit County, Tex.*—Continued

Soil type	Principal and characteristic plants		Size and density
	Grasses	Other plants	
Maverick-Monteola clays.	Curly mesquite, tobosa, red grama (G22, G23, G9).	Mesquite, huisachillo, pricklypear, lotebush, amargosa, guayacan, tasajillo, broomweed, bitterweed (T9, S6, C3, S22, S14, S37, C1, W31, W2).	Dense growth of medium-sized trees and shrubs to semiprairie; 20- to 25-percent grass cover.
Frio silty clay	Buffalo grass, curly mesquite, Bermuda grass (G11, G22, G15).	Mesquite, catclaw, sneezeweed, horsemint, brasil, huisachillo, guayacan, Mexican persimmon, lotebush, whitebrush, aster, bur-clover, carelessweed, snake apple, retama, live oak (T9, S7 and S36, W33, W43, S21, S6, S37, T4, S22, S34, W12, W42, W6, S26, T8, T11 and T12).	Large trees and shrubs; 50-percent grass cover.
Maverick clay loam	Red grama, pappusgrass (G9, G27).	Blackbrush, mesquite, lotebush, amargosa, granjeno, pricklypear, huisachillo, guayacan, leatherweed, broomweed, Spanish-dagger (S1, T9, S22, S14, S15, C3, S6, S37, S27, W31, W44).	Medium-sized trees and shrubs; 20- to 25-percent grass cover.
Frio clay loam	Buffalo grass, curly mesquite, red grama (G11, G22, G9).	Mesquite, whitebrush, brasil, lotebush, huisachillo, guayacan, tasajillo, pricklypear, leatherweed, live oak (T9, S35, S21, S22, S6, S38, C1, C3, S30, T11 and T12).	Dense growth of large trees and shrubs; 20- to 30-percent grass cover.
Miguel fine sandy loam.	Pappusgrass, red grama (G27, G9).	Mesquite, lotebush, granjeno, brasil, whitebrush, guayacan, pricklypear, alkaliweed (T9, S22, S15, S21, S35, S38, C3, W56).	Medium-sized trees and shrubs; 5- to 10-percent grass cover.
Crystal fine sand	Three-awn, crowfoot, broomsedge, little bluestem, lovegrass, hairy grama, grassbur, rescue grass, sandgrass (G4, G16, G3, G2, G20, G7, G13, G10, G31).	Mesquite, guayacan, granjeno, como, gaillardia, hoary pea, verbena, tallowweed, pricklepoppy, horsemint, sheep sorrel, beargrass (T9, S38, S15, S10, W30, W58, W62, W50, W9, W43, W46, S43).	Few trees and shrubs; many forbs; 30- to 40-percent grass cover.
Zavala loamy fine sand	Three-awn, crowfoot, grassbur, broomsedge (G4, G16, G13, G3).	Mesquite, willow, whitebrush, Mexican persimmon, pricklypear, hackberry, brasil, granjeno, lotebush, plains sunflower (T9, T13, S35, T4, C3, T3, S21, S15, S22, W34).	Scattered trees and shrubs; 25- to 35-percent grass cover.
Duval loamy fine sand, colluvial phase.	Three-awn, red grama (G4, G9).	Mesquite, lotebush, pricklypear, crotonweed, broomweed, plains sunflower (T9, S22, C3, W19, W31, W34).	Large trees and shrubs; 25- to 35-percent grass cover.
Duval fine sandy loam, shallow phase.	Three-awn, red grama, grassbur, crowfoot (G4, G9, G13, G16).	Blackbrush, paloverde, lotebush, guayacan, leatherweed, Mormon tea, *Coldenia*, broomweed, mesquite, brasil, tasajillo, pricklypear, crotonweed (S1, S17, S22, S38, S27, S24, W18, W31, T9, S21, C1, C3, W19).	Fairly dense growth of small trees and shrubs; 5- to 10-percent grass cover.
Leona clay	Buffalo grass (G11)	Mesquite, retama, aster, live oak, elm, ash, hackberry, sneezeweed (T9, T8, W12, T11 and T12, T16, T5, W33).	Scattered large trees; 5- to 10-percent grass cover.
Maverick clay	Curly mesquite, tobosa (G22, G23).	Mesquite, pricklypear, guayacan, amargosa, saladillo, broomweed (T9, C3, S38, S14, W61, W31).	Scattered small trees and shrubs; 5- to 15-percent grass cover.

TABLE 2.—*Correlation of soil types with vegetation in Dimmit County, Tex.*—Continued

Soil type	Principal and characteristic plants		Size and density
	Grasses	Other plants	
Frio clay	Buffalo grass, tobosa (G11, G23).	Mesquite, retama, aster, elm, hackberry, sneezeweed, guayacan (T9, T8, W12, T16, T3, W33, S38).	Medium-sized to large trees; 10- to 15-percent grass cover.
Zapata loam	Three-awn, red grama (G4, G9).	Paloverde, cenizo, *Coldenia*, creosotebush, mesquite, guajillo, blackbrush, tasajillo, cudweed, broomweed (S17, S34, W18, S32, T9, S2, S1, C1, W27, W31).	Scattered small trees and shrubs; 10- to 15-percent grass cover.
Zapata fine sandy loam.	Three-awn, red grama (G4, G9).	Mesquite, blackbrush, granjeno, lotebush, guajillo, cenizo, huisachillo, tasajillo, guayacan, broomweed, *Coldenia* (T9, S1, S15, S22, S2, S34, S6, C1, S38, W31, W18).	Somewhat scattered medium-sized trees and shrubs; 10- to 15-percent grass cover.
Reagan gravelly loam.	Red grama, three-awn (G9, G4).	Guajillo, cenizo, blackbrush, rockbrush, desert yaupon, Mexican persimmon (S2, S34, S1, S25, S41, T4).	Medium-sized to small trees and shrubs; 10- to 15-percent grass cover.
Webb gravelly fine sandy loam.	Red grama, three-awn (G9, G4).	Blackbrush, mesquite, rockbrush, cenizo, tasajillo, hog-plum, amargosa, granjeno, Mexican persimmon, guajillo, pricklypear (S1, T9, S25, S34, C1, S20, S14, S15, T4, S2, C3).	Moderately dense growth of medium-sized trees and shrubs; 5- to 10-percent grass cover.
Crystal fine sandy loam, shallow phase.	Three-awn, red grama, crowfoot (G4, G9, G16).	Guajillo, blackbrush, leatherweed, rockbrush, huisachillo, pricklypear, mesquite (S2, S1, S27, S25, S6, C3, T9).	Scattered small trees and shrubs; 10- to 20-percent grass cover.
Randall clay	Buffalo grass, tobosa (G11, G23).	Retama, mesquite, granjeno, sneezeweed, horsemint, broomweed, Russian-thistle (T8, T9, S15, W33, W43, W31, W54).	Scattered large trees and shrubs; 5- to 25-percent grass cover.

Dimmit County, named for Capt. Philip Dimmit, patriot who sacrificed his life in the ill-fated Mier expedition of 1842, was created by act of the Legislature of Texas in 1858 from a part of a tract that originally belonged to the Municipality of Bexar, but which subsequently had been a part of Uvalde, Webb, and Maverick Counties as the great Bexar land district was divided and subdivided. It was not until December 6, 1880, that independent organization of the county was completed. First land grants had been made by the Mexican Government in 1834. These were respected by the Republic of Texas (1836–45) and also by the State of Texas on admission to the Union.

El Camino Real, or the King's Highway, the original road from Mexico City to San Antonio and other points in the Province of Texas, crossed the area now occupied by Dimmit County. One of the camp sites on the old road was the "carrizo," which historians assume to have been at the present location of Carrizo Springs. Here, formerly, were many springs; and Carrizo Creek flowed perennially. Owing to the lowered water table the springs are now dry, and Carrizo Creek has only one or two unfailing water holes.

From earliest occupancy, which predates the independence of Texas, the vast region that includes Dimmit County was a free-range domain. Both cattle and sheep were grazed in the vicinities of

natural water supplies. With establishment of the Rio Grande as the international boundary between Mexico and the United States, and with the protection afforded by Fort Duncan, located at Eagle Pass in 1849, settlement of the region became more rapid and permanent. Development was slow, however, until barbed wire became available. Fencing began in the eighties and led to the acquisition of large tracts of land under private ownership. Thus a stable stock-raising enterprise was begun. Settlers came from other sections of the United States and from Europe and Mexico. Many of their descendants operate ranches today.

There was little other development aside from ranching before 1900, at about which time irrigation of cultivated crops began. Water for this purpose was obtained from streams and bayous in the valleys and from the newly discovered artesian basin on the uplands near Carrizo Springs. Great impetus was brought to agricultural development when railway transportation became available in 1909–11. The Asherton & Gulf Railway, connecting with a main-line road at Artesia Wells, La Salle County, was planned to terminate at Carrizo Springs, but construction was discontinued at Asherton. Two years later, in 1911, however, a line was built from Carrizo Springs to join the San Antonio, Uvalde, & Gulf Railroad, another short line, near Crystal City, Zavala County. These lines are now part of the Missouri Pacific system. After completion of the railroads irrigation farming expanded rapidly until about 1930.

During the period of expansion many new towns and farm subdivisions were started. Bermuda and the community around Dentonio School were among the first. Others were Asherton, Bigwells, Winter Haven, Palm, Brundage, Catarina, Valley Wells, and El Cid, some of which have grown, while others remain villages or farming communities. The Cometa farming community, which centers in Zavala County, extends for some distance into Dimmit County also.

The population of Dimmit County, according to the Federal census of 1930, is 8,828, or an average of 6.7 to the square mile. About 71 percent is of Mexican-Indian or Mexican-Spanish descent. All are classed as rural, but only about 35 percent actually live on farms. Most of the nonfarm population resides in the four small towns of the county. Carrizo Springs, the largest town, had 2,171 inhabitants in 1930; Asherton, in the central part, 1,858; Bigwells, in the northeastern part, about 715; and Catarina, in the southeastern part, 592. Since 1930 the populations of Asherton, Bigwells, and Catarina have decreased somewhat, while the population of Carrizo Springs has increased slightly.

Hard-surfaced roads of the State highway system radiate from Carrizo Springs, passing through Asherton, Catarina, Brundage, Bigwells, and El Cid, forming connections with the Nation-wide network and giving access to the Pan-American Highway, which enters Mexico at Laredo. A fairly good system of graded roads and some gravel- or caliche-surfaced county roads reach most farm communities and some ranches. Many private ranch roads are not improved. Except in wet weather these roads can usually be traversed by motor vehicles.

All towns and communities have telephones, and many privately owned lines reach farm homes and ranch headquarters. Most of the

rural homes are simple, but many are equipped with modern conveniences. Laborers, chiefly of Mexican descent, usually occupy primitive shelters.

Public elementary schools and high schools for the children of the county are located at Carrizo Springs, Asherton, Bigwells, and Catarina. These are consolidated, and busses transport many students from the outlying districts. Those whose homes are beyond bus routes usually establish residence in the vicinity of the school during the term. There are few rural elementary schools. Churches of several denominations are located in the larger towns.

Industries other than those of an agricultural nature include a small ice-manufacturing plant at Carrizo Springs. Its product is used largely for domestic consumption and for icing refrigerator cars for vegetables shipped from there. Ice for refrigerator cars shipped from Zavala and Dimmit Counties is manufactured in plants of the Winter Garden district and shipped by rail to Crystal City, where it is stored in summer. From there it is redistributed as needed during the vegetable-shipping season. Building sand, caliche, and gravel occur in abundance and supply all local requirements. Coal has been mined from underlying beds on the Light ranch, in the southeastern part of Dimmit County. Underground waters have been exploited extensively for irrigation.

CLIMATE

Dimmit County is situated in the warmer part of the Temperate Zone. Its eastern edge coincides approximately with the theoretical boundary separating the semiarid and subhumid regions, and therefore most of the county lies within the semiarid belt. The climate is continental, although influenced by winds from the Gulf of Mexico. It is characterized by short, mild winters, long, hot summers, and a mean annual precipitation of 21.27 inches.

The mean annual temperature is 71.2°F. Rather wide fluctuations in temperature occur. Winter temperatures range from 25° to 90° and summer temperatures from 55° to 105°. Extremes beyond these are reached occasionally. When cold waves, "northers," sweep down in winter the temperature may fall as much as 50° in 7 hours. Fortunately, summer temperatures, which soar from midday until late evening, are normally mitigated by relatively low humidity and by Gulf breezes, which stir at night.

Precipitation occurs mainly as rain, but some is in the form of mist, hail, fog, sleet, and snow. Sleet, however, is extremely rare, and an average of only 0.4 inch of snow falls annually. Records show that precipitation is erratic both during the year and from year to year. Humidity and precipitation are greatest in spring, summer, and fall. Hail and electric storms are sometimes destructive in these seasons, especially in spring and early summer. Throughout the rest of the year, and especially in winter, precipitation comes in the form of gentle showers, slow rains, mists, or fogs, all of which last for more or less extended periods, although only a small total amount of moisture falls.

March and April are windy months. North winds, similar to those of winter but not so cold, blow frequently and reduce materially

the moisture content of the soils. Occasionally they are laden with considerable amount of fine dust, gathered in the wake of retreating frost and snow farther north.

The average frost-free period is 283 days, extending from February 27 to December 7, but frost has occurred as late as March 28 and as early as November 7. A semiarid climate prevails, and crop production by dry-farming methods is generally hazardous, although on some soils some adapted crops are successfully grown without irrigation.

Irrigation removes many of the climatic obstacles to crop production, making it possible to take advantage of the long frost-free period and to grow several crops a year. Raising winter vegetables for northern markets, and growing spring and summer feed crops for local use under irrigation are very satisfactory. Tillage is possible at any time of year.

The nutritious native grasses, forbs, and woody plants, which furnish abundant grazing and browse, and the mild winters favor the production of range livestock. By far the greater part of the county is used as range.

Table 3, compiled from records of the United States Weather Bureau station at Carrizo Springs, Tex., shows climatic data for Dimmit County.

TABLE 3.—*Normal monthly, seasonal, and annual temperature and precipitation at Carrizo Springs, Dimmit County, Tex.*

[Elevation, 650 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1917)	Total amount for the wettest year (1931)
	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*
December	54.4	84	20	1.10	0.00	3.33
January	54.6	87	13	1.25	(1)	4.74
February	58.8	98	23	1.00	(1)	.65
Winter	55.9	98	13	3.35	(1)	8.72
March	63.9	99	21	1.04	(1)	1.42
April	71.6	101	36	1.71	.00	2.52
May	78.2	106	44	2.52	.85	8.22
Spring	71.2	106	21	5.27	.85	12.16
June	83.8	111	50	2.17	.45	4.25
July	86.1	108	62	2.20	2.00	3.88
August	86.2	108	61	2.23	2.50	4.66
Summer	85.4	111	59	6.60	4.95	12.79
September	81.2	104	50	3.08	1.32	.00
October	73.3	101	34	1.91	.02	.00
November	62.1	89	26	1.06	.23	.20
Fall	72.2	104	26	6.05	1.57	.20
Year	71.2	111	13	21.27	7.37	33.87

[1] Trace.

AGRICULTURAL HISTORY AND STATISTICS

Range livestock raising has been the dominant agricultural enterprise in Dimmit County since the days of the first settlers. Beef cattle, long-wooled sheep, and Angora and short-haired goats are raised chiefly. A very large proportion of the county, therefore, is occupied by ranches rather than farms.

According to the Federal census, during the eighties sheep outnumbered cattle on the range of the county; but by 1900, after a series of severe droughts and the depression of 1898, the sheep raising of the entire region failed. Apparently, cattle were not similarly affected. Only since the late twenties has sheep raising become important again.

Fencing, which began in the eighties, has gradually intensified ranching, a trend that still continues. Pastures are becoming smaller. Watering places, consisting of earthen reservoirs, or tanks, and wells with windmill or engine pumps, are multiplying. These developments have resulted in a more uniform utilization of the range and consequently in an increased carrying capacity. When the market demand and the possibilities for increased profits became apparent, improvement in quality of livestock began. The early cattle were Longhorns, which produced low-quality meat, but this breed was the only one that could endure on the unfenced range, with its widely scattered and entirely inadequate watering places. About 1900 the Shorthorn and Hereford breeds began to take the place of the Longhorn, and at present most of the cattle in the county are Herefords. There are also some of Hereford-Brahman breeding, and on one ranch a few Aberdeen Angus steers were observed in the course of this survey. Hereford herds are composed of purebred registered bulls and either high-grade or purebred cows, many of which are not registered. Some ranchers specialize in grazing steers purchased from others who specialize in breeding.

Improvement of cattle in the county was seriously hindered by the cattle fever tick, *Boöphilus annulatus* (Say), which transmits the microparasite that produces the fever in cattle. Improved breeds are more susceptible to this fever than the Longhorns. The tick was eradicated in this county about 1930, and since that time great improvement has been made in the quality of animals produced.

Comparatively few dairy cattle are kept. About three dairies in the vicinity of Carrizo Springs supply the town. Besides the animals kept by these dairies, there is only a small number of individually owned dairy cattle. A few of these are purebred, but most of them are grades. All are of Jersey breeding. In 1934, 475,168 gallons of milk and 44,901 pounds of butter were produced.

The number of cattle increased until after the turn of the century, and thereafter it decreased sharply until 1935, when the census showed a decided upturn. On January 1, 1935, according to the Federal census, there were 47,170 cattle of all ages in the county, a substantial increase over the 9,380 reported on April 1, 1930. (County tax-roll records, however, show 19,116 cattle of all ages as of January 1, 1930.) Of the total reported for 1935, 17,488 were cows and heifers 2 years old and over, although only 902 cows were milked during 1934.

In the revived sheep-raising industry, dating from the decade 1921-30, the Rambouillet is the favored breed. The number of these sheep

pastured in Dimmit County has fluctuated greatly. The center of the sheep-raising industry is farther north on the Edwards Plateau, and flocks pastured in Dimmit County are usually brought down for intermittent periods when the grazing is better than on the plateau. The Federal census records 207 head of sheep and lambs in 1920, 21,756 in 1930, and 21,334 in 1935.

There are a few small flocks of Angora (long-haired) goats and a number of the common or short-haired type in the county. The former are maintained primarily for the production of mohair and the latter for milk, meat, and hides. Many ranchers keep a flock of common goats to provide fresh meat as they find this more economical than butchering cattle. The first record of goats in the county by the Federal census was that of 1900, when 19,060 head were reported. This is the largest number on record. The census of 1935 reported 4,937 head.

A number of horses and mules are raised in the county, but not enough to satisfy present requirements. Most of the horses are cow ponies—small but sturdy—and relatively large-boned riding horses. The census of 1935 recorded 1,364 horses and colts of all ages, and 1,156 mules. Most ranches have a few mules for hauling, but farms use more of them in general farm work.

Swine have been reported since the first census. The number has fluctuated slightly from census to census but shows no marked trend upward or downward. The chief breeds are Poland China, Duroc-Jersey, and Hampshire. Present trends indicate that the bacon type is growing in favor. The total number of swine recorded by the 1935 Federal census is 1,435.

Poultry consist mainly of chickens raised for home consumption on the farms and ranches, but there are one or two commercial poultry farms between Carrizo Springs and Asherton. White Leghorn is the most common breed. A few turkeys, chiefly Bronze, are raised also. The 1935 Federal census reports 17,138 chickens and 1,412 turkeys in the county.

Bees are recorded by the census from 1900 to 1930, but none were reported in 1935. At present, however, there are numerous apiaries, though no data regarding the number of hives are available. Extremely high-grade honey is produced from the flowers and native shrubs, but the market for honey has not been attractive.

Table 4 gives the number of livestock on farms and ranches in Dimmit County, as reported by the United States census in stated years.

Crops are produced only in small areas in the Nueces River Valley, where most water for irrigation is taken from dams on the river and lakes, on the uplands within the area of economical artesian waters, and at the extreme eastern edge of the county, where dry farming has been attempted from time to time.

About 1900 the first artesian water was discovered about 4 miles east of Carrizo Springs. This water came from the geological formation known as Carrizo sand that underlies most of the county and outcrops along its western edge. The artesian basin (*11*),[7] from which

[7] WHITE, W. N., TURNER, S. F., and LYNCH, W. A. GROUND WATER IN DIMMIT AND ZAVALA COUNTIES, TEXAS. U. S. Dept. Interior, Press Memo. 83105, 4 pp. April 11, 1934. [Mimeographed report prepared through cooperation of the Texas Board of Water Engineers and the U. S. Geological Survey.]

TABLE 4.—*Number of livestock on farms and ranches in Dimmit County, Tex., in stated years*

Livestock	1880	1890	1900	1910	1920	1930 [1]	1935
Cattle [2]	8,721	44,934	74,641	38,770	32,605	9,380	47,170
Sheep	36,714	23,809	1,285	----	207	21,756	21,334
Goats	----	----	19,060	5,204	17,634	3,245	4,937
Horses	608	1,575	2,458	1,936	1,328	420	1,364
Mules	[3] 9	48	313	597	1,054	648	1,156
Swine	601	1,056	1,942	1,100	1,661	522	1,435
Chickens	501	2,780	[4] 2,711	[5] 3,035	12,251	7,920	17,138
Other poultry	45	412	267	----	276	----	[6] 1,412
Bees (hives)	----	----	1,013	1,286	1,137	2,444	----

[1] These census enumerations made on April 1, 1930, differ greatly from those of the county tax roll made on January 1 of the same year. The latter show 19,116 cattle, 3,455 sheep, 6,225 goats, and 1,493 horses and mules. Swine, poultry, and bees are not listed on the tax roll.
[2] Mostly beef cattle, but dairy cattle are included.
[3] Mules and asses.
[4] Includes guinea fowls.
[5] All poultry.
[6] Turkeys only.

a large part of the irrigated lands of the county are watered, is formed by the porous Carrizo sand sealed between other relatively impervious strata and dips in the general direction of the Gulf at a greater angle than the slope of the land surface. A structural feature that enlarges the scope and efficiency of this natural underground reservoir is a regional geosyncline, on the southeastern side of which Dimmit County lies. The axis of this syncline extends in a northwest-southeast direction, cutting across the northeast corner of the county and extending through La Salle County in the vicinity of Gardendale and through Zavala County in the vicinity of La Pryor.

Most of the water that replenishes the Carrizo sand, which supplies the wells of Dimmit County, comes from rainfall on the outcrop area, and only a small part comes from streams flowing across the outcrop. Withdrawal of water from the wells for irrigation lowers their water levels, but when pumping ceases, levels are stabilized and sometimes rise. The levels of the wells also rise when a heavy rain falls on the outcrop area, a fact that demonstrates the ability of the Carrizo sand to transmit water to the wells.

The Carrizo sand averages about 200 feet in thickness and dips generally to the east and southeast. The belt in which it can be reached within a depth of 1,000 feet averages about 15 miles wide. The supply of water obtainable from wells in Dimmit and Zavala Counties amounts to about 20,000 acre-feet a year, which is sufficient to irrigate about 27,000 acres under the average conditions of rainfall, stream flow, and distribution of crops that prevailed from 1929 to 1930. Water from this formation is of uniformly good quality throughout the basin area and is the only underground water suitable for irrigation that occurs in sufficient quantities.

Owing to withdrawals from the underground supply, hydrostatic pressure has been reduced until the only flowing wells remaining are at low elevations near the river and creek valleys. There are only a few of these; and flow from them usually is not strong enough to supply sufficient water for irrigating until augmented by pumping. Normally, wells drilled in or near the Carrizo sand outcrop are weaker than those drilled farther east of it. Output capacities of

the wells probably range from less than 200 to more than 700 gallons a minute.

Table 5 gives data regarding wells drilled into the Carrizo sand in various irrigated districts.

TABLE 5.—*Data regarding wells drilled into the Carrizo sand in various irrigated districts of Dimmit County, Tex.*[1]

Farming district	Range in total depth of wells	Range in depth to top of Carrizo sand	Range in depth to water levels of wells (1929-30)
	Feet	*Feet*	*Feet*
Carrizo Springs	40- 835	0- 550	4.0-116.0
Asherton	499-1,385	365-1,004	52.5-191.0
Bigwells	1,147-2,200	1,200-1,690	8.7-172.0
Catarina	1,081-1,816	780-1,557	15.0-190.7
Valley Wells	1,668-1,800	1,465-1,550	flowing- 58.0
Brundage	625-1,410	630-1,200	22.8- 38.9
Winter Haven	504-1,250	7- 900	20.2- 90.0
Dentonio School	280- 705	250- 825	20.0-197.2
Cometa [2]	100- 900	0- 350	29.2- 82.2

[1] Selected data from well logs and other information compiled in connection with surveys of ground water in Dimmit and Zavala Counties by the Texas Board of Water Engineers cooperating with the United States Geological Survey (1929-30).

[2] The Cometa district centers in Zavala County, but a large part of it lies in Dimmit County.

About the time artesian water was discovered, Bermuda Dam was completed on the Nueces River and some of the valley land in the vicinity was cleared and irrigated, the water being brought to the land by gravity. Boynton Dam, on the river just south of the Zavala County line, was not completed until 1914. Dams raising the level of Espantosa Lake were constructed about the same time. Water from these sources and from Soldier Lake is used to irrigate large areas of adjacent uplands and valleys. Some of the water is obtained by gravity, but most of it is pumped.

Despite the early artesian and gravity irrigation development prior to the period from 1909 to 1911, the years when railroad facilities were constructed, there was only a small amount of irrigation farming. Small acreages of corn and forage crops, together with smaller acreages of sweetpotatoes, potatoes, and sorgo were reported by the Federal census in this early period.

The greatest expansion in agriculture occurred between 1910 and 1930. During this period large tracts irrigated from wells were developed in the vicinities of Carrizo Springs, Asherton, Bigwells, Brundage, Winter Haven, Dentonio School, Catarina, Palm, and El Cid. The 1935 census shows that 237 farms reported crops harvested from 10,056 acres of irrigated land in 1934. This is slightly more than half of the cropland harvested.

The crops first produced under irrigation were cotton, corn, and forage. These crops were rapidly displaced, however, by vegetables, chiefly onions and spinach, grown in fall, winter, and early spring for northern markets. Later, citrus fruits and strawberries were successfully introduced.

In 1929 Substation No. 19 of the Texas Agricultural Experiment Station was established near Winter Haven. The purpose of this substation is to study the agricultural problems of the region and

especially to develop suitable new crops and varieties. The county has employed agricultural and home demonstration agents since 1934.

Table 6 gives the acreages of the important crops in 1909, 1919, 1929, and 1934, as reported by the United States census.

TABLE 6.—*Acreages of the principal crops in Dimmit County, Tex. in stated years*

Crop	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*
Corn, for grain	780	2,769	1,234	4,120
Grain sorghums	32	445	523	1,710
Cotton	869	4,078	988	----------
Sweetpotatoes	7	225	----------	17
Forage [1]	441	4,414	2,257	5,443
Sorghums for silage, hay, and fodder	----------	4,020	1,929	4,844
Legumes for hay	----------	74	20	303
Corn forage	----------	228	302	----------
Other hay and forage	----------	92	6	296
Market vegetables	----------	2,255	6,541	7,184
Strawberries	1	----------	2	192
	Trees	*Trees*	*Trees*	*Trees*
Oranges	1	----------	[2] 300	[2] 17,540
Grapefruit	----------	----------	[2] 93	[2] 7,577
	Vines	*Vines*	*Vines*	*Vines*
Grapes	40	25	[2] 250	[2] 499

[1] For forage only.
[2] Fruit trees and grapevines for 1930 and 1935, respectively.

Small acreages of corn were reported in the early censuses, but the largest, 4,120 acres, was harvested for grain in 1934. Since 1909, corn has been supplemented by increasing acreages of grain sorghums, a crop that is more suited to the region than corn, as it produces heavier yields under the prevailing dry conditions. Corn and grain sorghums have approximately the same feeding value (*9*).

Corn is also grown as a forage crop. Other hay and forage crops include sumac sorgo, hegari, milo, Sudan grass, Rhodes grass, peanuts, Johnson grass, and alfalfa. The combined acreage of forage crops reached a maximum of 5,443 acres in 1934.

Cotton, which was first reported in the 1910 census, reached its peak in production about the time of the World War. The census of 1920 reported 4,078 acres devoted to this crop in 1919. No cotton was reported for 1934. Some cotton has been raised since, but with little profit.

Market vegetables increased in acreage from 2,255 acres in 1919 to 7,184 acres in 1934, according to the census. The most important vegetables are dry onions and spinach, of which 3,157 and 1,606 acres, respectively, were harvested in 1929. In that year tomatoes were grown on 145 acres, watermelons on 113 acres, cantaloups on 75 acres, and string beans on 73 acres. The 1935 census reports separately tomatoes harvested on 977 acres, watermelons on 148 acres, string beans on 117 acres, sweet corn on 88 acres, and cabbage on 76 acres. A large part of the remaining 5,778 acres of vegetables harvested for sale in 1934 but not reported separately in the 1935 census was devoted to spinach and onions.

Practically all of the spinach and onions are shipped by rail, but a large part of the spinach is billed from Crystal City, Zavala County. Perhaps as much as 75 percent of the strawberry crop is

shipped by railway express; but about 75 percent of all other fruits and vegetables, including onion plants, are shipped by motortruck. Shipments of onions increased from 1,479 carlots in 1920 to 2,178 carlots in 1928 but decreased gradually to 23 carlots in 1939. Shipments of spinach, which amounted to 148 carlots in 1920, reached a maximum of 651 carlots in 1930 and thereafter fell to 36 carlots in 1939. Other shipments in 1939 were 94 carlots of tomatoes, 69 carlots of peppers, and 11 carlots of carrots. These shipments do not take into account shipments made from Crystal City. Cabbage, lettuce, cantaloups, green corn, and watermelons have also been shipped in some years.[8] Station agents' records also show that 27 carlots of onion plants were shipped in 1936 and 20 carlots in 1937.

Strawberries produced for the winter and early spring market have been a successful crop. From 1 acre reported for 1909, the acreage increased to 191 in 1934, according to the census.

Citrus fruits of high quality, especially oranges, are successfully produced. From 1 orange tree in 1909, as reported by the census, there was an expansion to 17,540 orange trees and 7,577 grapefruit trees in 1934, in addition to 22,803 nonbearing orange trees and 11,553 nonbearing grapefruit trees.

A few grapevines have been reported in every census since 1900. The greatest expansion in grapes, however, is under way at present. Experimental work conducted by the Texas Agricultural Experiment Station has indicated that Sultanina (Thompson Seedless), when grafted on proper stock, on desirable soil with suitable topography, can be grown successfully in this region. About 100 acres of this variety are being planted in the county. Station agents' records show that 27 carlots of onion plants were shipped in 1936 and 20 carlots in 1937.

According to the census of 1935, 728,985 acres, or 85.9 percent of the total area of the county were in farms, averaging 1,612.8 acres each. These include numerous ranches that have no cropland and many farms with no native pasture. The total number of farms in the county in 1935 was 452, of which 75 included 1,000 acres or more each, or a total area of 678,050 acres. In the more commonly accepted sense, the farms of the county range in size from 5 to 2,000 acres, whereas the ranches occupy from 2,000 to more than 80,000 acres.

In 1934, 38,174 acres, or 4.5 percent of the total area of the county, were available for crops. This includes cropland harvested, cultivated land that failed to produce a crop, idle or fallow land, and plowable pasture. In that year crop failure occurred on 4,684 acres and crops were harvested from 19,395 acres.

Ranching, commercial farming, and subsistence farming are the chief systems of agriculture. About 97 percent of the area of the county is devoted to ranching, and only slightly more than 2 percent is used for cultivated crops grown on commercial and subsistence farms.

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[8] Data obtained from carlot shipments of fruits and vegetables from stations in the United States by calendar years, as published in Statistical Bulletins 19, 27, 35, 42, and 61 (covering the period 1920–1935), Bureau of Agricultural Economics, U. S. Department of Agriculture, and as recorded by the Transportation Section, Fruits and Vegetables Division, Agricultural Marketing Service, U. S. Department of Agriculture.

Ranches raise beef cattle, sheep, or goats, chiefly on native pasture. On some ranches native pastures are supplemented by small dry-farmed acreages of feeds, such as corn, grain sorghums, Sudan grass, or other drought-resistant forage crops.

Commercial farms produce market vegetables on large acreages under irrigation. One or two vegetable crops are grown in many places on rented land. These farms use large tractor-drawn implements and employ inexpensive labor.

In general, the subsistence farms are irrigated, but they are smaller than the commercial farms and are operated by owners. These farms grow diversified crops and raise several kinds of livestock. Under this system considerable quantities of feed crops are produced, in some places by dry-farming methods.

Large areas of the normal or deep soils are suitable for the production of tilled crops under irrigation. The area of cropland probably will not increase much, however, until additional sources of water for irrigation are developed.

The use of commercial fertilizer seems to be more general in Dimmit County than in either Zavala or Maverick Counties, which adjoin it. The total quantities used, however, are relatively small as compared with those of other sections. Land used for growing onions, tomatoes, peppers, cantaloups, cabbage, onion plants, broccoli, strawberries, and citrus trees receives applications of fertilizer of various mixtures, including 11–48–0,[9] 16–20–0, and 5–15–5. The standard quantity applied to most crops is 200 pounds of 11–48–0 or its equivalent. The Federal census reports $12,976 worth of commercial fertilizer purchased in 1929, an average of $341.47 for each of the 38 farms reporting.

Labor, for which there is heavy seasonal demand for harvesting spinach, onions, other vegetables, and fruits, is entirely Mexican. The supply seems to be ample. In 1929 the hiring of labor was reported by 164 farms for wages totaling $311,928, or $1,902 per farm reporting.

Ranch lands are leased for 20 to 40 cents an acre, according to the quality of the range and the degree and condition of the improvements, such as fencing and watering facilities. The contracts ordinarily run from 1 to 3 years, and terms of payment are usually cash in advance. Practically all are farm-rental contracts for irrigated tracts and are generally for only one season, the landlord receiving one-fourth or one-fifth of the gross amount received by the renter for his crops except strawberries, payment being made when the crops are sold. Because of the high cash investments made by strawberry farmers, the landlord's share of this crop ranges from one-sixth to one-tenth. In farm-rental contracts the landlord furnishes only land and irrigation facilities.

SOIL SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or

[9] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

railroad cuts, are studied. Each excavation exposes a series of distinct soil layers, or horizons, called collectively the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail, and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil [10] and its content of lime and salts are determined by simple tests.[11] Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to the features that influence the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into mapping units, the three principal of which are (1) series, (2) type, and (3) phase. In places two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a map but must be mapped as (4) a complex.

The most important group is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from one type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics, the same natural drainage conditions, and the same range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Frio, Maverick, and Monteola are names of important series in Dimmit County.

Within a soil series are one or more types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Frio silt loam and Frio silty clay loam are soil types within the Frio series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within the type, differing from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and degree of accelerated erosion are frequently shown as phases. For example, within the normal range of relief for a soil type, some areas may be adapted to the use of machinery and the growth of cultivated crops, and others may not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation

[10] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality; higher values indicate alkalinity; and lower values indicate acidity.

[11] The total content of readily soluble salts is determined by the use of the electrolytic bridge. Phenolphthalein solution is used to detect a strong alkaline reaction.

throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such an instance the more sloping parts of the soil type may be segregated on the map as a sloping or a hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS

The soils of Dimmit County are typical of those occurring on a large section of the Rio Grande plain. Normally, the soils are deep and occupy smoothly undulating land; but some areas are gently rolling or rolling. On some of the steeper slopes, notably along the creek and river valleys, erosion is severe and areas of thin, little-developed, or immature soils occur.

Soil development has taken place in beds of calcareous and noncalcareous clays, shales, and sandstones, in ancient outwashed alluvial deposits of sandy, silty, and gravelly materials that are mostly calcareous, and in recent calcareous alluvium composed chiefly of silt and clay.

The deep soils of the area are well supplied with mineral nutrients and are relatively productive. Some of the fine-textured and dark-colored soils have considerable organic matter as well; but the sandier and lighter colored soils, although of better structure, as a rule are more or less deficient in organic matter.

The soils of Dimmit County are classified, on the basis of soil characteristics, into 13 series, 26 types, 6 phases, and 1 complex. The series names are as follows: Frio, Uvalde, Monteola, Maverick, Reagan, Zavala, Webb, Duval, Crystal, Miguel, Leona, Zapata, and Randall.

The Frio series includes calcareous gray or brownish-gray permeable alluvial soils composed largely of calcareous materials recently transported by streams originating in the Edwards Plateau. They are distinctly silty, contain a moderate to small amount of organic matter, but generally are highly productive. They are used to a large extent, for the production of spinach.

The Uvalde soils have light brownish-gray to dark-gray calcareous friable or crumbly surface soils with light-gray to yellow permeable subsoils. They occupy the high smooth benches of relatively ancient alluvium that in most places have a definite locational relationship to the Nueces River Valley. In places these benches are underlain by beds of gravel. Normally, soils of this series are well suited for the economical production of many crops under irrigation.

The Monteola soils have developed from calcareous shales and clays and are very dark brownish gray to almost black, fine-textured, and calcareous with comparatively smooth surfaces. Their yellow and gray subsoils are quite dense and are similar to subsoils of associated Maverick soils. Under irrigation these soils are very productive of certain crops.

The Maverick soils have developed from beds of calcareous clays and shales with interbedded sandstone in places. The surface soils are medium to light grayish brown or yellowish brown and calcareous, and the subsoils are yellow to light gray and dense to moderately friable. A large part of these soils occur in smooth areas, where they are moderately productive; but in some other places they are thin, immature, and not very productive.

The Reagan series include light to medium grayish-brown or brownish-gray crumbly or friable highly calcareous soils developed from ancient beds of calcareous outwashed clays, silts, sands, and gravels. Normally, these soils are deep and productive, but their total area is small.

Brown, grayish-brown, or dark-gray noncalcareous soils on the flood plains of small streams that drain areas of noncalcareous and sandy soils of the nearby uplands are placed in the Zavala series. Their total area is small, and very little of the land is cultivated. The soils, especially the medium-textured ones, are productive.

The Webb soils have brown or dull reddish-brown surface soils and fairly dense reddish-brown or red clay subsoils. The land is smooth. They are moderately productive and under optimum conditions of moisture produce good grain and forage crops.

Members of the Duval series have reddish-brown noncalcareous sandy surface soils with very friable red sandy clay or fine sandy clay loam subsoils. In Dimmit County these soils apparently have developed from parent materials that consist of weathered calcareous and noncalcareous sandstone beds of the Cook Mountain geological formation. The relief is undulating to gently rolling. These soils respond well to irrigation, are moderately productive, and well suited to many kinds of crops.

The Crystal soils are dull reddish-brown noncalcareous soils, developed from sandy materials of the Carrizo sand geological formation, which are mostly noncalcareous. The color is less red than that of the Duval soils, and the subsoils are less dense than those of the Webb series. When irrigated and fertilized they are quite productive of certain crops. Citrus fruits do especially well.

The Miguel soils have brown, grayish-brown, or reddish-brown noncalcareous surface soils, which, although friable, overlie at slight depths very tough and dense reddish-brown sandy clay subsoils. These soils occupy low smooth benchlike areas that generally adjoin creek valleys. In places they appear to contain soluble salts in the lower horizons. The parent materials are derived from valley deposits or interbedded shale and sandstone.

Very dark-brown, dark-gray, or black highly calcareous alluvial materials compose the Leona soils. Leona clay is the only soil type mapped in this series. It is not extensive and is not cultivated, probably because of poor drainage.

Very shallow gray calcareous soils developed over caliche are members of the Zapata series. These soils are inextensive and are not suitable for cultivation.

The Randall soils are dark gray, grayish brown, or black, are generally noncalcareous, and have a clay texture. They occupy bottoms of shallow depressions, such as sinkholes or dry lake beds, and are formed from fine soil materials washed from surrounding uplands.

In order to present their relationships to crops, the soils of Dimmit County are grouped on the basis of their suitability for use as follows: (1) Soils of high to moderate productive capacity, (2) soils of moderate to low productive capacity, and (3) soils unsuited for cultivated crops.

These soils are described in the following pages and their agricultural relationships are discussed in detail. Their distribution is shown graphically on the accompanying soil map, and a tabulation of their total acreage and proportionate extent is presented in table 7.

TABLE 7.—*Acreage and proportionate extent of the soils mapped in Dimmit County, Tex.*

Soil type	Acres	Percent	Soil type	Acres	Percent
Frio silt loam	11,712	1.4	Miguel fine sandy loam	19,904	2.3
Frio silty clay loam	17,600	2.1	Crystal fine sand	51,072	6.0
Uvalde silty clay loam	19,264	2.3	Zavala loamy fine sand	3,072	.4
Uvalde silty clay loam, shallow phase	2,112	.2	Duval loamy fine sand, colluvial phase	1,472	.2
Monteola clay loam	18,880	2.2	Duval fine sandy loam, shallow phase	7,168	.8
Maverick clay loam, smooth phase	54,016	6.4	Leona clay	9,984	1.2
Reagan loam	2,688	.3	Maverick clay	35,968	4.2
Reagan loam, colluvial phase	1,344	.2	Frio clay	10,880	1.3
Zavala fine sandy loam	10,752	1.3	Zapata loam	2,944	.3
Webb fine sandy loam	63,744	7.5	Zapata fine sandy loam	6,784	.8
Duval fine sandy loam	106,432	12.6	Reagan gravelly loam	1,728	.2
Maverick fine sandy loam	92,736	10.9	Webb gravelly fine sandy loam	3,456	.4
Crystal fine sandy loam	60,544	7.1	Crystal fine sandy loam, shallow phase	4,864	.6
Uvalde silty clay	8,640	1.0	Randall clay	896	.1
Monteola clay	20,672	2.4			
Maverick-Monteola clays	39,680	4.7			
Frio silty clay	23,360	2.8	Total	848,640	100.0
Maverick clay loam	120,512	14.2			
Frio clay loam	13,760	1.6			

SOILS OF HIGH TO MODERATE PRODUCTIVITY UNDER IRRIGATION

The soils of high to moderate productivity under irrigation are smooth and relatively deep. They occupy the overflow bottoms and uplands and are used extensively for the production of crops. Although the soils of this group are similar in productivity and certain profile characteristics, they differ widely in other respects.

Differences in texture, together with differences in relative elevation, slope, and internal structure present varying problems of irrigation, air drainage, and water drainage, which, in turn, greatly affect the suitability of the various members of the group for the production of specific crops.

These soils cover an area of 864.9 square miles, or about 65 percent of the area of the county.

Frio silt loam.—To a depth of about 10 inches the surface soil of Frio silt loam is gray or grayish-brown highly calcareous silt loam that dries to a light color, when it becomes flourlike and soft. The surface soil grades below into gray or brownish-gray highly calcareous silty clay loam, which at a depth of about 24 inches passes gradually into yellow silty clay loam many feet deep, the color becoming more pronounced with depth.

As indicated by the color, this soil, although well supplied with mineral plant nutrients, is low in organic matter. Under continuous cropping the addition of organic matter is beneficial.

A large part of this soil is in cultivation. It occupies the smooth bottom lands lying slightly higher than most of the other bottom land nearest the streams and slightly higher than bottom land farthest from the streams. In this position sedimentation of the coarser soil particles occurs.

Native vegetation consists of a fairly tall but not dense growth of mesquite, guajillo, and catclaw trees and other woody plants, together with a 5- to 10-percent grass cover of red grama and tall bunchgrasses. Native pasture yields about 20 cow-acre-days of grazing and browse.[12]

Under irrigation the soil is used chiefly for the production of spinach, grain sorghums, corn, and sown pasture consisting of oats in winter and Sudan grass for summer grazing. Some Rhodes grass is grown successfully. Spinach yields 250 to 500 bushels, grain sorghums 5 to 8 tons of dry fodder, and corn 20 to 30 bushels to the acre. Sown pasture under irrigation affords approximately 210 cow-acre-days of grazing. Indications are that flax, which has only recently been introduced into the region, will average about 20 bushels to the acre.

Frio silty clay loam.—The surface soil of Frio silty clay loam consists of light-brown or grayish-brown calcareous silty clay loam about 15 inches deep. This grades below into gray or grayish-brown calcareous silty clay or clay loam, which reaches to a depth of many feet without change except that the color is a light yellowish brown or grayish brown at a depth of 3 to 4 feet.

The surface of this soil is flat and more slowly drained than that of Frio silt loam, below which it lies in relative elevation. The soil is very similar to Frio silt loam, with the exception of its texture. It may contain slightly more organic matter, but still more of this material would probably be beneficial for many crops.

A fairly large area of this soil is mapped in the county, and a large part is cultivated. Owing to its lower position in the bottom, it is overflowed more frequently than Frio silt loam.

Native vegetation consists of a dense growth of medium-sized to large mesquite trees, brasil, granjeno, Mexican persimmon, live oak, lotebush, and whitebrush. There is also a 30- to 40-percent cover of buffalo grass, red grama, and other grasses, and in places considerable Bermuda grass has become established.

All the land under cultivation is irrigated. About the same crops are produced and about the same yields are obtained as on Frio silt loam, except when yields are reduced by overflow. The carrying capacity of the native pasture, on the other hand, is probably somewhat higher than the 20 cow-acre-days estimated for Frio silt loam.

Uvalde silty clay loam.—The surface soil of Uvalde silty clay loam consists of dark grayish-brown to grayish-brown highly calcareous

[12] The term "cow-acre-days" is used to express the carrying capacity or grazing value of pasture or range lands. It represents the number of days that 1 animal unit can be supported on 1 acre without injury to the pasture, or the product of the number of animal units to the acre multiplied by the number of days of grazing. For example, a soil that would provide grazing for 1 cow to the acre for 100 days, or for 2 cows for 50 days, would rate 100 cow-acre-days; and 1 cow to 4 acres for 100 days would equal 25 cow-acre-days. Estimates are for normal seasons only and do not include extremely dry years during which there is almost no grass. The animal unit is a means of measuring the feed requirements of livestock. It is the equivalent of a mature cow, steer, or horse, or 5 hogs, or 7 sheep or goats. On semiarid grazing land the ratio is more properly 3 to 5 mature sheep to each cow.

silty clay loam from 12 to 15 inches deep. When dry this breaks apart naturally into small angular clods or blocks that crush easily. Very finely divided aggregates or granules are abundant in the upper 5-inch layer, or grass-root zone. Below this the soil merges with light grayish-brown calcareous friable and crumbly silty clay loam or silty clay. At a depth of 24 to 30 inches is a horizon of calcium carbonate accumulation—a light gray or grayish-yellow silty clay loam containing lumps of calcium carbonate, which reaches to a depth of 85 inches or more. In places the soil is underlain by gravel beds. Drainage is slow to moderately free.

The land is flat to very gently undulating. Roots penetrate the soil mass to great depths. This uniform, deep, and permeable soil is developed from relatively ancient alluvium on moderately high smooth benches that have in most places a definite locational relationship to the Nueces River Valley. Most of the soil bodies are fairly large, totaling 30.1 square miles.

Native vegetation is characterized by a relatively open growth of medium-sized to large mesquite trees, guajillo, granjeno, brasil, numerous other wood shrubs, and a 15- to 20-percent grass cover of red grama, curly mesquite, three-awn, and fescue. Native pasture affords about 20 cow-acre-days.

A comparatively small part of the Uvalde silty clay loam in Dimmit County is cultivated, but much larger areas are under irrigation and cultivation in Zavala County. The chief areas in cultivation in Dimmit County are in the vicinities of Brundage and Valley Wells. It is a productive soil of excellent physical structure. Spinach, onions, tomatoes, peppers, carrots, cantaloups, cabbage, onion plants, eggplant, grain sorghums, corn, sown pasture consisting of oats in winter and Sudan grass in summer, and flax are grown. Under irrigation, spinach yields 200 to 500 bushels; onions, 150 to 400 bushels; tomatoes (fall green wraps), 4 tons; peppers, 400 bushels; carrots, 10 to 14 tons; cantaloups, 200 crates (36 to the crate); cabbage, about 10 tons; onion plants, 175 boxes of 6,000 plants; eggplant, 225 bushels; grain sorghums, 2 to 3 tons of dry fodder under dry farming or 6 tons under irrigation; corn, 12 to 15 bushels under dry farming or 20 to 30 bushels under irrigation; and flax, about 20 bushels of seed. Sown pastures, which are always irrigated, yield about 210 cow-acre-days of grazing.

Uvalde silty clay loam, shallow phase.—The surface soil of Uvalde silty clay loam, shallow phase, is light grayish-brown calcareous friable silty clay loam, 8 to 10 inches deep. When dry, the surface is quite gray. This grades into grayish- or yellowish-brown calcareous friable silty clay loam, which below a depth of about 20 inches passes into dull brownish-yellow or yellow crumbly calcareous silty clay containing considerable quantities of soft concretions of lime (calcium carbonate). This zone of lime accumulation reaches to a depth of several feet. The material below is about the same for many feet except that the lime accumulation gradually disappears. It rests on beds of rounded gravel in places.

The soil is developed from old alluvium of the Nueces Valley that now lies high above overflow. It occurs on the breaks or escarpments of these alluvial benches, which have moderate but eroded slopes. The soil differs from the normal Uvalde silty clay loam in that the

horizons above the zone of accumulation are thinner and there is less organic matter in the surface soil. Drainage is rapid. Only a small total area is mapped.

The soil supports a moderately thin growth of trees and shrubs and a 10- to 15-percent grass cover. Chief of the woody plants are mesquite, guajillo, paloverde, guayacan, lotebush, and brasil. The grasses are mostly red grama, three-awn, and curly mesquite. It is estimated that the vegetation furnishes approximately 18 cow-acre-days of grazing.

None of this soil is cultivated in Dimmit County. Some of it is cultivated in Zavala County in conjunction with typical Uvalde silty clay loam. It produces the same crops as does the typical soil, but yields are lower and irrigation and cultivation are more difficult.

Monteola clay loam.—The surface soil of Monteola clay loam is dark grayish-brown to almost black calcareous clay loam ranging in depth from 7 to 12 inches. If disturbed when dry, this material separates naturally into small, fine, angular clods that are not tightly bound together. The surface soil merges below with dark grayish-brown or dark-gray calcareous heavy compact clay, which when dry is hard and tough, separating into large or small slick-faced angular clods or blocks; it seems, however, to be fairly permeable. At a depth of about 30 inches this layer passes into grayish-yellow or yellowish-brown calcareous crumbly and friable clay containing lumps and concretions of lime, which continues to a depth of 4 to 6 feet. Below this the material is yellower and in places is mottled with gray. A sandy clay or dense clay occurs in places, and a few fragments of disintegrated sandstone, shale, or shell are present. In some places the parent material contains small fragments of crystalline gypsum.

In Dimmit County this soil is less extensive, occurs in smaller, narrower bodies, and is cultivated to a less extent than in Zavala or Maverick Counties. It is associated with Monteola clay and the finer textured soils of the Maverick series in the uplands. A fairly large area is mapped. The parent materials from which it has developed consist of calcareous and noncalcareous shales, sandstones, and clays. The surface is smooth with gently undulating slopes. Drainage is relatively slow.

Native vegetation consists of a 20- to 30-percent grass cover of red grama, three-awn, curly mesquite, tobosa, and fescue, together with a scattered to dense growth of woody plants and cacti composed chiefly of mesquite, huisachillo, blackbrush, catclaw, lotebush, brasil, pricklypear, tasajillo, and tallowweed (*Plantago* sp.). Native pasture affords somewhat more than 20 cow-acre-days of grazing.

Only a small acreage of this soil is used for tilled crops in Dimmit County, and most of this is irrigated. The soil is highly productive of such crops as onion plants, onions, peppers, cabbage, broccoli, eggplant, spinach, tomatoes, carrots, and especially staple crops such as grain sorghums, corn, sown pasture, and flax.

Under irrigation, acre yields are as follows: Onion plants, 200 boxes of 6,000 plants; dry onions, 300 bushels; peppers, 400 bushels; cabbage, 9 tons; broccoli, 200 crates; eggplant, 225 bushels; spinach, 250 bushels; tomatoes, 3 tons; carrots, 8 tons; grain sorghums, about 5 or 6 tons of dry fodder; corn, 25 bushels; sown pasture, 215 cow-

acre-days; and flax, 20 bushels of seed. When natural moisture conditions are favorable, heavy yields of staple crops are obtained by dry-farming methods. Such yields are obtained without the addition of commercial fertilizer. Apparently the soil is not sufficiently responsive to such fertilization to make its use profitable.

Maverick clay loam, smooth phase.—The surface soil of Maverick clay loam, smooth phase, is brown to dark grayish-brown calcareous clay loam 6 to 10 inches deep. This merges below with brown or grayish-brown compact and rather dense calcareous clay, which when dry separates naturally into small irregular hard clods. Below a depth of about 18 inches is yellowish-brown or grayish-yellow very compact and dense calcareous clay, which separates naturally on drying into large irregular clods. This layer contains a considerable number of soft and hard lumps of lime and represents the zone of calcium carbonate accumulation. The parent materials are similar to those underlying Monteola clay loam.

Most of this soil is smoothly undulating, but some is practically flat. The slopes range up to about 3 percent. Surface drainage is moderately rapid and free, whereas internal drainage is slow. Erosion is not severe except on the steeper slopes. A large area is mapped.

Native vegetation consists of medium-sized scattered to dense cover of mesquite trees, blackbrush, guayacan, brasil, and numerous other small shrubs and cacti, together with a 20- to 30-percent grass cover, mainly of red grama, three-awn, curly mesquite, tobosa, and sixweeks fescue. The carrying capacity is slightly more than 20 cow-acre-days.

A large part of this soil is cleared and under irrigation. About the same crops are produced and about the same yields are obtained as on Monteola clay loam.

Reagan loam.—To a depth of 7 to 10 inches, Reagan loam consists of grayish-brown highly calcareous loam, which is quite gray when perfectly dry. When disturbed the dry mass breaks easily into small, easily crushed, angular clods and granules. In places a few very small hard chalky particles are present. This surface soil grades below into a subsoil of light grayish- or yellowish-brown calcareous crumbly and friable clay loam or silty clay loam, which reaches downward to a depth of 3 to 6 feet and rests on a bed of hard caliche containing in places rounded gravel of chert, limestone, quartzite, and other igneous rocks. In places small lenses composed of thin, hard, platy caliche occur at a varying depth and in the lower part soft chalky lumps of lime are numerous.

The soil is smooth, gently undulating, or slightly sloping. It is developed from old alluvium of ancient outwash plains materials and occupies comparatively small scattered areas in the southwestern part of the county from the top of the Nueces-Rio Grande divide westward. Only about 4.2 square miles of this soil occur in Dimmit County.

The native vegetation is of rather open growth, largely of cenizo and guajillo shrubs and to a less extent of *Coldenia canescens*, cudweed, paloverde, lotebush, mesquite, catclaw, guayacan, and broomweed, and a 30- to 40-percent grass cover of red grama, three-awn,

and other grasses. Its grazing and browsing capacity is probably about 20 cow-acre-days.

None of the soil is cultivated in Dimmit County. Under irrigation it would be well suited to the production of crops and amenable to the management adapted to soils of the Frio and Uvalde series. Its chief disadvantage for cultivation lies in its elevation above sources of available supplies of irrigation water. Because of this, its small total area, and its isolation from cultivated land, it probably will not be cultivated in this county in the near future.

Reagan loam, colluvial phase.—The 8- to 10-inch surface layer of Reagan loam, colluvial phase, is brown or grayish-brown calcareous loam. This grades into grayish-brown crumbly compact calcareous loam, silty clay loam, or silty clay. Below a depth of 20 to 30 inches the material is brownish- or grayish-yellow silty clay loam or silty clay containing soft lumps of lime, which at a depth of 24 to 36 inches rests on beds of rounded gravel, similar to those underlying Reagan loam.

This soil consists of fine earth washed from ridges of Reagan gravelly loam and occurs as very narrow uniform gently sloping valleys and aprons extending short distances from the gravelly ridges. Some of the areas are cut by deep gullies. Only a very small area of this soil occurs in Dimmit County.

Native vegetation is moderately large and dense, with open areas in which grasses cover from 30 to 40 percent of the ground. Mesquite, guayacan, cudweed, paloverde, pricklypear, guajillo, and lotebush are the chief plants other than grasses, and red grama, three-awn, curly mesquite, and tobosa are the chief grasses.

None of the soil is cultivated in Dimmit County. It probably is moderately productive and similar to Reagan loam in its usefulness for crop production, but it is too far from existing transportation facilities to be used for any purpose other than grazing and browsing, of which it affords somewhat more than 20 cow-acre-days.

Zavala fine sandy loam.—The surface soil of Zavala fine sandy loam is brownish-gray noncalcareous fine sandy loam, generally 10 to 15 inches deep. In some places this layer is several feet deep, ranging from loose to compact; in other places the layers are of heavier soil materials, ranging in texture from fine sandy loam to clay loam and in color from dark gray to light gray.

This soil consists of alluvial material washed and transported from noncalcareous soils of the uplands. It occurs in the long narrow valleys of small creeks and short drainageways. The surface is apparently flat, and overflows occasionally cover the surface for short periods after heavy rains.

Comparatively large trees, a thick growth of shrubs, and a 10- to 15-percent grass cover make up the native vegetation. Mesquite, live oak, whitebrush, guayacan, brasil, Mexican persimmon, catclaw, and lotebush are the dominant woody plants, in about the order named. Elm and willow trees line some creek banks. The grasses are largely crowfoot, red grama, sacaton, and grassbur. Bermuda grass, which is not native, has encroached in places and made a heavy growth. The native cover affords about 16 cow-acre-days of browse and grazing for livestock.

A very small amount of the soil is cultivated in Dimmit County. It is fairly productive of the crops commonly grown, which include spinach, onions, cabbage, corn, grain sorghums, and sown pasture. Pecan trees, if irrigated, might grow well.

Webb fine sandy loam.—The surface soil of Webb fine sandy loam consists of medium- to dark-brown or reddish-brown noncalcareous fine sandy loam from 8 to 20 inches deep. The upper 4- to 6-inch layer is browner, whereas red is more distinct in the lower part of the surface soil. The upper part of the horizon is also less compact than the lower, but the entire section is friable and breaks into easily crushed clods when dry. The surface soil gradually merges with reddish-brown or brownish-red noncalcareous compact and relatively dense sandy clay, which, when dry, crumbles naturally into small, hard, slick-faced, angular clods or blocks. At a depth of 20 to 30 inches the subsoil grades into reddish-yellow calcareous fine sandy clay, which crumbles into relatively soft clods. This layer contains concretions and lumps of lime. This is a horizon of lime accumulation and rests on deeply weathered sandstone or sandstone and clay interbedded. On a few slopes the layer of calcium carbonate accumulation is only a few inches thick and sandstone lies near the surface, but normally the soil is smooth and deeply developed.

The soil occurs in many small and moderately large bodies scattered throughout the county in association with Crystal and Duval fine sandy loams, which it resembles in some respects. The surface is smooth to gently undulating, with slopes ranging up to 4 percent in some places. Drainage is moderately free, and where the land is sloping and unprotected erosion is severe. The total area is large.

Native vegetation consists largely of small trees and brush with a thin cover of grass. Blackbrush, mesquite, huisachillo, brasil, guayacan, granjeno, desert yaupon, amargosa, pricklypear, leatherweed, Mormon tea, and tallowweed are the dominant woody plants. The 25- to 35-percent grass cover is mostly red grama, three-awn, curly mesquite, and rescue grass. About 20 cow-acre-days of grazing is afforded by this vegetation.

A comparatively large part of this soil is in cultivation. Tomatoes, carrots (pl. 1), peppers, eggplant, onions, strawberries, and citrus fruits are produced under irrigation, and grain sorghums, chiefly hegari, and corn are grown under dry-farming methods. Under irrigation tomatoes yield from 1 to 4 tons an acre, carrots 8 to 16 tons, peppers 150 to 400 bushels, eggplant 100 to 250 bushels, onions 100 to 400 bushels, strawberries 200 to 600 crates of 24 pints, oranges about 200 field boxes, and grapefruit 250 to 300 boxes. Of the dry-farmed crops, grain sorghums produce 1 to 3 tons of dry fodder, and corn yields 5 to 25 bushels of grain.

Duval fine sandy loam.—The surface soil of Duval fine sandy loam is red or brownish-red noncalcareous very friable fine sandy loam 10 or 12 inches deep. This grades gradually into red very friable and permeable heavy fine sandy loam or fine sandy clay. Below a depth of 18 to 24 inches this layer passes gradually into yellowish-red fine sandy clay loam or fine sandy clay, which is also noncalcareous, very crumbly, friable, and permeable. At a depth of 2 or 3 feet the subsoil is reddish-yellow calcareous fine sandy loam or fine sandy clay containing a large amount of soft and hard calcium carbonate con-

cretions. In places this material lies 4 or 5 feet below the surface. This is the zone of calcium carbonate accumulation. It rests on deeply weathered disintegrated sandstone or solid sandstone, which in most places is very calcareous.

The relief is uniformly undulating to gently rolling, with slopes of 1 to 5 percent, and drainage is free. Erosion is not severe, but in places drains cut deep steep-sided channels. Open bare fields are subject to soil blowing. With the exception of a few small isolated bodies, the soil occupies two large bodies lying north and south of the Nueces River Valley in the eastern part of the county. This is one of the most extensive soils in the county.

Native vegetation consists of a scattered growth of large trees and brush dominated by mesquite trees, brasil, Mexican persimmon, como, leatherweed, lotebush, coyotillo, broomweed, pricklypear, hoary pea, guayacan, and crotonweed. Grasses, consisting chiefly of three-awn, crowfoot, red grama, and grassbur, cover 20 to 25 percent of the surface and afford approximately 20 cow-acre-days of grazing.

Owing to the great depth to artesian water, not much of this soil is in cultivation. Relatively small areas along the eastern county line are dry-farmed intermittently, and these represent the extreme western limit of dry farming in this part of the State. Cotton, grain sorghums, sorgo, corn, and other feed crops are grown, and yields are fair except in extremely dry seasons. Farther east in Frio County, where the precipitation is heavier, this soil is considered one of the best soils for crops, and in addition to the crops mentioned, produces peanuts, watermelons, and citrus fruits. One citrus orchard is planted on this soil in Dimmit County, near Carrizo Springs. Under irrigation the soil responds well to fertilization, and excellent yields are obtained. It is suitable for production of about the same crops as are grown on Webb fine sandy loam. Under similar conditions yields are about the same on the two soils, although local reports indicate that yields of some crops are somewhat lower on the Duval soil than on the Webb.

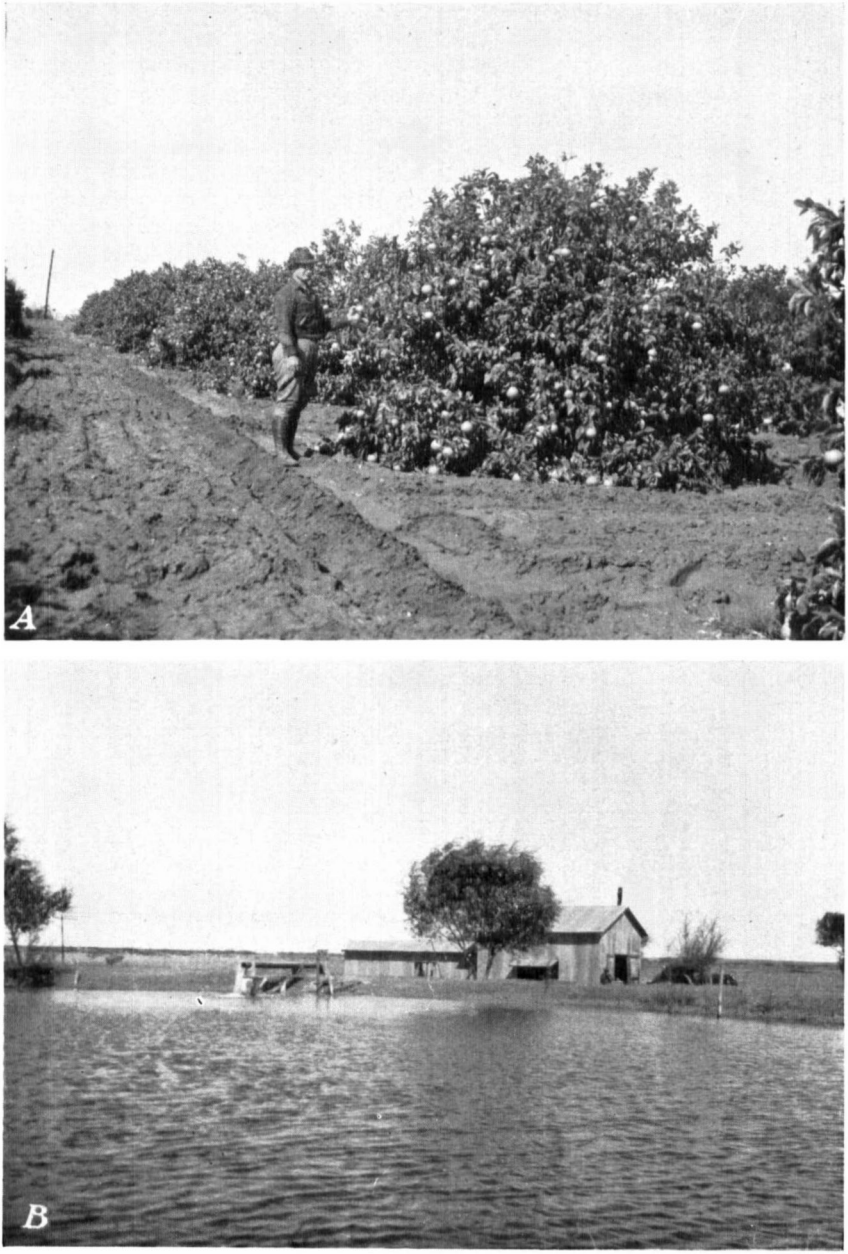
Maverick fine sandy loam.—The 10- or 12-inch surface soil of Maverick fine sandy loam is grayish-brown or yellowish-brown calcareous heavy fine sandy loam, which separates into easily crushed clods when dry. This grades very gradually into brownish-yellow or brownish-gray calcareous fine sandy clay loam, which at a depth of 20 to 30 inches merges with light-yellow or gray friable calcareous fine sandy clay loam or fine sandy clay containing lumps of soft calcium carbonate. This is the zone of calcium carbonate accumulation. Soft calcareous sandstone lies from 30 to 60 inches below the surface.

The relief is undulating to gently rolling, with slopes ranging generally from 1 to 3 percent. Drainage is relatively rapid, both externally and internally. The unprotected soil erodes slightly but less than Maverick clay loam.

This soil occurs in some moderately large and many small bodies throughout the county, on hilltops, on slopes of hills, and, in a few places, at the base of hills. The total area is large.

The native vegetation consists of moderately large mesquite trees, brasil, granjeno, huisachillo, lotebush, guajillo, *Coldenia canescens*, cudweed, blackbrush, pricklypear, and tasajillo. The 25- to 30-percent grass cover consists of red grama, three-awn, pappusgrass, and six-

Winter carrot harvest on Webb fine sandy loam. (Courtesy of Texas Agricultural Experiment Station.)



A, Eight-year-old Marsh Seedless grapefruit trees on Crystal fine sandy loam. *B*, Reservoir and pump showing how well water is collected for distribution in fields.

weeks fescue. Somewhat more than 20 cow-acre-days of grazing is afforded by the vegetation on this type.

A large part of the soil is cultivated, and its yields are slightly higher than those obtained on Crystal fine sandy loam and slightly less than those obtained on Webb and Duval fine sandy loams. Spinach, onions, peppers, carrots, onion plants, and other winter vegetables are produced under irrigation; and corn and other forage crops, such as grain sorghums, are grown under dry farming. Some citrus fruits are also grown. Spinach normally yields 225 bushels, onions 200 bushels, and irrigated corn 26 bushels to the acre. Dry-farmed corn is said to yield about 13 bushels, and grain sorghums 3 tons of dry fodder. Sorghum produces 5 or 6 tons of dry fodder under irrigation. The use of commercial fertilizer, the growing of green-manure crops, and, in some instances, terracing are reported to increase materially the yields of irrigated crops.

Crystal fine sandy loam.—The surface soil of Crystal fine sandy loam is reddish-brown noncalcareous fine sandy loam ranging from 10 to 16 inches in depth. This material is loose and friable but has a tendency to harden or bake slightly on drying. The soil contains, in places, appreciable amounts of medium sand, which is noticeable after heavy rains. In some places a thin brown to light-gray layer, about one-fourth of an inch or more thick, composed largely of medium sand grains, covers the surface of the undisturbed virgin soil. Field tests show the surface soil to be neutral to slightly acid in reaction. The subsoil is reddish-brown or brownish-red noncalcareous friable fine sandy clay loam. The reddish color gradually fades with depth, and at a depth of 24 to 30 inches the material is yellowish-red friable fine sandy clay loam, faintly calcareous in places. At 30 to 40 inches this material grades into a light reddish-yellow, friable, highly calcareous sandy clay. This zone of lime accumulation contains numerous lumps of lime. At a depth of 40 to 60 inches this material rests on soft coarse-grained sandstone, which generally is not calcareous, although slightly so in some places. This soil resembles the Webb and Duval fine sandy loams, but its subsoil is less dense than that of the Webb and less red than that of the Duval.

Many bodies of this soil are associated with bodies of Crystal fine sand, Maverick fine sandy loam, and Webb fine sandy loam in the western half of the county. The surface is undulating to gently rolling, with slopes from 1 to 5 percent. In general, the surface is more sloping than that of Webb fine sandy loam, and the elevation is higher. Both internal and external drainage are rapid. Soil washing is active on the steeper slopes. The total area of this soil is fairly large.

The native vegetation consists of a large but scattered growth of woody plants and a grass cover of about 40 percent. The former is composed of mesquite trees, brasil, granjeno, hog-plum, lantana, leatherweed, and coyotillo; and the grasses are largely three-awn, grassbur, crowfoot, hairy grama, and rescue grass. The soil is distinguished in spring by the number of flowering forbs, such as verbena, poppy-mallow, winecup, gaillardia, and evening-primrose, that it supports. The carrying capacity of the vegetation is estimated at slightly more than 20 cow-acre-days.

A large part of the soil is cultivated and irrigated in the vicinity of Carrizo Springs. When irrigated and fertilized, it is moderately

to highly productive for winter vegetables, fruits, berries, and other crops. Where air drainage provides protection from frost, it is especially suitable for such crops as strawberries, citrus fruits (pl. 2, *A*), grapes, dewberries, blackberries, melons, tomatoes, and sweetpotatoes. Strawberries yield about 500 crates to the acre under proper management, oranges 225 field boxes, grapefruit 300 boxes, cantaloups 150 to 300 crates, and tomatoes 1 to 4 tons. Good response is reported from commercial fertilizers and green-manure crops on this soil. In some places the steeper slopes should be protected from erosion by terracing. This practice also conserves water by decreasing run-off.

Uvalde silty clay.—The surface soil of Uvalde silty clay is dark brownish-gray calcareous silty clay about 12 inches deep, which appears dark grayish brown when moist. This material dries to a hard mass, but when disturbed it separates into small and fine clods. By careful cultivation when moisture conditions are favorable the material can be worked into a rather friable condition. The surface soil grades into dark-gray or brownish-gray calcareous clay that is dense but fairly crumbly and permeable. At a depth of about 30 inches this passes into yellow or grayish-yellow calcareous clay or silty clay containing lumps of lime—the layer of lime accumulation. Below a depth of 4 or 5 feet this is underlain by thick beds of yellow or gray calcareous silty clay or clay, which, in places, rest on thick beds of gravel.

The surface of this soil is almost flat, although the slope is sufficient for irrigation. It occupies areas on old alluvial benches made up largely of calcareous materials washed from soils on the Edwards Plateau and deposited long ago along the Nueces Valley. Both surface drainage and underdrainage are slow, but water does not stand long on the surface except in small spots. There is little or no erosion. The total amount of this soil in the county is about 13.5 square miles.

Native vegetation is composed of a dense growth of medium-sized trees, shrubs, and cacti, with a 20- to 30-percent grass cover. The woody plants and cacti are mainly mesquite, guajillo, guayacan, lotebush, catclaw, pricklypear, and tasajillo. The principal grasses are curly mesquite, red grama, and three-awn. The estimated carrying capacity for livestock is 20 cow-acre-days.

A smaller proportion of this soil is cultivated in this county than in Zavala County. Because of its fine texture and slow drainage, it is not so well suited to the production of winter vegetables as are coarser textured soils. Some crops, such as onion plants, peppers, cabbage, and broccoli, yield well on this soil. Under irrigation feed crops, such as corn, grain sorghums, oats, and Sudan grass for pasture, are also well suited. Flax might do well on this soil. Root crops, such as onions, carrots, and beets, produce good yields, but many misshaped roots lower the quality. Spinach also grows well, except that many lower leaves turn yellow, and diseases, such as blue mold, which is induced by dampness, are prevalent. Onion plants are reported to yield about 200 boxes of 6,000 plants to the acre, peppers 400 bushels, cabbage 9 tons, broccoli 175 crates, corn from 5 to 30 bushels, grain sorghums 1 to 6 tons of dry fodder, dry onions 300 bushels, carrots 7 tons, and spinach 250 bushels. Oats and Sudan grass for pasture have a carrying capacity of about 200 cow-acre-days.

Systematic dry farming is not considered generally feasible on this soil.

Monteola clay.—The surface soil of Monteola clay is very dark grayish-brown to almost black calcareous clay. This material is very plastic and tenacious when wet, but on drying it separates naturally into coarse granules and fine irregular clods. At a depth of 10 to 30 inches this layer grades into brown, very dark-brown, or grayish-brown heavy rather tough calcareous clay, which at a depth of 20 to 40 inches gives way gradually to yellow, grayish-yellow, or gray calcareous clay. This layer is more crumbly and less compact or dense than the layer above and contains much calcium carbonate in soft white lumps often associated with considerable quantities of crystalline gypsum. It is underlain at a depth of 3 to 6 feet by calcareous clay or shales.

The surface of this soil is very smooth and apparently flat to very gently sloping. A microrelief of round very shallow depressions a few feet in diameter, called hog wallows, characterizes the virgin soil. In such depressions the soil is generally much darker and deeper and less calcareous than in the intervening slightly higher spots. Surface drainage for the most part is moderately free, but internal drainage is slow. Fairly large areas are scattered over the northern and western parts of the county.

A moderate to dense growth of trees, shrubs, and cacti and a 40- to 50-percent grass cover make up the native vegetation. Some areas have few trees or shrubs. In order of importance the plants are chiefly mesquite, pricklypear, lotebush, guayacan, tasajillo, huisachillo, and amargosa, and the grasses are chiefly curly mesquite, tobosa, and red grama. The estimated carrying capacity of the typical vegetation is 20 cow-acre-days. Like most soils with fine-textured surface soils and dense subsoils, this provides an abundance of grazing when moisture conditions are optimum, but it dries out quickly in periods of drought, drastically reducing the value of the grazing.

Several large farms are situated on this soil. They are all irrigated and produce onion plants, dry onions, peppers, egg plant, cabbage, broccoli, tomatoes, and some spinach. Staple crops, such as corn, grain sorghums, sown pasture, and flax, yield well under irrigation. Occasionally good yields are obtained also by dry-farming methods when natural moisture is optimum, but profitable yields cannot be expected year after year. Yields are the same or slightly less than those produced on Uvalde silty clay.

Maverick-Monteola clays.—This soil complex includes areas of Monteola clay and Maverick clay too small and too closely associated for separation on a small scale map. In places the profile is exactly like that of Monteola clay or of Maverick clay; in others it represents a transition between the two, especially in color. The transitional soil has a 6- or 7-inch surface soil of dark grayish-brown to grayish-brown calcareous clay that separates to fine angular clods when dry. In some places numerous small slick-coated smooth iron concretions appear on the surface. The surface soil grades into dark grayish-brown dense calcareous clay that is rather tough and compact and breaks into large angular clods when disturbed. At a depth of 20 to 24 inches this passes into a transitional layer of yellowish-brown calcareous clay, which gradually changes at a depth of 30 to 36 inches

into yellow or grayish-yellow calcareous clay. This layer of lime accumulation contains large quantities of finely divided gypsum and some soft lumps of lime. It rests on gray and yellow beds of calcareous clay or shale. The complex includes a larger total area of Monteola clay and of the transitional soil described above than of Maverick clay. In the Soil Surveys of Maverick and Zavala Counties (*14*, *15*), this mapping unit was indicated as Monteola clay.

The surface ranges from apparently flat to very gently sloping. Drainage is moderately free, and the soil erodes readily on the sloping areas. This complex occupies large and small areas in association with the Monteola and Maverick soils scattered widely throughout the county.

Native vegetation ranges from a thick growth of medium-sized trees and shrubs to grass, with practically no woody vegetation. Woody plants are practically the same as those on Monteola clay, although possibly not so large. The grasses also are the same and supply 30 to 45 percent of the cover. In a few places, chiefly in the south-central part of the county, small areas are covered with saladillo, which is considered salt tolerant. These areas are indicated on the map by an appropriate symbol. The carrying capacity for livestock is about the same as that of Monteola clay.

Some of this complex is in cultivation and under irrigation. About the same crops are grown, and similar or not quite so large yields are obtained as on Monteola clay and Uvalde silty clay.

Frio silty clay.—The surface soil of Frio silty clay is gray highly calcareous crumbly silty clay from 8 to 20 inches deep. This grades gradually into dark-gray or brownish-gray calcareous silty clay, which reaches downward for many feet without change, except for a slightly lighter color and a more pronounced yellow with increase in depth.

This alluvium has been transported largely from the Edwards Plateau. Its flat smooth surface and its position on the low bottom lands subject it to frequent overflows.

This soil supports a growth of large trees and shrubs, as well as an excellent cover of nutritious grasses, probably as much as 50 percent. Chief woody growth is mesquite, catclaw, brasil, huisachillo, guayacan, Mexican persimmon, lotebush, whitebrush, snake apple, retama, and live oak. Other common plants are sneezeweed, horsemint, and bur-clover. Buffalo grass, curly mesquite, and Bermuda grass make up most of the grass cover. These furnish excellent grazing and browse for cattle because of the supply of moisture provided by overflows. The carrying capacity is estimated at 25 cow-acre-days.

Only a few narrow bands of this soil are in cultivation, in connection with other higher lying Frio soils. In such areas crops are the same as those on Frio silt loam and Frio silty clay loam. Yields are high when not cut by overflow damage. Should overflow of the river be controlled, much of this soil would be highly suitable for many cultivated crops under irrigation.

SOILS OF MODERATE TO LOW PRODUCTIVITY UNDER IRRIGATION

The soils of this group are deep, smooth, and extensive enough to invite cultivation, but they have a moderate to low productivity under irrigation and are adapted to only a few crops that may be produced economically. Under special conditions some of these soils

are cropped successfully; but when all the crops of the region are considered the general productive capacity of these soils is lower than that of the first group.

These soils cover a total area of 427.8 square miles, or about 32 percent of the area of the county.

Maverick clay loam.—The surface soil of Maverick clay loam is grayish-brown or yellowish-brown calcareous clay loam ranging from 4 to 10 inches in depth. On drying it crumbles into fine grains and small irregular clods. In places small round pebbles are strewn over the surface. The soil grades, through a short transition, into grayish-brown, brownish-yellow, or yellowish-gray compact and tough calcareous clay or sandy clay, which when dry is broken readily into moderately small, slick-faced, angular clods or blocks. In places this horizon is very thin or absent altogether. At a depth of 12 to 20 inches it changes to yellow or grayish-yellow calcareous clay that contains much lime in white lumps and breaks into large clods. From 3 to 8 feet below the surface this material merges with disintegrated platy sandstone, shale, or yellow and gray clay materials, all of which are calcareous. Beds of shell are common in the parent material also.

This is the most extensive soil of the county. It occurs on the upper and lower slopes and narrow divides throughout the county in association with other Maverick soils. The slope ranges from 2 to 5 percent. Although surface drainage is free and rapid, internal drainage is slow. On some of the steeper positions erosion is severe.

The native vegetation is composed of a moderately open growth of woody plants; cacti, mainly pricklypear and tasajillo; and grasses. The woody plants consist mainly of mesquite, guajillo, paloverde, guayacan, lotebush, and brasil. Grasses, chiefly red grama, threeawn, and some curly mesquite, cover from 10 to 15 percent of the ground. The estimated carrying capacity is somewhat less than 20-cow-acre days.

Maverick clay loam is cultivated to some extent in Dimmit County, especially in the vicinities of Asherton and Catarina, where the land is smoother and less sloping. Many areas formerly cropped are now abandoned. The chief crops produced, all under cultivation, are onions, onion plants, peppers, tomatoes, grain sorghums, and sown pastures. Onions are reported to yield from 175 to 300 bushels to the acre, onion plants 125 to 200 boxes of 6,000 plants, peppers 300 to 400 bushels, tomatoes, ½ to 2 tons, grain sorghums 1 to 6 tons of dry fodder, and sown pasture 125 to 200 cow-acre-days. Some small acreages of flax on this soil in Zavala County are reported to yield about 20 bushels to the acre.

Frio clay loam.—Frio clay loam, to an average depth of about 10 inches, is brown or grayish-yellow clay loam that is calcareous in most places. This is underlain to a depth of 60 inches or more by interbedded layers of grayish-brown, yellow, and dark-gray clay and loam, some of which is calcareous.

This is an alluvial soil of the first bottoms along the large creeks in the south-central part of the county that drain mostly areas of the Maverick soils.

The soil is densely covered with medium-sized trees and brush together with a 20- to 30-percent grass cover. Chief among the woody plants are mesquite, whitebrush, brasil, lotebush, huisachillo. guayacan, tasajillo, pricklypear, leatherweed, and live oak. Buffalo grass, curly mesquite, and red grama are the principal grasses. The carrying capacity is estimated at slightly less than 20 cow-acre-days.

Very little of the soil has been cleared for cultivation, and much of this has been abandoned. The same crops are produced as on Maverick clay loam. Yields are approximately the same as on that soil, or somewhat less.

Miguel fine sandy loam.—The surface soil of Miguel fine sandy loam, having a depth of 8 to 12 inches, is medium- to light-brown noncalcareous fine sandy loam. When dry this material is rather hard and compact. It rests abruptly on brown to reddish-brown dense compact noncalcareous clay or sandy clay that is claypan in character and when dry breaks into small and large angular clods. Below a depth of 18 to 24 inches this grades into yellowish-brown calcareous clay containing soft lumps and hard concretions of lime. The material in this layer is considerably less tough and much more crumbly than that in the overlying layer. It reaches to a depth of about 60 inches.

This soil is developed on low, smooth, benchlike areas, generally adjoining creek valleys, from material that may be derived from valley deposits or from interbedded shale and sandstone. The largest of these border either side of El Moro Creek Valley near Asherton. In places soluble salts apparently are accumulated in the lower horizons. The surface is apparently flat to very gently sloping, and both external and internal drainage are slow. Sheet erosion is fairly rapid in bodies bare of vegetation.

Medium-sized trees, shrubs, and cacti grow thickly on this type, but grasses—mostly pappusgrass—cover only 5 to 10 percent of the ground. The main woody plants are mesquite trees, lotebush, granjeno, brasil, whitebrush, guayacan, and pricklypear.

Only a small part of this soil is now in cultivation, as many previously cultivated areas have been abandoned. The subsoil is apparently too tight to afford moisture conditions favorable to plant growth in very dry seasons. Onions, onion plants, and feeds are the principal crops. Fair yields of shallow-rooted crops may be obtained when irrigation water is supplied frequently. Strawberries might prove successful, but they probably could not be made to survive the summer, owing to the droughty nature of the soil.

Crystal fine sand.—The surface soil of Crystal fine sand ranges from 10 to 20 inches in depth. It is light-brown, yellowish-brown, or grayish-brown loose fine sand with a slightly reddish hue. In places it is slightly loamy, and it grades with depth into dull-yellow or slightly reddish-yellow slightly loamy fine sand. At a depth of 3 to 8 feet this layer grades into mottled red, yellow, and gray clay that is slightly calcareous in many places. The thickness of this material in most places ranges from a few inches to 1 or 2 feet. Below this lies soft generally noncalcareous sandstone. In places the sandy clay layer is absent, and the sand rests directly on the sandstone. The soil is not calcareous and in the main shows a slightly acid reaction in field tests.

The soil occurs in a north-south band across the west side of the county on high undulating areas with slopes of 1 to 4 percent. A few small isolated bodies are in the vicinity of Catarina and Winter Haven. Drainage is free, both from the surface and internally. Erosion is not a problem on this soil, but soil blowing occurs in some unprotected areas. A fairly large area is mapped.

The soil supports a scattered growth of relatively large mesquite trees and a few shrubs, mainly guayacan, granjeno, como, and beargrass. The type is conspicuous for the number of forbs, among which are many spring flowering plants, chiefly hoary pea, wild verbena, tallowweed (*Plantago* sp.), pricklepoppy, horsemint, gaillardia, and sheep sorrel. Grasses occupy from 30 to 40 percent of the surface and consist largely of tall coarse bunchgrasses, such as crowfoot, broomsedge, little bluestem, lovegrass (*Eragrostis secundiflora*), and sandgrass, and small bunchgrasses, such as hairy grama and rescue grass. This vegetation is considered excellent for livestock grazing, as it holds up well during droughts, although it is best in spring and early summer. The soil is used largely for pasturing cows and calves. The carrying capacity is estimated at 20 cow-acre-days.

Little of the total acreage within the county is cropped, and most of the land cultivated is in citrus fruit trees. Citrus fruits and grapes produce good yields of high quality if the land is fertilized heavily. Irrigation farming is limited by the inadequate supply of suitable water obtainable at slight depths. Possibly berries, tomatoes, melons, and similar crops could be grown with fair success if water were available.

Zavala loamy fine sand.—The surface soil of Zavala loamy fine sand is grayish-brown or brownish-gray noncalcareous loamy fine sand 12 or 15 inches deep. It is rather compact in some places and loose in others. Below, it grades into gray or brownish-gray loamy fine sand that is less compact and less dark than the surface soil. This material reaches to a depth of 5 feet or more.

Zavala loamy fine sand is a deep soil developed from alluvial materials that were transported by water from eroded surfaces of noncalcareous sandy upland soils, principally of the Crystal series. It occurs in the narrow bottoms of a few of the larger creeks in the vicinity of Carrizo Springs, where it is subject to occasional overflow. The total area is not large.

The native vegetation is composed of scattered rather large trees and shrubs with coarse grasses, forbs, and weeds. These consist of mesquite, willow, whitebrush, Mexican persimmon, hackberry, brasil, granjeno, lotebush, pricklypear, sunflower, three-awn, crowfoot, grassbur, broomsedge, and speargrass. The estimated carrying capacity for livestock is slightly more than 15 cow-acre-days.

None of this soil is cultivated. It could possibly be used for the production of vegetable crops, especially of the vine type, that need no protection from frost. Pecans would probably do well on this soil.

Duval loamy fine sand, colluvial phase.—Duval loamy fine sand, colluvial phase, consists of a 3- or 4-inch layer of grayish-brown loose noncalcareous loamy fine sand underlain by darker grayish-brown noncalcareous loamy fine sand with a reddish hue. At a

depth of about 30 inches this grades into yellowish-brown noncalcareous loamy fine sand, which passes into yellow noncalcareous loamy fine sand at a depth of about 40 inches. No layer of lime accumulation occurs within 50 inches of the surface.

Only a small area of this soil is mapped. This is mainly in the southeastern part of the county, bordering some narrow creek valleys that lie in large areas of Duval fine sandy loam. As the soil is not subject to overflow, it may have been placed by sedimentation or colluvial wash from local slopes, or it may have developed by the weathering of sandstone in place. The soil is similar to Crystal fine sand, except for its topographic position.

Native vegetation and livestock-carrying capacity are about the same as for Zavala loamy fine sand.

The crops grown on Crystal fine sand cannot be recommended for this soil because of its low position and lack of air drainage. About the same crops as those mentioned for Zavala loamy fine sand would be suited. None of the soil is now in cultivation, and the likelihood of its cultivation is remote, owing to isolation from other farming areas.

Duval fine sandy loam, shallow phase.—To a depth of 2 to 8 inches Duval fine sandy loam, shallow phase, consists of reddish-brown or brownish-red noncalcareous fine sandy loam, which grades into red or reddish-brown crumbly noncalcareous fine sandy clay loam. At a depth of 12 to 15 inches this material grades into reddish-brown fine sandy clay loam containing many lumps and concretions of calcium carbonate, and at 15 to 20 inches this layer rests on sandstone that generally is calcareous. The thickness of these layers varies greatly, and frequently one or more of them is entirely absent. Because of the slope and general scarcity of vegetation on this soil, erosion is active. This shallow phase, occurring in small areas on the upper slopes of hills, is closely associated with the typical soil. In places narrow bands are indicated by rock-outcrop symbols.

The native vegetation is stunted and usually scattered, but in a few places it is rather dense. It consists of blackbrush, Texas paloverde, lotebush, soapbush or guayacan, Mormon tea, mesquite, bluewood or brasil, crotonweed, broomweed, tasajillo, pricklypear, and a 5- to 10-percent grass cover of three-awn, red grama, field sandbur or grassbur, and crowfoot grasses. The carrying capacity for livestock is slightly more than 15 cow-acre-days.

An included variation that occurs in and near Carrizo Springs has a 2- to 15-inch layer of reddish-brown noncalcareous fine sandy loam surface soil, resting on hard white caliche that resembles limestone. Scattered on the surface are usually a few small hard caliche fragments. The growth of trees and shrubs on this inclusion is larger and more dense than that described above, and, in addition to the plants mentioned, guajillo, cenizo, and leatherweed are prominent. Livestock carrying capacity is about 20 cow-acre-days.

Leona clay.—Leona clay has a very dark gray highly calcareous clay surface soil about 12 inches deep, which appears nearly black when the soil is moist. When thoroughly dry it separates naturally into fine angular blocks and grains to a depth of 2 inches and cracks very deeply. Below the surface soil is lighter gray calcareous clay that continues to a depth of many feet. This material is very dense and

when dry breaks into large angular clods; when wet, the soil is very plastic. The proportion of silt in Leona clay is smaller than that in Frio silty clay.

Leona clay is alluvial soil occupying very low depressed sections of tributary valleys near their junction with the Nueces Valley. These places, known locally as bayoucas, are threaded by many intersecting channels, and the surface is rather uneven, owing to washing overflow currents. Water often stands in these bayoucas after overflows for extended periods. Underdrainage is slow.

Native vegetation consists of scattered large mesquite, retama, live oak, elm, ash, and hackberry trees, dense growths of sneezeweed and aster (*Aster spinosus*), and a 5- to 10-percent cover of buffalo grass. The estimated carrying capacity for livestock is only 15 cow-acre-days.

The slow drainage and tight consistence of this soil make it less suitable for cultivation than some other soils, and none is cultivated in Dimmit County.

Maverick clay.—The surface soil of Maverick clay is grayish-brown or grayish-yellow heavy calcareous clay that breaks into small irregular blocks and grains when dry. It ranges from 3 to 12 inches in depth. In many places small pebbles or fragments of shale are present. This grades below into grayish-brown or yellowish-brown tough calcareous clay which changes at a depth of about 40 inches into yellowish-gray calcareous clay containing lumps of lime. At greater depth this material becomes mottled gray and yellow and contains large quantities of crystalline gypsum. A bed of shale lies from 4 to 6 feet below the surface.

This land is smooth and nearly flat to gently sloping, although it is subject to both gully and sheet erosion in places. Internal drainage is slow. Fairly large areas occur in the south-central part of the county.

The native vegetation consists of a thinly scattered growth of small mesquite trees, guayacan, and amargosa, a more dense growth of pricklypear, saladillo, and broomweed, and a 5- to 15-percent grass cover of curly mesquite and tobosa. The estimated carrying capacity for livestock is 15 cow-acre-days.

This soil is difficult to work, takes water slowly, and is not highly productive. Little of it is now in cultivation.

Frio clay.—To a depth of 9 or 10 inches the surface soil of Frio clay is grayish-brown or grayish-yellow clay that is calcareous in places. This gradually gives way to gray or grayish-yellow calcareous clay.

Frio clay consists of creek-bottom alluvium and occurs in the valleys of a few of the larger streams in the south-central part of the county that drain large areas of Maverick soils. The soil resembles Frio silty clay but differs from it in that it has a lower silt content, greater toughness and cloddiness, and a propensity to crack deeply. It occupies areas, locally called bayoucas, that are related to the Neuces Valley proper in the same way as are similar areas occupied by Leona clay.

Medium-sized to large trees and shrubs—chiefly mesquite, retama, elm, hackberry, and guayacan—and a 10- to 15-percent cover of grasses, chiefly buffalo grass and tobosa, make up the native vegeta-

tion. In addition, sneezewood and *Aster spinosus* are prevalent. The estimated carrying capacity for livestock is about 15 cow-acre-days.

None of this soil is in cultivation. As it is developed from relatively poor material and the native growth is not large, it is probably not very productive. Some feed crops might succeed under irrigation or after flooding from natural overflow.

SOILS UNSUITED FOR CULTIVATED CROPS

The remaining soils of the county fall into the third group—soils unsuited for cultivated crops. These are Zapata loam; Zapata fine sandy loam; Reagan gravelly loam; Webb gravelly fine sandy loam; Crystal fine sandy loam, shallow phase; and Randall clay. Although nonarable, some of these soils provide valuable grazing and browse for livestock. The total area of the soils of this group is only 32.3 square miles, or about 3 percent of the area of the county.

Zapata loam.—The surface soil of Zapata loam is grayish-brown or brownish-gray calcareous loam ranging from light to dark, and containing small fragments of hard caliche and in places some small rounded pebbles. At a depth of 4 to 15 inches this rests on beds of caliche and gravel from 1 foot to 30 or more feet thick. As a rule caliche caps the beds of gravel, but in places gravel is cemented in the caliche. The surface of the caliche, just under the soil layer, is very hard and smoothly rippled on the upper side as though it were water-worn. Under this hard platy or stratified upper crust, which is from ½ foot to 2 feet in thickness, the caliche is massive in structure and much softer.

This soil is developed in ancient outwash alluvium in smoothly undulating bodies on ridge tops in a number of places in the southwestern part of the county. These bodies represent isolated remnants of the old gravel plain that parallels the Rio Grande Valley. Their total area is not large.

An open growth of scattered small trees and shrubs, together with a 10- to 15-percent grass cover, makes up the native vegetation. The former consist of paloverde, cenizo, *Coldenia canescens*, creosotebush, mesquite, guajillo, and blackbrush, and the grasses are chiefly three-awn and red grama. In addition, cudweed, broomweed, and some tasajillo are common. This vegetation furnishes about 20 cow-acre-days of grazing.

Zapata fine sandy loam.—The surface soil of Zapata fine sandy loam is grayish-brown or grayish-yellow calcareous fine sandy loam from 2 to 8 inches deep. This grades into brownish- or grayish-yellow calcareous fine sandy loam containing many fragments of sandstone and in places a few fragments of hard platy caliche. In some places there is a considerable accumulation of calcium carbonate. This layer rests, at a depth of 6 to 20 inches, on beds of thin-layered, calcareous, gray sandstone, which in places is coated and interbedded with thin white layers of hard caliche. Here and there massive sandstone is interbedded with the platy sandstone and caliche.

The relief is gently undulating to rolling, with slopes ranging from 1 to 5 percent. Erosion is relatively rapid on the steeper slopes. The soil is associated with Maverick fine sandy loam. Its total area is not large.

The native vegetation consists of a moderately dense to rather open growth of small- to medium-sized trees and shrubs, together with a 10- to 15-percent grass cover. The former consist of mesquite, blackbrush, guayacan, lotebush, guajillo, cenizo, huisachillo, and granjeno, together with three-awn and red grama. In addition, tasajillo and broomweed are abundant. Estimated carrying capacity for livestock is somewhat less than 20 cow-acre-days.

Reagan gravelly loam.—Reagan gravelly loam consists mainly of round pebbles of limestone, chert, quartzite, and igneous rocks. Brown, grayish-brown, or brownish-gray calcareous fine earth of about loam texture comprises 10 percent or less of the soil mass in the upper 8 or 10 inches of soil. Below this the fine earth is gray calcareous loam containing much chalky lime. In many places thick beds of caliche or lime-cemented gravel lie near the surface.

Highly dissected bodies of this soil occupy the steeper slopes along the tributaries to the Rio Grande Valley in the extreme southwestern part of the county. The surface is undulating to steeply sloping. The soil represents the lower eroded parts of the ancient outwash gravel plain that parallels the Rio Grande Valley. The materials are sediments deposited by the Rio Grande when it flowed at a much higher level. Erosion is very active in these gravel beds. Only small bodies of the soil are mapped in this county, but they join extensive areas in Maverick County.

The native growth is mainly small shrubs consisting of guajillo, cenizo, blackbrush, rockbrush, desert yaupon, Mexican persimmon, and a few small mesquite trees. Grasses, chiefly red grama and three-awn, cover from 10 to 15 percent of the surface. This is considered excellent browsing land, as its carrying capacity is as much as 20 cow-acre-days.

Webb gravelly fine sandy loam.—The 8-inch surface soil of Webb gravelly fine sandy loam is red or reddish-brown noncalcareous fine sandy loam containing small rounded chert, quartzite, and igneous gravel. This grades into a bed of small rounded gravel embedded in a small quantity of red noncalcareous heavy clay. At a depth of about 20 inches this rests on a bed of large and small round pebbles loosely cemented in a mass of lime or caliche. In some places this material forms a hard conglomerate.

The surface ranges from smooth to gently sloping. A few small areas are scattered over the uplands close to the north edge of the Neuces River Valley in the eastern part of the county on the ancient high outwash gravel plain paralleling the Rio Grande Valley in the southwestern part.

The soil supports a moderately dense growth of blackbrush, small mesquite trees, rockbrush, cenizo, tasajillo, hog-plum, amargosa, granjeno, Mexican persimmon, guajillo, and pricklypear. The 5- to 10-percent grass cover consists of red grama and three-awn. The carrying capacity for livestock is about 20 cow-acre-days.

Crystal fine sandy loam, shallow phase.—The surface of Crystal fine sandy loam, shallow phase, consists of reddish-brown noncalcareous fine sandy loam, which rests, at a depth of 6 to 10 inches, on sandstone bedrock or partly disintegrated fragments of sandstone. In places fragments of sandstone are scattered on the surface.

This soil is closely associated with Crystal fine sandy loam in small

sloping areas on the upper slopes of hills where erosion has occurred. The soil is neither extensive nor valuable.

The native vegetation consists of small stunted brush largely of guajillo, blackbrush, rockbrush, huisachillo, pricklypear, and mesquite. There is also a 10- to 20-percent grass cover, mainly of threeawn, red grama, and crowfoot. The carrying capacity for livestock is estimated at about 15 cow-acre-days.

Randall clay.—Randall clay is dark grayish-brown to dark-gray dense tough clay that generally is noncalcareous. This material is several feet deep, becoming denser, cloddy, and lighter gray in the lower part. The flat surface is pitted in many places with deep hog wallows, in which the soil is little different from the rest of the soil.

This soil occupies shallow sinkholes or lake beds in the uplands within larger areas of the Crystal and Duval soils. In this county the bodies are comparatively small, but larger areas occur in Maverick County and other nearby counties. Most of the time these bodies are dry, although water stands on the surface for long periods after rains. The soil is alluvial or colluvial in origin, being derived from materials that have been washed or moved from adjacent areas. Only a small total area is mapped.

In some places the ground is bare of vegetation, but in most places it supports a growth of large retama, mesquite, granjeno, and a few hackberry trees, as well as sneezeweed, horsemint, and Russian-thistle. Generally there is a 5- to 25-percent cover of buffalo and tobosa grasses, which, together with browse plants, provides an estimated carrying capacity of slightly more than 10 cow-acre-days.

PRODUCTIVITY RATINGS

The principal factors affecting the productivity of land are climate, soil (including many physical, chemical, and biological characteristics), slope, drainage, and management (including the use of amendments). No one of these factors operates separately from the others, although some one may dominate. In fact, the factors listed may be grouped simply as the soil factor and the management factor, since slope, drainage, and most of the aspects of climate may be considered as characteristics of a soil type, in that it occupies geographical areas characterized by a given range of slope and climatic conditions. Crop yields over a long period of years furnish the best available summation of the influence of the associated factors on production and therefore are used where available.

In table 8 the soils of Dimmit County are listed alphabetically and estimated average acre yields of the principal crops are given for each soil under the prevailing practices of irrigation and dry-land farming.

TABLE 8.—*Estimated acre yields of the more important crops on the soils of Dimmit County, Tex.*[1]

Soils, soil types, complexes, and phases [2]	Irrigation farming																			
	Oranges		Grapefruit		Grapes (table) [3]	Strawberries	Tomatoes		Spinach		Onions		Onion plants		Carrots		Peppers		Cantaloups	
	A	B	A	B	B	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Boxes	*Boxes*	*Boxes*	*Boxes*	*Tons*	*Crates*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Crates*	*Crates*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Crates*	*Crates*
Crystal fine sand	------	275	------	375	2.0	250	0.5	3.0	25	100	25	100	------	------	2	4	25	125	125	250
Crystal fine sandy loam	------	225	------	300	2.0	500	1.0	3.5	200	500	100	350	50	150	10	15	200	350	150	300
Crystal fine sandy loam, shallow phase	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Duval fine sandy loam	------	200	------	250	2.0	500	1.0	3.5	225	500	125	350	50	150	10	15	200	350	150	300
Duval fine sandy loam, shallow phase [5]	------	80	------	100	1.0	350	.5	2.0	150	250	50	125	25	75	2	4	125	200	125	175
Duval loamy fine sand, colluvial phase	------	------	------	------	------	250	.5	3.0	25	100	25	100	------	------	2	4	25	125	100	150
Frio clay	------	------	------	------	------	------	------	------	------	------	------	------	100	------	------	------	------	------	------	------
Frio clay loam	------	------	------	------	------	------	.5	2.0	175	250	175	300	125	200	4	6	300	375	75	100
Frio silt loam	------	------	------	------	------	------	4.0	------	350	------	400	475	125	200	15	------	400	------	130	------
Frio silty clay	------	------	------	------	------	------	2.0	------	250	------	300	------	200	------	7	------	400	------	50	------
Frio silty clay loam	------	------	------	------	------	------	3.0	------	325	------	350	400	175	------	10	------	400	------	125	------
Leona clay	------	------	------	------	------	------	.5	------	100	------	100	------	120	------	4	------	300	------	50	------
Maverick clay	------	------	------	------	------	------	------	------	------	------	------	------	50	------	------	------	200	------	------	------
Maverick clay loam	------	------	------	------	------	------	.5	2.0	200	350	150	250	125	200	7	12	200	360	125	150
Maverick clay loam, smooth phase	100	------	125	------	------	------	3.0	------	250	------	250	400	200	------	8	------	400	------	150	------
Maverick fine sandy loam	------	175	------	200	2.0	200	1.0	3.5	225	500	200	350	75	150	10	15	200	350	150	300
Maverick-Monteola clays	------	------	------	------	------	------	2.0	------	225	------	250	------	200	------	7	------	400	------	75	------
Miguel fine sandy loam	------	------	------	------	------	300	.5	2.0	150	250	100	250	25	------	7	12	150	250	125	175
Monteola clay	------	------	------	------	------	------	2.0	------	250	------	300	------	200	------	7	------	400	------	75	------
Monteola clay loam	100	------	125	------	------	------	3.0	------	250	------	300	400	200	------	8	------	400	------	150	------
Randall clay	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Reagan gravelly loam	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Reagan loam	------	80	------	100	1.6	------	2.0	4.0	200	400	275	400	100	200	10	------	300	400	175	200
Reagan loam, colluvial phase	------	------	------	------	------	------	3.0	4.0	250	500	275	400	100	200	10	------	300	400	175	200
Uvalde silty clay	------	------	------	------	------	------	2.0	------	250	------	300	------	200	------	7	------	400	------	75	------
Uvalde silty clay loam	------	------	------	------	------	------	3.0	4.0	325	------	300	375	175	------	8	12	400	------	200	------
Uvalde silty clay loam, shallow phase	------	------	------	------	------	------	2.5	3.5	275	350	200	300	125	200	7	10	300	400	175	200
Webb fine sandy loam	------	200	------	250	1.5	500	1.0	3.5	250	500	125	350	75	150	10	15	200	350	150	300
Webb gravelly fine sandy loam	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Zapata fine sandy loam	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Zapata loam	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Zavala fine sandy loam	------	------	------	------	------	500	3.0	4.0	250	500	300	400	100	150	10	15	170	250	100	150
Zavala loamy fine sand	------	------	------	------	------	250	.5	3.0	25	100	25	100	------	------	2	4	25	125	100	150

Footnotes at end of table.

TABLE 8.—*Estimated acre yields of the more important crops on the soils of Dimmit County, Tex.*[1]—Continued

Soils, soil types, complexes, and phases [2]	Irrigation farming—Continued												Dry-land farming and grazing		
	Eggplant		Cabbage		Squash (summer)		Broccoli		Corn	Sorghums (dry fodder)	Flax	Sown pasture	Corn	Sorghums (dry fodder)	Native pasture
	A	B	A	B	A	B	A	B	A	A	A	A			
	Bu.	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Crates*	*Crates*	*Bu.*	*Tons*	*Bu.*	*Cow-acre-days* [4]	*Bu.*	*Tons*	*Cow-acre-days* [4]
Crystal fine sand	25	100	1	3	0.5	3				1.3	5	125		0.7	20
Crystal fine sandy loam	150	225	3	8	1.0	4	75	175	23	5.3	15	150	13	2.0	20
Crystal fine sandy loam, shallow phase															15
Duval fine sandy loam	150	225	4	8	1.0	4	75	175	23	5.3	15	165	13	2.0	20
Duval fine sandy loam, shallow phase [5]	75	125	2	5	.5	2	75	125	13	2.0	10	140	3	1.3	15
Duval loamy fine sand, colluvial phase	25	100	1	3	.5	3				1.3	5	125		.7	20
Frio clay	25		5				25			2.7	5	75			15
Frio clay loam	125	175	6	8	.5	2	50	100	17	5.3	10	100	7	1.3	20
Frio silt loam	150		9		4.0		175		27	6.0	20	210	10		20
Frio silty clay	150		10		2.0		200		27	6.0	20	135	7	1.3	25
Frio silty clay loam	150		10		3.0		175		20	6.0	20	210	10		20
Leona clay	25		5		.5		50		20	5.0	5	160	7	.7	15
Maverick clay	25									2.7	10	100			15
Maverick clay loam	150	200	4	6	.5	2	80	125	17	5.3	20	150	7	1.3	20
Maverick clay loam, smooth phase	225	250	9		3.0		200		27	5.3	20	215	13	2.0	20
Maverick fine sandy loam	150	225	4	8	1.0	4	100	175	27	6.0	15	165	17	2.7	20
Maverick-Monteola clays	250		9		2.0		200		27	5.3	20	200	10	1.3	20
Miguel fine sandy loam	150	200	2	5	.5	2	75	125	17	2.0	10	125	3	.7	15
Monteola clay	200		9		2.0		200		27	5.3	20	200	10	1.3	20
Monteola clay loam	225	250	9		3.0		200		27	5.3	20	215	13	2.0	20
Randall clay															10
Reagan gravelly loam															20
Reagan loam	175	250	6	10	2.0	4	150	200	23	5.3	15	200	7	.7	20
Reagan loam, colluvial phase	175	250	6	10	3.0	4	150	200	23	6.0	15	215	7	1.3	20
Uvalde silty clay	175		9		2.0		175		27	6.0	20	200	10	1.3	20
Uvalde silty clay loam	225		10		3.0	4	200		27	6.0	20	210	13	2.7	20

Uvalde silty clay loam, shallow phase	200	250	8	10	2.0	3	150	200	20	5.0	15	180	7	.7	20
Webb fine sandy loam	150	225	4.5	9	1.0	4	100	175	27	6.0	15	170	10	2.0	20
Webb gravelly fine sandy loam	--------	--------	------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	20
Zapata fine sandy loam	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	20
Zapata loam	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	20
Zavala fine sandy loam	125	150	5	10	2.0	4	75	125	27	6.0	15	200	17	2.7	15
Zavala loamy fine sand	25	100	1	3	.5	3	--------	--------	--------	2.0	5	125	--------	.7	15

1 The estimates shown are based on: (1) Estimates and a few yield records furnished by staff members of Substation No. 19 of the Texas Agricultural Experiment Station; (2) estimates of the county agricultural agents of Dimmit, Zavala, and Maverick Counties; (3) estimates of local farmers; and (4) observations during the progress of the survey. The estimates in column A are for yields obtained under current practices of irrigation without the use of commercial fertilizers; those in column B are for yields obtained under irrigation and with the use of commercial fertilizers. Absence of an estimate indicates that the crop is not commonly grown.

2 Listed alphabetically.

3 Yields of wine grapes would probably be double.

4 See footnote 12, p. 26.

5 The estimated yields apply only to areas that are better suited to cultivation than the typical shallow phase.

The estimates were made with the help of members of the staff of the Texas Agricultural Experiment Station located at Substation No. 19, the county agents of Dimmit, Zavala, and Maverick Counties, and local farmers. Yield records of certain crops were available for some of the soils. These records included yields of strawberries, grapes, grapefruit, and oranges on the Crystal, Maverick, and Webb soils; yields of onions, spinach, tomatoes, peppers, carrots, cantaloups, cabbage, onion plants, broccoli, and eggplant on the Uvalde, Frio, Monteola, Maverick, Webb, Crystal, and Duval soils; yields of sorgo, corn, flax, and sown pasture on these same soils and also on the Reagan soils; yields of squash and native pasture on the Uvalde, Frio, Monteola, Maverick, Crystal, Duval, and Reagan soils. These estimates are not for yields of specific tracts of land, inasmuch as the soils as shown on the map vary somewhat, management practices differ slightly from farm to farm and climatic conditions fluctuate from year to year.

In table 9 the soils are listed in the approximate order of their general productivity for all important crops, and the yield estimates of individual crops are converted into crop-productivity indexes.

The crop productivity index or rating compares the productivity of each of the soils for each crop on the basis of a standard of 100. This standard index represents the approximate average yield obtained without the use of amendments on the more extensive and better soil types of the regions of the United States in which the crop is most widely grown. An index of 50 indicates that the soil is about half as productive for the specified crop as the soil with the standard index. The standard yield for each crop shown in table 9 is given at the head of the column. The soils given amendments, such as lime and commercial fertilizers, or special management, such as irrigation, and unusually productive soils of small extent may have productivity indexes of more than 100 for some crops.

The standard indexes given for corn, sorghum, flax, and pasture are used throughout the United States, and hence are national indexes, whereas the standards for the vegetable crops represent average yields obtained on the better soils under irrigation and good management in the Winter Garden district of Texas. Yields of vegetables and the practices under which they are produced vary so greatly in various sections of the United States that satisfactory standards for all of the country are difficult to determine.

TABLE 9.—*Productivity ratings of the soils in Dimmit County, Tex.*

Soils, soil types, complexes, and phases [1]	Crop-productivity index under irrigation farming for [2]—																					
	Oranges, 100=200 boxes		Grapefruit, 100=250 boxes		Grapes (table),[3] 100=2 tons	Strawberries, 100=150 crates	Tomatoes, 100=4 tons		Spinach, 100=350 bu.		Onions, 100=500 bu.		Onion plants, 100=200 crates		Carrots, 100=15 tons		Peppers, 100=400 bu.		Cantaloups, 100=200 crates		Eggplant, 100=250 bu.		Cabbage, 100=10 tons	
	A	B	A	B	B	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Frio silt loam							100		100		80	95	65	100	100		100		65		60		90	
Frio silty clay loam							75		95		70	80	90		65		100		65		60		100	
Uvalde silty clay loam							75	100	95		60	75	90		55	80	100		100		90		100	
Monteola clay loam	50		50				75		70		60	80	100		55		100		75		90	100	90	
Maverick clay loam, smooth phase	50		50				75		70		50	80	100		55		100		75		90	100	90	
Reagan loam, colluvial phase [6]							75	100	70	140	55	80	50	100	65	100	75	100	90	100	70	100	60	100
Uvalde silty clay							50		70		60		100		45		100		40		70		90	
Monteola clay							50		70		60		100		45		100		40		100		90	
Maverick-Monteola clays							50		65		50		100		45		100		40		100		90	
Zavala fine sandy loam [6]						335	75	100	70	145	60	80	50	75	65	100	45	65	50	75	50	60	50	100
Uvalde silty clay loam, shallow phase							65	90	80	100	40	60	65	100	45	65	75	100	90	100	80	100	80	100
Reagan loam [6]		40		40	80		50	100	55	115	55	80	50	100	65	100	75	100	90	100	70	100	60	100
Frio silty clay [6]							70		50		60		100		45		100		25		60		100	
Webb fine sandy loam		100		100	75	335	25	90	70	145	25	70	40	75	65	100	50	90	75	150	60	90	45	90
Duval fine sandy loam		100		100	100	335	25	90	65	145	25	70	25	75	65	100	50	90	75	150	60	90	40	80
Maverick fine sandy loam		90		80	100	135	25	90	65	145	40	70	40	75	65	100	50	90	75	150	60	90	40	80
Crystal fine sandy loam		115		120	100	335	25	90	55	145	20	70	25	75	65	100	50	90	75	150	60	90	30	80
Maverick clay loam							15	50	55	100	30	50	65	100	45	80	50	90	65	75	60	80	40	60
Leona clay [6]							15		30		20		60		25		75		25		10		50	
Miguel fine sandy loam						200	15	50	45	70	20	50	15	25	45	80	40	65	65	90	60	80	20	50
Frio clay loam [6]							15	50	50	70	35	60	65	100	25	40	75	95	40	50	50	70	60	80
Duval fine sandy loam, shallow phase		40		40	50	235	15	50	45	70	10	25	15	40	15	25	30	50	65	90	30	50	10	50
Crystal fine sand		140		150	100	165	15	75	5	30	5	20			15	25	5	30	65	125	10	40	10	30
Zavala loamy fine sand [6]						165	15	75	5	30	5	20			15	25	5	30	50	75	10	40	10	30
Duval loamy fine sand, colluvial phase [6]						165	15	75	5	30	5	20			15	25	5	30	50	75	10	40	10	30
Maverick clay [6]													25				50				10			
Frio clay [6]													50								10		50	
Zapata loam [6]																								
Zapata fine sandy loam [6]																								
Reagan gravelly loam																								
Webb gravelly fine sandy loam [6]																								
Crystal fine sandy loam, shallow phase [6]																								
Randall clay [6]																								

Footnotes at end of table.

TABLE 9.—*Productivity ratings of the soils in Dimmit County, Tex.*—Continued

Soils, soil types, complexes, and phases [1]	Crop-productivity index under irrigation farming for [2]—								Crop-productivity index under dry-land farming and grazing for [2]—			General productivity grade [5]			
	Squash (summer), 100=4 tons		Broccoli, 100=200 crates		Corn, 100=50 bu.	Sorghums (dry fodder), 100=4 tons	Flax, 100=15 bu.	Sown pasture, 100=100 cow-acre-days [4]	Corn, 100=50 bu.	Sorghums (dry fodder), 100=4 tons	Native pasture, 100=100 cow-acre-days [4]	Irrigation farming		Dry-land farming	General soil group
	A	B	A	B	A	A	A	A				A	B		
Frio silt loam	100	------	90	------	55	150	135	210	20	----------	20	1	------	9	High to moderate productivity under irrigation.
Frio silty clay loam	75	------	90	------	55	150	135	210	20	----------	20	1	------	9	
Uvalde silty clay loam	75	100	100	------	55	150	135	210	25	65	20	1	1+	8	
Monteola clay loam	75	------	100	------	55	135	135	215	25	50	20	1	------	8	
Maverick clay loam, smooth phase	75	------	100	------	55	135	135	215	25	50	20	1	------	8	
Reagan loam, colluvial phase [6]	75	100	75	100	45	150	100	215	20	35	20	1	1+	8	
Uvalde silty clay	50	------	90	------	55	150	135	200	20	35	20	1	------	8	
Monteola clay	50	------	100	------	55	135	135	200	20	35	20	1	------	8	
Maverick-Monteola clays	50	------	100	------	55	135	135	200	20	35	20	2	------	8	
Zavala fine sandy loam [6]	50	100	40	65	55	150	100	200	35	65	15	2	1+	8	
Uvalde silty clay loam, shallow phase	50	75	75	100	40	115	100	180	15	15	20	2	1	8	
Reagan loam [6]	50	100	75	100	45	135	100	200	15	15	20	2	1+	8	
Frio silty clay [6]	50	------	100	------	55	150	135	135	15	35	25	3	------	8	
Webb fine sandy loam	25	100	40	90	55	150	100	170	20	50	20	3	1+	8	
Duval fine sandy loam	25	100	40	90	45	135	100	165	25	50	20	3	1+	8	
Maverick fine sandy loam	25	100	50	90	55	150	100	165	35	65	20	3	1+	7	
Crystal fine sandy loam	25	100	40	90	45	135	100	150	25	50	20	4	1+	8	
Maverick clay loam	15	50	40	65	35	135	135	150	15	35	20	4	2	8	
Leona clay [6]	15	------	25	------	40	115	35	160	15	15	15	5	------	9	Moderate to low productivity under irrigation.
Miguel fine sandy loam	15	50	40	65	35	50	65	125	15	35	15	5	3	8	
Frio clay loam [6]	15	50	25	50	35	135	65	100	15	35	20	5	4	8	
Duval fine sandy loam, shallow phase	15	50	40	65	25	50	65	130	5	15	20	6	3	9	
Crystal fine sand	15	75	------	------	--------	35	35	125	--------	15	20	7	3	9	
Zavala loamy fine sand [6]	15	75	------	------	--------	50	35	125	--------	15	15	7	5	9	
Duval loamy fine sand, colluvial phase [6]	15	75	------	------	--------	35	35	125	--------	15	20	7	5	9	
Maverick clay [6]	------	------	------	------	--------	65	65	100	--------	----------	15	8	------	9	
Frio clay [6]	------	------	15	------	--------	65	35	75	--------	----------	15	8	------	9	

Zapata loam [6]											20			9	Unsuited for field crops.
Zapata fine sandy loam [6]											20			9	
Reagan gravelly loam											20			9	
Webb gravelly fine sandy loam [6]											20			9	
Crystal fine sandy loam, shallow phase [6]											15			9	
Randall clay [6]											10			10	

[1] The soils are listed in the approximate order of their general productivity under current irrigation practices.

[2] The soils of Dimmit County are given indexes that indicate the estimated average production of each crop as the percentage of the standard production, which is shown at the head of each column. The standard indexes are explained in text, p. 48. The indexes in column A refer to yields obtained under current practices of irrigation without the use of commercial fertilizers; those in column B from yields obtained under irrigation and with the use of commercial fertilizers. Absence of an index indicates that the crop is not commonly grown.

[3] Yields of wine grapes would probably be twice those shown.

[4] See footnote 12, p. 26.

[5] The general productivity grade is based upon a weighted average of the crop indexes. The weight assigned to the index of a particular crop is based on the acreage and value of the crop in the county. The method of weighting is explained more fully in the text, p. 52.

[6] Little or none of the soil is cultivated.

General productivity grade numbers, assigned in the column under "General productivity grade," are based on the weighted average of the indexes for the various crops, the weighting depending on the relative acreage and value of the crop.[13] If the weighted average was between 90 and 100, the soil was given a grade of 1; if it was between 80 and 90, a grade of 2 was given, and so on. Since it is difficult to measure mathematically the exact significance of a crop in the agriculture of an area or the importance or suitability of a soil for particular crops, too much significance may be given to the order in which the soils are listed.

Some large areas of arable soils remain in a virgin state and are used only for native pasture. Some of these areas lie above present sources of irrigation waters, but, because of the possibility of irrigation in the future, productivity ratings are included for them also.

Economic considerations play no part in determining the crop productivity indexes. These indexes cannot be interpreted, therefore, into land values except in a very general way. Distance to market, relative prices of farm products, and other factors influence the value of land. It is important to realize that productivity, as measured by yields, is not the only consideration that determines the relative worth of a soil for growing crops. Ease or difficulty of tillage and ease or difficulty with which productivity is maintained are examples of considerations other than productivity that influence the general desirability of a soil for agricultural use. In turn, steepness of slope, absence or presence of stone, resistance to tillage offered by the soil because of its consistence or structure, and the size and shape of areas are characteristics of soils that influence the relative ease with which they can be tilled. Likewise, inherent fertility, susceptibility to erosion, and other factors, such as moisture-holding capacity and permeability to roots and water, affect the ease of maintaining soil productivity. Productivity, as measured by yields, is influenced to some extent by all of these factors, and they are not to be considered entirely separately from productivity. Methods of land evaluation or classification to designate the relative suitability of land for agricultural use must give some recognition to such factors.

LAND USES AND AGRICULTURAL METHODS

About 97 percent of the area of Dimmit County is in native pasture, which supports range livestock, chiefly cattle, although there are a few sheep and goats. About 2 percent of the total area is in cultivation, most of which is under irrigation, though some is dry-farmed. The remaining 1 percent represents town sites and fenced railroad and public-road rights-of-way.

Ranching consists chiefly of raising calves and steers. Calves are sold at the age of 6 months to 1 year as vealers; steers are sold at the age of 18 months, 2, 3, and 4 years as feeders and stockers; and

[13] Determination of the general productivity grade numbers and the order of the placement of the soils was based on information furnished by the county agent's office. Weights of 75 percent and 25 percent, respectively, were given to the total acreage and net acre-value of each crop in determining the percentage weight of each crop. For the irrigated crops the following percentage weightings of the crop indexes were used: Oranges 9, grapefruit 3, grapes 1, strawberries 3, tomatoes 11, spinach 11, onions 9, onion plants 3, carrots 6, peppers 4, cantaloups 3, eggplants 2, cabbage 2, squash 1, broccoli 1, corn 4, sorghums 5, flax 1, and sown pasture 21. For dry-land farming the following weights are used: Corn 11, sorghums 15, and native pasture 74.

old cows and bulls are sold for cutters and canners. San Antonio, Fort Worth, Kansas City, and St. Louis are the principal markets. Many stockers and feeders are sold direct to farmers in the Corn Belt. Some ranchers maintain intermediate pastures in Oklahoma, on which they graze their cattle en route to the more distant markets.

More calves and young steers are sold from the county than older steers. Frequently there is insufficient range on which to pasture older steers when there is breeding stock on the ranch. Some ranchmen, chiefly well-established landowners, either purchase or raise their young stock elsewhere and run only steers on their Dimmit County ranches. One of the reasons for this practice is to avoid losses from screw-worm infestation of young calves, as it is difficult to find and treat such cases in brushy pastures.

Long-wooled sheep are maintained intermittently in the county, more or less in emergencies when pastures are overcrowded in the sheep district farther north. Long-haired goats are not numerous, but a fairly large number of short-haired goats are kept on ranches to supply fresh meat for home consumption.

Ordinarily grass, brush, and forbs provide a sufficient source of feed. The size and density of vegetation, however, are restricted by the low supply of moisture, although many areas provide highly nutritious browse. Probably more than half of the range sustenance for livestock is obtained from trees and shrubs rather than from grasses or forbs. The deep-rooted shrubs and trees, chiefly blackbrush, guajillo, mesquite, catclaw, rockbrush, and huisachillo, afford succulent and nutritious browse of flowers, leaves, and beans or fruits over long periods, and the shallow-rooted grasses and forbs provide lush grazing for relatively short periods. The dominant grasses are curly mesquite, red grama, hairy grama, tobosa, buffalo grass, little bluestem, crowfoot, and field sandbur or grassbur. All of these except the last two are valuable nutritious grasses. The forbs that furnish valuable grazing in spring and after most rains throughout the year are criefly cudweed, *Coldenia canesceus*, gaillardia, hoary pea, bladderpod, plantain, and honey daisy, the last two of which are commonly called tallowweed. These are especially important on the sandier soils. Pricklypear is a reserve range forage that is made available in dry seasons by burning off the spines with a torch. The mesquite tree, aside from its value as browse, furnishes fence posts and fuel and is frequently used on the ranch for the construction of houses, corrals, and sheds. Saladillo, a weed occurring on large areas of the heavier soils in the Maverick series, is reported by ranchers to tend to satisfy the salt requirement for cattle that have access to it. The average carrying capacity of the native range is about 18¼ cow-acre-days, or 20 acres for one animal a year.

Auxiliary feeding of livestock is resorted to only when native vegetation is insufficient, especially in cold weather. It is discontinued when natural forage is renewed. Sometimes droughts become sufficiently severe to require removal of livestock to pastures distant from the affected area or to market, and at such times there is frequently a market surplus with attendant low prices.

Water for livestock is obtained from tanks, or earthen reservoirs, that catch the run-off water from natural watering places on the Nueces River, from creeks and arroyos, and from wells. Well water of excellent quality for livestock is obtainable in most parts of the

county except west of the Carrizo sand geological outcrop, where it is mostly too highly mineralized to be usable. Here dependence is placed entirely on tanks and natural water holes.

Cattle are the only livestock on most of the ranches. According to specialists of the Texas Agricultural Experiment Station, a system wherein only one type of livestock is grazed does not utilize the natural forage most economically and may actually result in deterioration of the range (*1*). Cattle, sheep, and goats have different preferences for particular forage plants, and continuous grazing of one type of livestock leads to the scarcity or extinction of plants that are especially relished by that type, while other plants increase. Obviously, under this system some forage is wasted, whereas the carrying capacity of the range for the type of livestock grazed is reduced. The fullest and most economical use of the range is obtained when different types of livestock, such as cattle, goats, and sheep, are grazed in rotation. Such utilization of the range requires relatively small pastures containing numerous watering places and the shifting of the herds and flocks from pasture to pasture in order that the vegetation may be evenly grazed and browsed and given an opportunity for recovery. Such a system requires close supervision in order to guard against overgrazing. One factor that discourages the handling of sheep and goats is the prevalence of predatory animals, but these are being reduced by Government trappers.

Production of cultivated crops in Dimmit County was reported as early as 1880, but large-scale commercial production did not begin until about 1910.[14] Crops are now produced the year round, and fruits and vegetables are actually harvested in every month of the year, although most vegetable crops are produced in fall, winter, and early spring. This advantage of the region led to its designation as the Winter Garden region (*12*).

Crops are produced under irrigation and by dry-farming methods. In 1938, according to estimates of the county agricultural extension agent, about 60 percent of the cultivated land was irrigated and 40 percent was dry-farmed. Both methods are often in operation on the same farm or ranch for the production of different crops.

Water for irrigation is procured in several ways: By pumping underground water from wells and collecting it in small surface reservoirs before leading it into the field laterals (pl. 2, *B*), by pumping from storage reservoirs in streams, and by gravity flow from stream reservoirs.

The general method of applying irrigation water is by flooding between borders, or parallel ridges 8 or 10 feet apart, laid out in the direction of the land slope. The borders are crossed at varying intervals, according to the degree of surface slope, by laterals that have enough fall to carry the water without washing the soil. These laterals induct water between the borders from the upper side, and small earthen baffles along the sides of the border ridges and at right angles to them aid in spreading the water evenly over the surface.

The chief crops produced by dry-farming methods are grain sorghums and corn. Most of the sorghum is cut and stacked for fodder,

[14] Information regarding crops supplied in part by E. Mortensen, superintendent, and Leslie R. Hawthorn, horticulturist, Substation No. 19 of the Texas Agricultural Experiment Station.

but some is headed for grain. The corn is harvested on the ear for grain.

Irrigated crops are fruits and berries, vegetables, grain sorghums, corn, sorgos, Sudan grass, Rhodes grass, alfalfa, and cotton. Commercial fruits and berries are chiefly oranges, grapefruit, and strawberries. The vegetables, most of which are grown in the fall, winter, and early spring, consist of onions and onion plants, spinach, tomatoes, carrots, peppers, turnips, beets, cantaloups, eggplants, cucumbers, watermelons, cabbage, summer squash, sweetpotatoes, snap beans, edible cowpeas, mustard, and broccoli. Most of the irrigated corn is harvested on the ear for grain, but some is picked green for roasting ears, and some is cut for silage. Sorgos are cut for hay or fodder. Sudan grass and Rhodes grass are cut for hay and used for summer grazing. Alfalfa is cut for hay. Only a very small acreage is used for cotton.

The soils used in the production of these crops in Dimmit County are Frio silt loam; Frio silty clay loam; Uvalde silty clay loam; Maverick clay loam, smooth phase; Uvalde silty clay; Monteola clay; Maverick-Monteola clays; Webb fine sandy loam; Duval fine sandy loam; Maverick fine sandy loam; Crystal fine sandy loam; Miguel fine sandy loam; Duval fine sandy loam, shallow phase; and Crystal fine sand. Practically all the other soils are in native pasture.

In general, the best forage crops are produced on the fine-textured soils, or clays and silty clays, and the best vegetables on the medium-textured sandy soils. The latter soils are warmer and favor the production of winter vegetables, but the former generally are inherently more productive.

Because of favorable soils and climate, parts of Dimmit County are well suited for fruit culture. An important factor in fruit production is protection from frost. For this reason air drainage is very important, and as a result fruit production is mostly confined to the sand-hill area with underground water available for irrigation. Avoidance of frost pockets, or low areas where cold air can collect, is essential to successful fruit production.

The largest income from fruit crops is from strawberries. This crop thrives best on neutral or acid soils rather than on calcareous ones. For fruit production the following winter and spring the plants are set each fall in late September or early October, about 30,000 to the acre. On slopes with good air drainage, strawberries withstand temperatures as low as 27° F. without serious damage to the fruit. The commercial varieties are Missionary and Klondike, and the marketing season extends from January to May.

Citrus fruits are next in importance. The more hardy kinds, such as satsuma, tangerine, and other oranges, are recommended for planting. These are marketed mostly in November and December. Grapefruit is produced, but at greater risk because of less resistance to low temperatures. Meyer lemon trees freeze at temperatures of 20° F. or below, but recover quickly and are highly productive of good-quality fruit that is available from August to January. Kumquats grow well but have a limited market demand. The more promising citrus varieties are Owari, Kawano Wase, and Silverhill satsuma oranges; Clementine (Algerian) tangerine; and Hamlin and various strains of Washington Navel oranges.

Deciduous fruits are affected by mild winters, and choice of varieties is important for success. European varieties of plums are not adapted to local conditions. The best plums for this area are the so-called Japanese sorts, such as Bruce, Methley, Munson, Excelsior, Beauty, Santa Rosa, Burbank, and Kelsey. Good crops of plums are obtained in May and June.

Peaches are limited to southern varieties, many of which are poor shippers. Some of the leading ones are Japan Dwarf, Pallas, Smith, Frank, Babcock, and P. I. 61302. Peach trees are subject to root rot (*Phymatotrichum omnivorum* (Shear) Duggar), as are most deciduous fruits. It is recommended that sorghum crops precede the planting of a deciduous orchard for 2 years. So far no resistant stocks are available for plums, peaches, apricots, and other fruits of this nature.

Pears are rarely planted in the county, but such varieties as Douglas, Pineapple, and Wilder Early have some promise. A few local varieties of apples and apricots are succeeding.

Grapes are exceptionally well suited and make remarkable growth. The better market possibilities are for the early maturing seedless varieties, such as Sultanina (Thompson Seedless). Since these varieties are susceptible to root rot, it is necessary to graft them on a resistant rootstock, such as Dog Ridge, La Pryor (T. S. 20313), or Champanel, for successful vineyards. This fruit ripens in Dimmit County from June 10 to 30, which is earlier than the ripening of grapes in California. One of the main projects of the local experiment station is the search for a better grape rootstock.

Blackberries are generally unsuited to this area, except early varieties that mature before hot weather. The best commercial variety is the Advance, which produces well and ripens in mid-April.

Figs are very susceptible to root rot, but they may be grown successfully where there is a good moisture supply.

Southwestern Texas is one of the few sections of the United States in which dates mature successfully. This is because the mean annual temperature is high and the relative humidity is low. Plantings are limited because of insufficient pest-free planting stock. Promising varieties are Braim, Amir Haj, and Kustawy (*17*).

Truck farming is well established. Studies at the local experiment station have indicated that some varieties of nearly all the commonly grown American vegetables are well suited to this section (*5*, *7*). Only a few vegetables have failed at the station. Rhubarb rarely survives the summer, owing to the various root diseases, particularly root rot; but it grows well in winter. Asparagus, as a plant, is well suited, but from the commercial point of view it exhausts itself by too frequent new growth and hence rarely has an abundance of good-sized spears. The number of vegetables grown commercially is controlled by the profit in their production.

Care has to be taken in the selection of the variety of some vegetables. Because climatic conditions may differ greatly from those under which a variety has been bred and grown for generations, its response to conditions in southern Texas is sometimes unexpectedly unfavorable (*8*).

Much of the vegetable land is kept fallow during summer. This practice is neither necessary nor desirable. Not only are there sum-

mer vegetables, but in addition various feed crops, cover crops, or green manures can and should be grown. A vegetable-planting guide worked out by the local experiment station for the home gardener shows that vegetables can be planted with success during every month of the year, the number ranging from 10 kinds in April and May to 25 in October.[15]

Although onions are among the most expensive crops to raise under irrigation, many thousands of acres are devoted to their production in southern Texas. The local experiment station has studied extensively their fertilizer and cultural requirements (*6*, *9*). These studies, which were conducted on Webb fine sandy loam and Crystal fine sand, showed that onions on these soils responded most to applications of phosphoric acid and next to applications of nitrogen. Potash has never had a consistent effect in any of the experiments, and the station is therefore recommending its omission in most applications. It should probably be added in small amounts every 4 or 5 years, but no condition has yet been found where it is really needed. Supplementary fertilizer tests, begun in 1936 on Monteola clay, Laredo silt loam,[16] and Laredo very fine sandy loam,[16] have so far indicated that onions on these soils respond to applications of fertilizer carrying nitrogen and phosphoric acid, but again the response to potash is indefinite.

For onions, applications of 600 to 900 pounds of 6–18–0, 5–15–0, or any equivalent amount of fertilizer, or 200 to 350 pounds of 11–48–0 are recommended, depending on the type of soil and the history of the land (*6*). The larger quantities are more desirable for the sandy soils. Superphosphate alone is often beneficial but is rarely as profitable as when a nitrogen-carrying material is included. Although many growers use side dressings, especially of sodium nitrate, the experiment station does not recommend the practice except under special circumstances. In most cases fertilizer should be applied before onions are set out.

The Crystal Wax and Yellow Bermuda onions are the most commonly grown varieties, being best suited to local conditions (*3*). Most of the seed comes from the Canary Islands. Seed is sown in the seedbeds during late September, and the plants are transplanted to the field in rows in late November and during December. The local crop is harvested in April. Many onions are harvested as plants and shipped to growers in other parts of the State and farther north.

Pink root disease and the insect thrips are the chief enemies that prey upon the onion crop. Heavy attacks do not occur every year nor under all conditions. Methods of control involve crop rotation, the use of fertilizer, and other cultural practices that encourage continuous and sturdy growth.

Spinach is planted from September to late January (*4*). The marketing period extends from early November to some time in April, but prices fluctuate greatly throughout the season. Bloomsdale Savoy and related and similar varieties represent the type most commonly grown. The seed is sown broadcast with large grain

[15] HAWTHORN, LESLIE R. AN ALL-YEAR-ROUND VEGETABLE PLANTING GUIDE FOR THE WINTER GARDEN REGION OF TEXAS. Tex. Agr. Expt. Sta. Prog. Rpt. 539A, 9 pp. 1941. [Mimeographed.]

[16] The Laredo soils do not occur in Dimmit County.

drills before the irrigation borders and laterals are constructed. This method of planting encourages weed infestation; and weeds, in turn, increase the probability of disease and insect damage to the crop.

Tomatoes are sometimes planted in hotbeds in December or January. More often, however, because the most important commercial season is in the fall, they are planted along with peppers, eggplant, and occasionally cabbage, sprouting broccoli, and similar crops during June or July in open or covered seedbeds. Transplanted to the field, all of these crops are ready for harvest some time during the fall and early winter—from late October, to January. Freezing temperatures sometimes terminate earlier the harvesting of the tenderer crops, such as tomatoes, peppers, and others. Pritchard, Marglobe, Rutgers, and Stokesdale tomatoes, California Wonder and World Beater peppers, and Florida High Bush eggplants are the varieties commonly grown.

Carrots, beets, turnips, and mustard are usually planted during October, November, and December. Harvesting of the quicker growing vegetables, such as early-planted mustard and turnips, begins in December and continues until midspring, depending on how late they are planted and the stage of maturity desired. Danvers Half-Long, Imperator, and Morse Bunching carrots, Detroit Dark Red beet, and Shogoin and Purple Top White Globe turnips are the varieties commonly grown.

Cucumbers, cantaloups, and watermelons are all planted in late February or early March. Cantaloup plantings may continue as late as July or early August, depending on the market a grower wants to serve. Aphids and mildew are likely to cause serious troubles for these crops. The former are usually not numerous until midsummer and fall; the latter is likely to cause more trouble in spring and fall. Experiments at the local experiment station, as well as the practical experience of growers, indicate that aphids can be controlled by the proper use of nicotine dust. Work on mildew is now under way. The use of powdery mildew resistant cantaloups, such as Powdery Mildew Resistant No. 45, helps to some extent, but since downy mildew is also prevalent, the use of mildew-resistant varieties does not solve the problem completely. Hale Best 36, Hale Best 112, and New Seed Breeders are the cantaloup varieties usually grown. The cucumber varieties are Early Fortune and such new varieties as Ace, A and C, and Straight 8. Among the watermelons, Tom Watson, Red Heart Tom Watson, and Dale are favored chiefly by commercial growers.

Beans of all types, but not all varieties, do well in both spring and fall, although the latter is the more favorable season. In spring they need to be planted as early as possible in March. They will then be ready for harvest in late May and early June. In fall, beans are planted in August or early September. The lesser cornstalk borer, *Elasmopalpus lignosellus* (Zell.), may be a pest in the fall, but in large fields the damage is usually not very serious. Among the snap beans, Giant Stringless Green Pod and Bountiful are the best suited varieties. Few if any wax-podded varieties are well suited to this section, but Pencil Pod Black Wax grows and produces fairly well. Of the lima beans only Henderson Bush and Jackson Wonder

are satisfactory. Recent tests with pole beans indicate that the Blue Lake variety is well suited in both spring and fall plantings.

In addition to studying varieties of vegetables suited to the region and the fertilizer and cultural requirements of onions, the local station has also conducted irrigation experiments with spinach and onions, various cultural and fertilizer experiments with spinach and onions, various cultural and fertilizer experiments with tomatoes, and investigations regarding time of planting, rates of seeding, and stages of maturity in various canning crops. The irrigation tests, made on Webb fine sandy loam, indicate that too frequent irrigation is easily possible (*13*). Some of the highest yielding crops of spinach were raised with a minimum of irrigation.

Climatic conditions during winter favor the commercial canning of such crops as spinach and beets. Spinach is slow to make seed stems then, and the beets have an excellent interior color, which they hold for a long time. In fall the stage of maturity in lima beans changes very slowly, so that a crop is not likely to become overmature before it is canned. At the same time fair to good yields may be expected. One commercial cannery is located south of Crystal City just outside the county.

Of the staple crops, corn is not so well suited to this area as the grain sorghums. Sometimes 50 bushels of corn to the acre may be obtained, but usually the low humidity is unfavorable and low yields result, even with irrigation. Grain sorghums, such as hegari and yellow milo, are very dependable and compare favorably with corn in feeding value (*10*). Sorgos are often used as hay crops by planting 100 or more pounds of seed to the acre under irrigation. They make a fine stem, and there is little waste in feeding. The Sumac or Red Top variety is commonly used for this purpose.

Peanuts are grown in the county without irrigation and usually make a fair to good yield of nuts and hay. Severe drought may cause failures. Common Spanish and Macspan are the chief varieties grown.

Good yields of mangels have been obtained, but the difficulty of harvesting has prevented their general use. Yields of sesame are satisfactory, but are not profitable, for the same reason.

Legume crops are sometimes grown for soil improvement and occasionally for feed. The better ones for soil improvement are Hubam sweetclover and sourclover (*Melilotus indica*). These are grown in winter. Cowpeas are the best summer crop for this purpose. Alfalfa is grown to a small extent for hay, but it usually lasts only a few years before new plantings have to be made because of root rot. Good yields are made on certain soils with proper management.

Flax is a very promising new cash crop. Acre yields of from 20 to 30 bushels of seed have been obtained under irrigation. The best varieties seem to be Punjab, Giza, Bison, and Rio.

Cotton yields of ½ to 1½ bales an acre have been obtained under irrigation on sandy loam soils. Proper control of the boll weevil by dusting with calcium arsenate is essential for high yields. Acala is probably the best variety under irrigation.

IRRIGATION, DRAINAGE, AND SALINITY

The first irrigation in Dimmit County dates around 1900, when artesian water was discovered and the first dam was constructed on

the Nueces River at Bermuda. There was no great increase in irrigated land, however, until after rail facilities for transportation were available, about 1910. From this time until 1930 there was rapid expansion, but since then the area under irrigation has decreased. At present from 10,000 to 15,000 acres are being irrigated.

Irrigation in Dimmit County differs from that in Maverick County in that each farm is an independent irrigation unit with its own pumping plant or gravity canal. These irrigation works obtain water either from wells (pl. 2, *B*) or from storage reservoirs on the various channels in the Nueces River Valley. In general, upland farms are irrigated from wells and valley farms from reservoirs. Most of the latter have small lifts, but one large farm obtains some of its water by gravity.

Cost of irrigating from wells ranges from about $3 to $6 an acre-foot, according to the amount of lift involved. Lifts range from only a few to 200 feet. Water obtained by gravity costs about $1.50 per acre-foot, and water pumped from reservoirs in the river valley probably costs between $2 and $3.

No accurate record is kept of the exact amount of water required for irrigating crops. Because of the cost of pumping, however, over-irrigation is not so likely to occur as in other districts; nevertheless it is very probable that economies could be achieved were the duty on water determined for each crop on each soil. Such information, together with accurate records of precipitation and evaporation, is necessary for the most efficient and economical irrigation. The estimated amount of water required for most crops on all soils is 3 to 4 acre-feet. The first application requires 3 to 4 inches, and successive ones 2 to 3 inches each. The number of irrigations varies with the crop, the soil, and the climatic conditions that prevail during the growing season. From 1 to 20 irrigations to the crop are reported. The greatest number are required for citrus fruits and strawberries, the smallest number for feed, green manure, and cover crops, and intermediate numbers for vegetables.

Three general methods of irrigation or applying water to crops are in use. The border system, which has been described previously (p. 54), is used chiefly for vegetable and field crops. Row crops, such as corn, are irrigated by the furrow system, in which water is led between the rows in one or more furrows, depending on the width between rows. Some citrus trees are also irrigated by the furrow method, and strawberries are irrigated by a modification of this method. The general method for irrigating citrus fruits is by the check system. The checks are pans or basins, each of which is enclosed by a low dike and contains one or two trees. Water is introduced into these from conveniently spaced field laterals.

As each farm constitutes an irrigation unit in itself, canals and field laterals are relatively small and do not contain water except when irrigation is actually in progress. Also, water is not wasted to the same extent as in other irrigation districts. For these reasons, there are no large-scale seepage areas in the county, and damage from this source is slight. Seepage does occur sometimes in limited areas around the collecting reservoirs near wells. Occasionally seepage from such a source does not come to the surface until it reaches some distance away from the reservoir. In such cases it is often difficult

to ascertain the real source of the seep water. Areas affected in this manner are relatively small. Seepage can be remedied by discovery of the source and installation of impervious lining at this point, by providing drainage of the seeped area, or by a combination of both measures. Seepage spreads more rapidly and farther through permeable soils, but it can also move through the tighter ones.

The soils of Dimmit County have developed under conditions of comparatively low precipitation and high evaporation. Under such circumstances chemical weathering and subsequent leaching of soluble constituents are not so great as in more humid regions. For this reason all the soils contain appreciable quantities of soluble salts, and in some places concentrations are sufficient to be harmful to plant growth. Generally, in the virgin-soil state, the salts are distributed comparatively evenly and there is no evidence of inhibited plant growth. Where highly concentrated within the feeding zone of plant roots, however, the salts retard or destroy vegetative growth.

Under virgin conditions the coarser textured, sandy, more permeable, and better drained soils generally contain the least amount of soluble salts, whereas the less permeable, denser, and slowly drained soils contain larger amounts. This is because clays and fine-textured soils as a rule inherit larger amounts of soluble materials and retain them more tenaciously. All soluble substances in soils are subject to removal in solution, but the fine-textured or clay soils are leached less because of density and high colloid content.

On the uplands and in a few of the small local valleys, particularly in the vicinity of Catarina and on Salt Creek near Carrizo Springs, the presence of excess salts in the surface layers of the soil is evidenced by the absence or stunted condition of certain vegetation and the presence of other species not common on the normal soil. Mesquite trees and thorny shrubs are scattered and stunted, while alkali- or salt-tolerant plants, such as saladillo and alkaliweed, thrive in abundance. Curly mesquite and Bermuda grass are salt-tolerant and carpet many affected areas. In places a white efflorescence of salts appears on the surface in dry weather. Erosion is generally more active in sloping saline areas than in areas of the same soils in similar positions that are not impregnated with salts. The concentration of salts in soils alters their structure, rendering them less resistant to erosion. Such areas are indicated by symbol on the map.

Under irrigation the normal processes of soluble salt accumulation and removal are upset. Irrigation waters take up soluble salts as they pass through the soil mass, becoming more impregnated until they reach a stationary level or drain away naturally. The only escape for impounded waters that cannot find a gravity outlet is by capillary rise and evaporation at or below the surface.

Evaporating water cannot carry its burden of salts into the air with it. The salts rise through the soil mass in solution, however, until the water begins to vaporize. They are then precipitated and deposited in the soil, often in the surface layer, in ever-increasing concentration. When sufficient quantities have been deposited within the rooting zone, plant growth is first damaged and finally killed.

The affected area, visible on the surface, is frequently referred to as an "alkali spot." It usually grows in size as the water table rises

or the hydrostatic pressure increases, the outer edge being marked by a fringe of dead vegetation and a white efflorescence of salts. The center of such a spot is generally bare of vegetation, darker colored than the surrounding soil, and moist.

When such an area is drained, the water table is lowered and capillary rise of water to the surface is stopped. As a result, the surface becomes dry, and the white efflorescence spreads over the affected area, for drainage alone does not remove the salts previously accumulated. These must be flushed out by means of heavy applications of irrigation water. Only a small part of the salts is actually on the surface and can be carried off by surface flushing; the greater part is in the soil and must be dissolved and carried down and out by means of subdrainage.

Although fine-textured soils normally carry the largest concentrations of soluble salts under virgin conditions, sandy soils become contaminated more rapidly under irrigation. This is due to their permeability, which allows salts in solution to spread through them more rapidly.

Although the normal waters of the Carrizo sand are exceedingly low in salt content, soils in parts of Dimmit County are being contaminated with salts in well water. This is caused by faulty well casings. In order to reach the Carrizo sand the wells must pass through several strata containing salty waters. These waters must be cased off in order to prevent contamination of the Carrizo waters. Frequently the well casings become perforated by corrosion, and the salty waters flow into the well. This contaminates not only the waters of the particular well but also other wells in the locality as the salts spread through the Carrizo sand. For this reason well casings should be examined frequently, and abandoned wells should be plugged.

Various crops exhibit different degrees of tolerance for salts ("alkali"), and shallow-rooted crops may thrive where deep-rooted ones cannot, depending on the uniformity of salt occurrence throughout the soil profile or the degree of concentration in any layer. Young plants are more susceptible than older ones, consequently crops may thrive on soils where concentrations are light in the surface layers but heavy in the subsoil and fail entirely where the reverse is true. It is said that plants withstand greater concentrations on finer textured soils than on coarser textured ones.

For practical purposes of crop production, a soil is considered salt-free in which the average concentration to a depth of 6 feet is less than 0.2 percent and of comparatively uniform distribution without localization or concentration within the feeding zone of plant roots. Surface concentrations of 0.2 percent may be sufficient to limit or prohibit crop production, even though the average salt content to a 6-foot depth may fall under the 0.2-percent limit. Only small amounts of salts have been observed at 6-foot depths.

From tests in adjoining counties, it has been determined that where salts of this region occur in isolated spots they consist almost totally of the saline salts, or so-called "white alkali"—sodium chloride, sodium sulfate, magnesium chloride, and calcium chloride. Sodium carbonate, or "black" alkali, is generally absent or is present only in very slight quantities. In normal unirrigated soils of the area none

of these salts are concentrated at the surface in sufficient quantities to damage or kill plant growth, except in areas indicated on the map by symbol. Owing to the transitory nature and general low concentration of soluble salts in soils here under irrigation, it is deemed unnecessary to make extensive determinations of salt concentration.

MORPHOLOGY AND GENESIS OF SOILS

Soil is the product of forces of weathering and development acting on soil materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point depend on the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and has existed since accumulation, the plant and animal life in and on the soil; the relief, or lay of the land, and the length of time the forces of development have acted on the material. External climate is less important in its effects on soil development than is internal soil climate, which depends not only on temperature, rainfall, and humidity, but on the physical characteristics of the soil or soil material and the relief, which, in turn, strongly influences drainage, aeration, run-off, erosion, and exposure to sun and wind.

Dimmit County lies within the soil region of the Pedocals and in the eastern part of the region of the Reddish Brown soils. The eastern edge of the county practically coincides with the theoretical line separting the zone of the Reddish Brown soils from that of the Reddish Chestnut soils, which extends far to the east of this county (*16*.) Beside the normal Reddish Brown soils, a few Rendzinalike or Chernozemlike soils and azonal soils are represented.

The soils of Dimmit County all reflect the effect of climatic environment in their individual profiles, but variations in parent materials and relief have caused variations from the normal soil.

Parent materials from which the soils have developed are exposed and also weathered formations of the Claibourne group of the Eocene and Pleistocene periods. In ascending order in the geologic section from west to east across the county, the Eocene deposits are the Indio, Carrizo sand, Bigford or lower Mount Selman, upper Mount Selman, and Cook Mountain formations. Pleistocene deposits include the recent alluvium and the ancient outwash Uvalde gravel, Leona, and probably Reynosa limestone formations on terraces that mantle the others on the higher hills and ridges, being most prominent and persistent in the southwestern part of the county. Recent alluvium occupies the valley floors of streams that now traverse the area.

The materials of these formations consist of unconsolidated and partly decomposed sandstone, shale, gravel, and caliche or calcareous tufa. Many of these are calcareous, but some are not. Many materials from the Indio, Bigford, and Mount Selman formations contain large quantities of gypsum and other salts in addition.

The area is an easterly sloping plain, dissected to an undulating and gently rolling topography by the Nueces River and its tributary drainageways and the tributaries of the Rio Grande. The original surface of the plain has been modified locally by some faulting, but surface features caused by this are not so prominent as in Maverick County on the west.

The average gradient of the original plain throughout the county is undetermined, but that it is relatively great may be inferred from the rapidity with which storm waters run out. The average fall of the Nueces River in its course through the county is about 3.5 to 4.5 feet per mile; that of the Rio Grande south of the county is about 3.5 feet.

The gradient of many of the tributaries of both of these streams must be considerably greater. The relatively steep gradient and the dashing torrential rains that are common in summer cause severe erosion in some sections, and storm waters are always heavily laden with sediment. On many broad smooth areas, however, erosion is not active.

The soils have developed under high temperatures and low precipitation. The mean annual temperature is 71° F., and the mean annual precipitation is 21 inches. The soils are almost never subjected to freezing and thawing. Precipitation seldom falls in the form of snow.

The vegetation consists of a relatively light to dense growth of low thorny shrubs, small trees, cacti, forbs, weeds, and grasses. Many of the shrubs and small trees are legumes.

The typical normally developed or zonal soils of the county are included in the Reddish Brown and Reddish Chestnut great soil groups (*16*), although the reddish soils of the county are about identical with those that occur just east of the county in the Reddish Chestnut soils.

The normal profile of the Reddish Brown soils consists of a medium- to light-brown surface horizon, of slightly reddish hue, which grades into dull reddish-brown or red material heavier than the surface soil, thence into a horizon of calcium carbonate accumulation, which is almost white, or pinkish, reddish, or yellowish brown. These soils are represented in Dimmit County by members of the Webb, Crystal, Miguel, and Duval series. The Crystal soils are somewhat lighter colored and less red and more representative of the Reddish Brown group, whereas the Webb soils are darker and more representative of the Reddish Chestnut soils.

A profile of Webb fine sandy loam, situated on a smooth, gentle slope at the southwestern corner of the pasture belonging to the substation of the Texas Agricultural Experiment Station near Winter Haven, is described as follows:

0 to 10 inches, medium- to dark-brown noncalcareous fine sandy loam with a slight reddish hue. The soil is nearly structureless (single grain).

10 to 15 inches, brownish-red noncalcareous fine sandy clay, plastic when wet. The material has a fine blocky structure, and the aggregates are slick-faced.

18 to 43 inches, yellowish-red fine sandy clay that has a coarse blocky structure. The soil mass is calcareous and contains accumulated calcium carbonate in many large and small soft white lumps. This is the zone of lime accumulation.

43 to 60 inches, reddish-yellow comparatively friable massive fine sandy clay. A few soft white lumps of calcium carbonate are present, and the soil mass is highly calcareous

The lighter colored Rendzinalike soils range in color from brown to gray. They are crumbly calcareous soils of moderate depth, grading below into a lighter colored material and finally into a layer

of carbonate accumulation. Soils of the county that best represent this profile are Maverick fine sandy loam, Maverick clay loam, Reagan loam, and Uvalde silty clay loam.

The following is a description of a profile of Maverick clay loam, observed in a roadside cut 2½ miles southeast of Asherton on a slope with a gradient of about 3 percent:

0 to ¼ inch, yellowish-brown calcareous very fine sandy loam. This surface crust easily separates from the material below, cracks into irregular chips from 2 to 3 inches in diameter, and curls up around edges.

¼ to 11 inches, brown or yellowish-brown crumbly calcareous clay loam, with an irregular fine blocky and granular structure.

11 to 22 inches, yellowish-brown calcareous clay with a coarse prismatic structure.

22 to 38 inches, light yellowish- or grayish-brown calcareous clay with a coarse prismatic structure. The material breaks into large clods. It contains many soft white lumps of calcium carbonate and a few crystals of gypsum.

38 to 64 inches, light grayish- or brownish-yellow dense compact calcareous clay with a coarse prismatic structure. This material breaks into large clods. It rests on interbedded platy calcareous sandstone and shale.

The darker colored Rendzinalike soils are moderately deep, fine-textured, highly calcareous soils developed from relatively soft, highly calcareous materials in smooth areas. They have dark-gray or dark grayish-brown to black crumbly or granular surface soils showing practically no eluviation. A thin crust covers the surface soil. The subsoil is light gray or grayish yellow and has a prismatic structure. Other distinguishing features are gradual transition from horizon to horizon and an accumulation in a definite zone of calcium carbonate, gypsum, and other salts. Monteola clay, Monteola clay loam, and Maverick-Monteola clays are the darker colored Rendzinalike soils in this county.

A description of a profile of Monteola clay, observed about 2½ miles northwest of Bigwells on a very gentle slope near the P. C. Levering farm, follows.

0 to 7 inches, very dark-gray calcareous clay with a very thin surface crust. The material is crumbly, or it consists of irregular fine crumbs and fine blocky aggregates. A few pieces of igneous and chert gravel ranging from ¼ to 2½ inches in diameter are present.

7 to 25 inches, dark-gray dense calcareous clay with a prismatic structure. The material breaks into large and small angular clods.

25 to 35 inches, yellow and gray dense calcareous clays, so mixed as to appear yellowish brown. The material has a prismatic structure and breaks into large angular clods.

35 to 60 inches, yellow dense clay with a prismatic structure. The material breaks into large angular clods. It contains calcium carbonate in soft white lumps and a considerable quantity of finely divided and crystalline gypsum in the zone of lime accumulation. It rests on beds of shale at undetermined depth.

Other soils of the area are immature, eroded, or otherwise abnormal. These include recent alluvium, shallow and eroded soils, and soils whose profiles are made abnormal by saline accumulation.

SUMMARY

Dimmit County, which includes an area of 1,326 square miles, is situated in the Winter Garden district of southwestern Texas, rather

distant from the larger markets. Physiographically, it is the part of the Coastal Plain that lies in the drainage basins of the Nueces River and the Rio Grande, being dissected to undulating and gently rolling topography by the tributaries of these streams. The climate is characterized by high temperature, low rainfall, long hot summers, and short mild winters. This environment encourages a vegetation consisting of low thorny brush and small trees, many of which are legumes, and forbs and weeds, and mixed short and coarse grasses, many of which are highly nutritious. The mesquite tree is dominant, ranging in size from a small shrub to a moderately large tree.

Climate and vegetation favor the production of livestock on the range. This enterprise has long thrived in the region and still dominates it. About 97 percent of the area is thus employed. The average carrying capacity of the native pasture is about 18 cow-acre-days, or 20 acres per cow or other animal unit per year, except in the occasional years of severe drought. All pastures are fenced. The chief breed of cattle is the Hereford. Some sheep and goats are also pastured.

Cultivated crops are produced chiefly in the north-central and central parts of the county. Most of them are irrigated, but some are dry-farmed. Many farms operate under both methods. The soils involved are chiefly of the Frio, Uvalde, Webb, Crystal, Monteola, Maverick, and Duval series. The coarser textured sandy soils are the best for dry farming, but they are of course more productive under irrigation. Dry farming is very uncertain. Greater use of the soils for cultivated crops is limited by the lack of water for irrigation and the slight demand for the products that could be produced. There are three types of farming—ranching, commercial farming, and subsistence farming.

For discussion, the soils are grouped under three heads: (1) Soils of high to moderate productive capacity, (2) soils of moderate to low productive capacity, and (3) soils unsuited for cultivated crops. Not all of the soils of the first or second groups and none of the third group are cropped.

Soils of the Reddish Chestnut and Reddish Brown great soil groups are represented by those that are normally developed. Most of them are smooth-lying, deep, and fertile; some, however, are immature, eroded, or otherwise abnormal. Rendzinas and Chernozemlike soils and azonal soils also occur in the county. Soil textures range from fine sand to clay.

The principal crops produced are vegetables grown for winter market, citrus fruits, grapes, strawberries, and feed crops. Intermediate- and coarse-textured soils produce vegetables of the best quality although some are grown successfully on fine-textured soils. The coarser textured soils are most suitable for fruit crops. Strawberries thrive best on noncalcareous to acid soils. Feed crops return the largest tonnages on the intermediate- to fine-textured soils.

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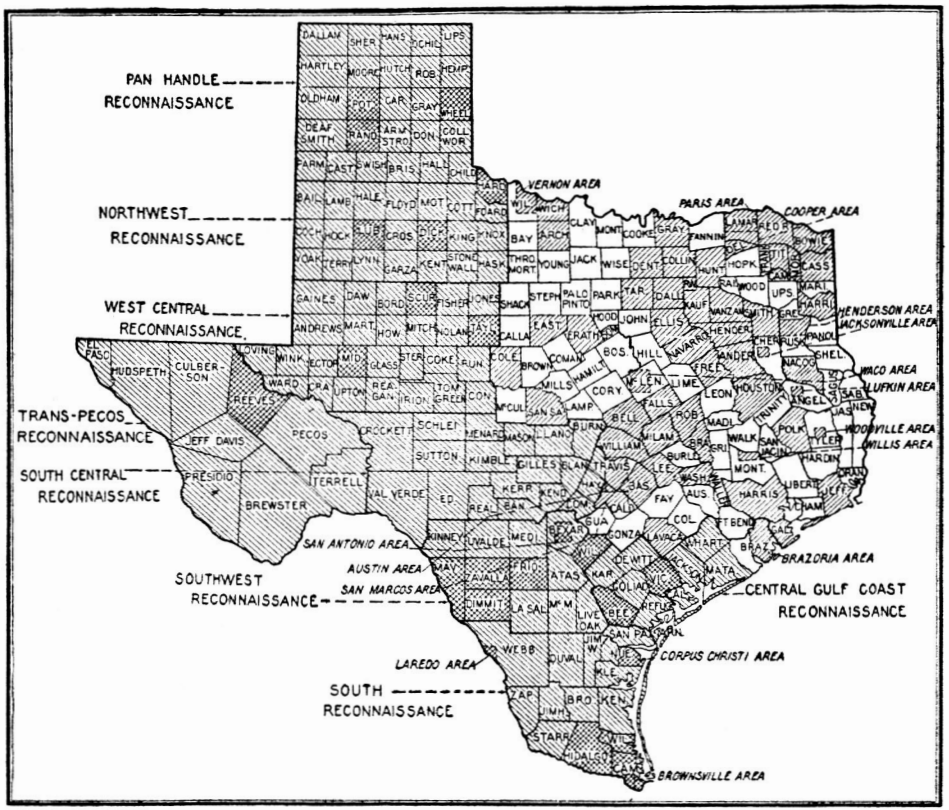

Areas surveyed in Texas shown by shading. Detailed surveys shown by northeast-southwest hatching; reconnaissance surveys shown by northwest-southeast hatching; cross hatching indicates areas covered in both ways.

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