B-226

WHEAT.....

A Major Cash Crop in Texas

TEXAS AGRICULTURAL EXTENSION SERVICE
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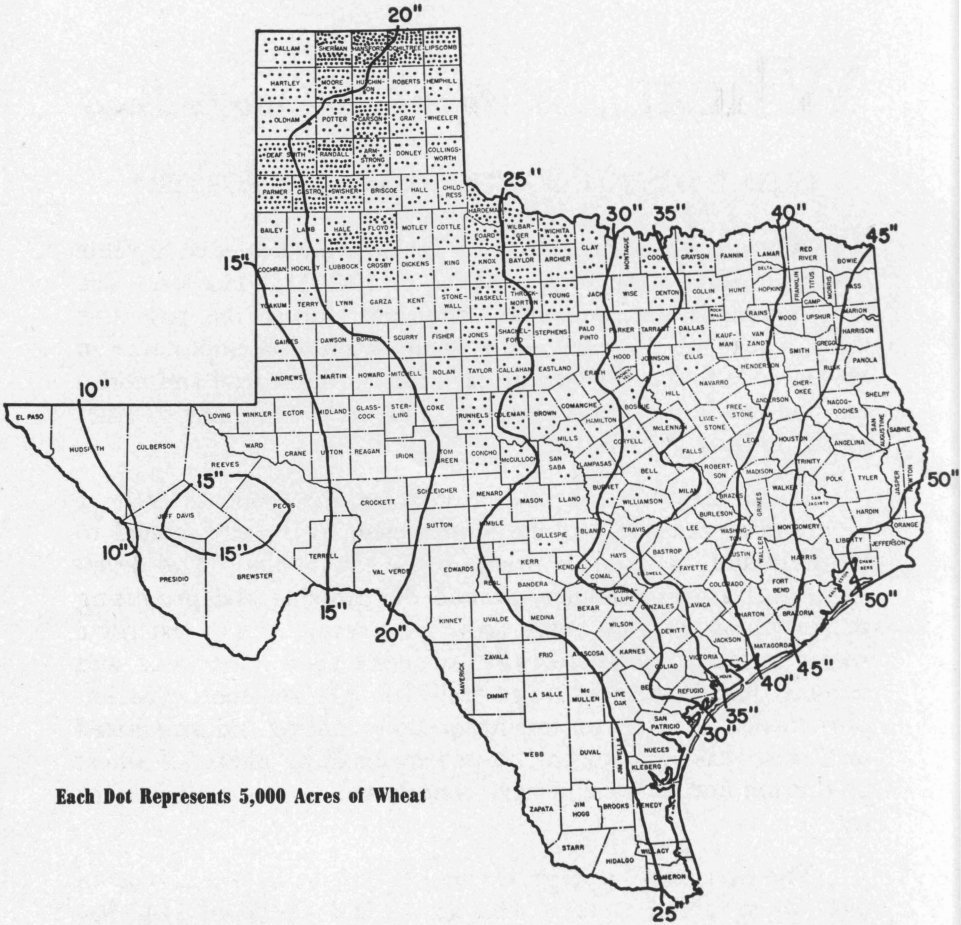

Figure 1. Distribution of the wheat acreage in Texas and rainfall belts of the State.

Wheat... *A Major Cash Crop In Texas*

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Wheat is a major cash crop of Texas, being exceeded in value only by cotton for the 10-year period of 1942-51. However, due to unfavorable environmental conditions during the past five years, wheat has dropped below grain sorghum in importance in the State. Wheat is the leading cash crop in the central and northern portions of the Texas Panhandle, as well as in many counties of the Rolling Plains.

In the major wheat production areas, the economic welfare of the farmer, as well as the businessman, is directly related to the yield and the price of wheat in the community. The development of a major industry around the growing and processing of the wheat crop has come about as a result of (1) extensive wheat farming operations, (2) adequate country elevator and terminal handling and storage facilities, (3) transportation improvements, and (4) an important flour milling industry based on Texas wheat production. Improvements in all phases of wheat production and processing have contributed to this major industry.

The maximum acreage devoted to wheat in Texas was in 1947 when 7,301,000 acres were grown and a total of 124,270,000 bushels of wheat were produced with a farm value of $264,695,000. The average acreage for the 10-year period, 1941-1950, was 4,841,000 acres with an average production of 62,505,800 bushels of an average farm value of $105,512,400. Inside the front cover is a map (Figure 1) which shows the distribution of the wheat acreage in Texas and the rainfall belts of the State.

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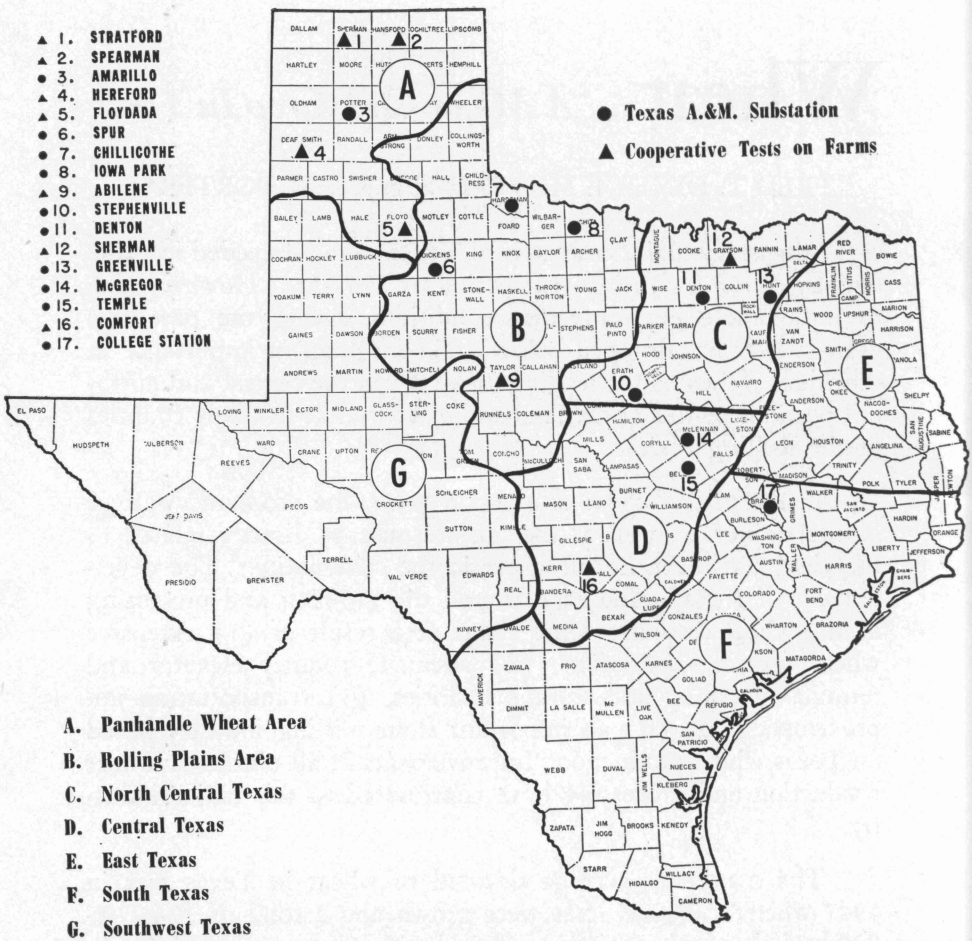

Figure 2. Wheat growing areas of Texas and locations of substations and cooperating farms of the Texas Agricultural Experiment Station where wheat research is carried on.

Wheat Growing Areas

Wheat is grown as a commercial cash crop in four main areas of Texas. It is of only minor importance in other sections of the State. For convenience in describing conditions and making recommendations, the State has been divided into seven areas. These are designated as areas A to G in Figure 2. Wheat is of importance in areas A, B, C, and D.

Approximately 68 percent of the acreage of wheat in Texas is grown in area A, the High Plains or Panhandle. This is a high plateau ranging from 3000 to 4000 feet in elevation, having an average rainfall of 16 to 22 inches with most of it being received in May, June, July, and August.

Area B, the Rolling Plains, is the second largest production area for wheat with approximately 23 percent of the State acreage. Wheat is grown on the heavier soils of this area, the sandier soils being devoted to cotton, grain sorghum or grass. Rainfall averages nearly 30 inches per year at the eastern border and decreases gradually to approximately 20 inches at the western edge. April and May have the highest rainfall. Elevation ranges from nearly 1000 feet on the east to 2500 feet in the western part.

Areas C and D comprise the Blackland, Grand Prairie, West Cross Timbers, and Edwards Plateau areas which run northeast-southwest through the State. This area is divided into two parts as low temperatures can be important in small grain production in the northern part. Areas C and D are largely within the 30 to 40-inch rainfall belt, and because of this higher precipitation and humidity, plant diseases can be limiting factors in the production of wheat and other small grains. The area is well diversified with small grains being only one of the main farm crops. The total acreage in wheat is only about 450,000 acres or about eight percent of the State total.

Areas E, F, and G grow very little wheat and that which is seeded is used primarily for winter pasture, especially in Areas E and F.

Cultural Practices

Cultural practices for wheat production vary greatly over the wide range of soil and climatic conditions in Texas.

ROTATION

Continuous growing of the same crop on the same land is undesirable. Continuous cropping provides favorable conditions for the increase of plant diseases and insects, and it rapidly re-

duces the available nutrients. Wireworms, cutworms, and mites increase in number under continuous wheat production. Greenbugs often live through the summer on volunteer grain; if such a field is returned to wheat in the fall, they can increase on the new crop. Soil-borne mosaic has become a serious disease in the hard red winter wheat belt in recent years and may become important in Texas. Rotation will aid in holding down the spread of this desease. Root rots, caused by a group of soil-borne organisms, may increase to such an extent under continuous cropping to wheat that profitable production will be impossible.

Fallow has paid dividends in wheat production at the Amarillo Conservation Experiment Station through the added insurance of producing a crop and in the reduced total cost of operation.

SUGGESTED ROTATIONS BY GROWING AREAS

Area A:
1. Wheat-grain sorghum-fallow in a three-year rotation
2. Wheat-fallow in a two-year rotation
3. Wheat-wheat-fallow in a three-year rotation

Longer rotations which involve grasses or legumes may be worked out where these crops can be utilized. Some legume should be included in the rotation to maintain fertility and organic matter in the soil, especially under irrigation. In most instances, wheat should not be seeded on grain sorghum land in the fall following the grain sorghum harvest. Sorghum leaves the soil depleted of moisture and readily available plant food.

Area B:
1. Wheat-grain sorghum-cotton in a three-year rotation
2. Wheat-wheat-grain sorghum in a three-year rotation
3. Wheat-wheat-cotton in a three-year rotation
4. Wheat-grain sorghum-biennial sweetclover in a four-year rotation

5. Wheat-cotton-biennial sweetclover in a four-rotation
6. Wheat, followed by a green manure crop-cotton-grain sorghum

Somewhat more latitude is possible in the rotation choice in this area. Fallow probably is not economical under most conditions, but may be utilized by the farmer if found practical. It is especially useful in the control of weeds. A legume should be included in the rotation. Some legumes which may be used, depending upon location, include alfalfa, vetch, Austrian Winter peas, and Chinese Red cowpeas.

Areas C and D:
1. Wheat-sweetclover-(1 or 2 years)-cotton
2. Wheat-summer crop of cowpeas-corn or grain sorghum-cotton
3. Wheat-summer crop of cowpeas-spring oats-cotton
4. Wheat-corn-alfalfa (2 to 3 years)

Wide choice of crops, length of rotation, and crop sequence is possible in these areas. Cotton is an excellent crop to precede small grain as it leaves a good seedbed relatively free of weeds and without undue depletion of plant food in the surface soil.

Implements

Generally speaking, implements that fit into other needs on the farm can be utilized for wheat. The chisel and subtillage implements have come into wide use in recent years, especially in the main wheat growing areas. These implements loosen the ground to varying depths without turning the plow slice over as does a moldboard plow. Crop residues left on the surface are helpful in preventing soil blowing in the Panhandle.

More stable yields are obtained by subtillage of continuous wheat land and wheat on fallow. Delayed subtillage of summer fallowed land protects the soil, conserves moisture, reduces the cost of production, and has not resulted in lower yields than

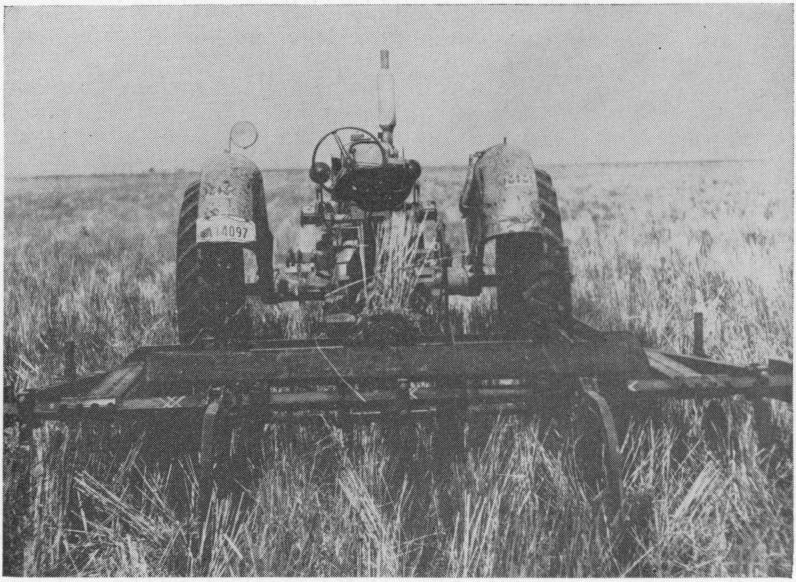

Figure 3. Subtillage plow designed and built at the Amarillo Conservation Experiment Station. Implements of this type are now available commercially.

the early tillage of fallow land. Delayed subtillage land is not broken or stirred until the spring following wheat harvest. The average yield of wheat in a two-year fallow rotation at the Amarillo Experiment Station, using delayed subtillage, was 24.3 bushels per acre as compared with 14.2 bushels for continuous wheat using the one-way plow as a tillage implement. A subtillage plow is shown in Figure 3.

A second implement that has been widely used is the chisel. On many soils a hardpan or "plow sole" is formed by continued plowing or tilling at the same depth, especially with the one-way plow. Water often cannot penetrate this hardpan. The chisel is a useful implement for breaking up this plow sole and allowing the storage of water during periods of higher rainfall.

The wide spaced, semi-deep to deep furrow type drill is generally used in the Panhandle. It can be used in fairly trashy ground which not only permits seeding under more favorable moisture conditions, but also assists in protecting the soils from

blowing. This type of drill, which spaces the rows 12 to 14 inches apart, also assists in catching snow during the winter. One of the deep furrow type drills operating in heavy stubble is shown in Figure 4.

Methods of seeding wheat in the remainder of the State are less exacting and several types of drills are used satisfactorily. Closer spacing of the rows, such as is found in the common 8-inch disc drill, probably utilizes soil and moisture better in Central Texas.

SUGGESTED RATES AND DATES OF SEEDING WHEAT

	Areas (See Figure 2)			
	A	B	C	D
Seeding rate, pounds per acre	30	45	60	60
Seeding date for grain production	Sept. 15 to Oct. 15	Oct. 1 to Oct. 15	Oct. 15	Oct. 15

Rates and dates may be altered to suit the needs of the individual farmer and the use for which the crop is grown.

Figure 4. A deep furrow type drill operating in heavy stubble.

Fertilizers for Wheat

With sufficient moisture in the soil wheat responds well to increased fertility and improved physical conditions of the soil. Increased fertility may be obtained through the application of barnyard manure, commercial fertilizers, or the growing of a legume crop to which phosphate fertilizer has been applied. As most of the wheat is grown in the western part of the State in an area of limited rainfall, moisture is the limiting factor in production most seasons. Except under irrigation, commercial fertilizers often do not pay dividends in the Rolling Plains and Panhandle areas because there is not enough moisture available for the plant to take advantage of the increased fertility. Even under the higher rainfall conditions of areas C and D, a good rotation in which a legume and phosphate are included may be sufficient for maximum production. Suggested applications of commercial fertilizer by areas follow.

Area A: Dry land —not practical under most conditions
Irrigated —150 pounds 16-20-0 or its equivalent preceding planting or top-dress after wheat is up to a stand. Top-dress in early spring with 30-0-0.

Area B: Heavy soils—top-dress in early spring with 30-0-0. May not pay dividends most seasons.

Sandy soils—200 pounds of 10-20-10 or its equivalent at seeding. Top-dress in early spring with 30-0-0.

Area C: Heavy soils—200 pounds superphosphate at seeding time plus 30-0-0 in early spring or 200 pounds 16-20-0 or its equivalent at seeding time plus 30-0-0 in early spring.

Sandy soils—200 pounds of 10-20-10 or its equivalent at seeding time plus top-dress of 30-0-0 in early spring.

Area D: Same as area C.

Farmers who are considering applying fertilizer to wheat should contact their county agricultural agent for advice on local conditions. Each farmer should have his soil tested for nutrient deficiencies as a guide to what fertilizers to use and the amounts to apply for the crop grown.

Irrigation of Wheat

In the recent series of drouthy years, the number of irrigated farms on the High Plains has increased rapidly. The extent of wheat production under irrigation likewise has increased and there are now more than 300,000 acres of wheat under irrigation. In 1929 there were only about 3,000 acres.

Yields of irrigated wheat have been extremely variable. In favorable seasons, dry land wheat often has yielded as much as irrigated wheat in nearby fields. In general, farmers have not found wheat under irrigation to be highly profitable. The successful production of irrigated wheat requires additional knowledge of the crop requirements and considerable additional effort and attention to the growing crop.

Specific recommendations for irrigated wheat production are difficult to make because conditions on farms vary so greatly. The following suggestions are based on research and on the experience of successful growers.

1. Pre-irrigate the seedbed if possible.
2. Seed an adapted variety.
3. Increase the seeding rate to 60-90 pounds per acre.
4. Fertilize at seeding time with 150 pounds of 16-20-0 or its equivalent per acre. Apply at seeding time or soon after wheat has emerged.
5. Irrigate the crop soon after stands are established and after the fertilizer has been applied.
6. Top-dress in the spring with 100 pounds of ammonium nitrate (30 pounds N) or 150 pounds ammonium sulfate then irrigate again. If the crop is grazed, the fertilizing and watering should be done as soon as the livestock are removed. Anhydrous ammonia may be used in the irrigation water, if desired.
7. Avoid irrigating wheat after the late boot stage unless the crop shows signs of wilting. The wheat plant is susceptible to injury from lack of oxygen which may occur after heavy rains or irrigation late in the growing season. Late irrigation may produce conditions favorable for the spread of rusts.

For high yields, water should be applied early and allowed to penetrate deeply into the soil so that it will be available to the plant during the fruiting period. With proper attention to improved practices, it should be possible under irrigation to produce average yields of 40 to 60 bushels per acre or more. Verified reports of 70 to 85 bushels per acre are on hand now.

Grazing of Wheat

Research conducted at Amarillo and Denton, as well as experiences of farmers, indicates that with careful management the grazing of wheat need not reduce yields or damage the crop. Wheat provides a source of succulent, high protein feed during the winter when such feeds are at a premium. If not needed by the grower himself, the leasing of wheat for grazing provides a second source of income.

Controlled grazing may be beneficial to the crop if, due to warm weather, excessive nitrogen supply or excessive moisture, growth becomes too rank. Very rank wheat is more easily injured by sudden periods of cold weather. The crop should not be grazed until the plants are well established so that livestock do not pull up the plants. It also should not be grazed late in the spring after rapid growth has started. This is especially injurious to early maturing varieties. Under most conditions, livestock should be removed from wheat fields by March 1st in Central Texas and by March 15th in West Texas. Livestock should not be allowed to graze fields that are excessively wet, nor fields that are so dry that tramping may start soil blowing. Moderate grazing from late fall to early spring is less harmful to growing wheat than is the heavy grazing of lush growth.

Returns from wheat pasture, either in terms of beef production or in rental to other stockmen, have been remunerative enough to cause a gradual trend to earlier seeding. Early seeding, however, utilizes soil moisture for the production of forage, which could be used for the production of grain from later seeding. Early seeding also provides an early host crop for the survival and increase of insects such as the greenbug, spider mite, and cutworm. Later cultivation and seeding would make conditions less favorable for these insects. Early seeding favors the development and

spread of some plant diseases, particularly the root rots that attack wheat. Early sown wheat also is more susceptible to fall infection of leaf and stem rust.

Wheat where adapted as a pasture crop provides more growth during the winter than oats or barley. When adapted, oats and barley produce earlier grazing after seeding, but wheat grows at lower temperatures and provides more pasture during the winter and early spring. The total seasonal production of wheat, oats, and barley is about the same.

Wheat Varieties

The first wheat varieties grown in Texas were of soft red winter wheat brought by the early settlers to North Central Texas. Soft red winter varieties, mostly Red May and Mediterranean, made up most of the acreage in the State until about 1905. Since that time, the planting of hard red winter wheat varieties has increased and they now are grown on more than 90 percent of the State acreage.

In addition to these two major wheat classes, a small acreage of durum wheat and of emmer (locally called "speltz") is grown on the Edwards Plateau and in Central Texas south of Temple. They are used locally for feed or commercially in mixed feeds. These wheats are more resistant to rust than the bread wheats.

The choice of a variety to grow should depend upon the locality, the date of seeding, the prevalence of diseases in the area, the adaptation of the variety to the local farm needs, the importance of winter grazing to the farmer, the maturity date, and the quality of the variety as indicated by its demand on the market. Growers should check with their local county agricultural agent before growing an unknown or untried variety for commercial use. Through state and regional tests, most of the commercial varieties of nearby states are tested and information on their adaptation is available.

Soft red winter wheat production is recommended only in the eastern portions of Areas C and D. The new variety Frisco is recommended as a soft red winter wheat variety. The Red May,

Mediterranean, Denton, and Vigo are soft wheat varieties grown in this area and should be replaced by Frisco as it has greater resistance to leaf rust.

On the basis of yield data and information on agronomic and quality data, the following hard red winter wheat varieties are recommended, for the wheat growing areas of Texas.

	AREAS			
	A	B	C	D
	Panhandle	Rolling Plains	North Central	Central
Preferred	Westar	Westar	Quanah	Quanah
	Comanche	Comanche	Comanche	
	Wichita	Ponca		
	Triumph	Triumph		
		Wichita		
Acceptable	Tenmarq	Quanah	Ponca	
	Ponca	Tenmarq	Triumph	
	Apache	Kiowa	Wichita	
	Pawnee	Apache		
	Kiowa	Turkey		
	Turkey			

Producing Good Seed Wheat

Each wheat grower should try to have the very best seed he can produce in reserve for seeding his crops. It should be pure, of good germination, and free of disease. Good planting seed can be maintained on the farm with only limited additional expense if certain measures are taken throughout the season.

Seed wheat does not "run out." Wheat is a self fertilized crop in which very little natural crossing occurs. Wheat becomes mixed from custom or other combines which move from one field to another without cleaning; by mixtures from bins, sacks, trucks,

drills and cleaning equipment, or by mixtures from volunteer wheat in the field. Varieties may be kept pure year after year if precautions against mixing are taken regularly.

Maintaining pure seed must start first with a source of pure seed of the chosen variety. The seed block should be land on which no wheat was grown the previous year. It is almost impossible to destroy all volunteer wheat. In the western part of the State this seed block probably should be sown on fallow land to increase the chances of a good return on the investment. The drill should be thoroughly cleaned before it is used. After the crop is mature, the field should be rogued to see that no off-type plants or other small grains are present. Rodents may carry in seed from adjoining fields or fence rows. Livestock may contribute mixtures by undigested grain that passes through the digestive tract. Wild and false wild oats can cause serious mixtures as these plant seeds may lie in the soil several years before germinating.

The most difficult task in maintaining pure seed is the cleaning of the combine. In the rush of harvest operations, this operation is often neglected. It is not enough to "run" a few bushels of grain before saving grain for seed. Grain in the augers, elevators, and sieves will add mixtures from the previous field for a long time. The combine should be cleaned from top to bottom with brooms and brushes. An air blast machine is also good for cleaning a combine. All elevator shafts should be opened, sieves removed, and canvas removed from elevators and platforms. The grower who cleans his combine frequently will find it worth the investment if he will have a machine shop cut extra doors and openings into inaccessable places on the machine so that he can be sure every part is cleaned.

Finally, all trucks, bins, sacks, and all recleaning equipment should be cleaned with equal attention. Often this work can be done when it is too damp to thresh wheat and much of it can be done before harvest. Proper attention to these details will insure pure seed for seeding the entire acreage another season. What may be just as important, it will prevent bringing in and spreading over his land noxious weeds such as Johnson Grass, bindweed, or goat grass.

Importance of Quality

Texas wheat is used principally in bakery flour production which requires varieties of high milling and baking qualities. Although supply and demand are the basic factors determining the average price of wheat, there are other important points affecting prices for individual lots in different locations. Among the most important of these are variety, moisture content, test weight, protein content, and class of wheat. These factors, together with supply and demand, form the basis for determining market premiums and discounts.

In recent years, the trend in the use of bakers' type flour has been up as more and more people turn to commercial bakery products. This tends to strengthen the demand for hard wheat such as is grown in Texas. The average quality of Texas wheat is good. There are, however, enough low quality varieties grown to weaken the market price for the entire crop. Communities producing good milling quality varieties such as Comanche, Tenmarq, and Westar enjoy a better demand than other communities which produce low quality varieties.

Flour milling concerns are on the alert to find the areas where high quality varieties are grown. To do this, various companies make variety and quality surveys just before harvest time each year. This information serves as a valuable guide to the companies in locating supply and determining prices.

The export market is another important factor in determining prices. During recent years, exports have absorbed most of the wheat in excess of domestic consumption. There is little change in the total volume of wheat used for food annually in this country. Per capita consumption continues to decline; however, its affect on consumption has been offset by the increasing population. The decline in per capita consumption is mainly the result of the growing tendency of people to limit the use of high starch foods and to increase consumption of fruits, vegetables, and other products.

With the current outlook for a smaller volume of exports of wheat from the United States, and the possibility that these conditions could continue indefinitely, quality becomes ever more important in relation to foreign markets.

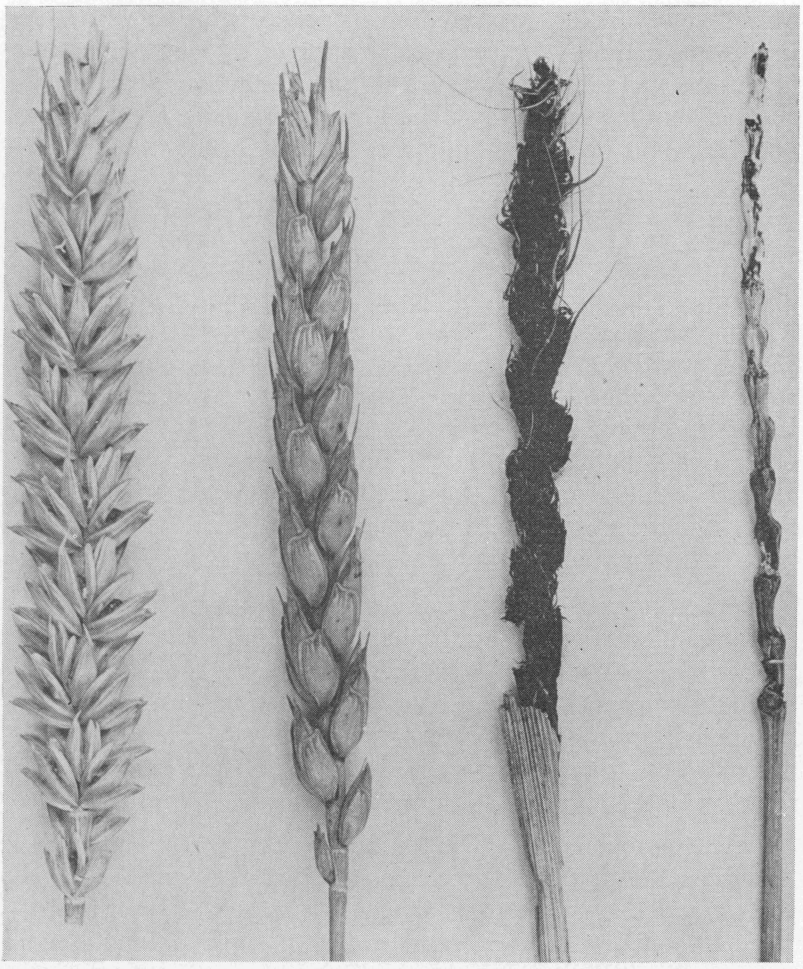

Figure 5. Left to right: Covered smut as it appears at harvest time, healthy wheat head, loose smut prior to harvest, and at harvest time. — (Photo courtesy Ceresan Division, E. I. du Pont de Nemours & Co., Inc.)

Government price support loans, administered by the Commodity Credit Corporation, have not provided differentials for inherent wheat variety quality differences. The flat loan rates based upon official wheat grades have affected the relationship between quality and price, especially in the years when there is a heavy movement into the loan. Each wheat producer, however, can visualize the effect on market price should supports be re-

moved and wheat be marketed on its actual value as determined in the free market. Under these circumstances, it is all the more important that wheat growers pay more attention to improving and maintaining quality as a basis for assuring the highest prices possible under prevailing supply and demand conditions.

Plant Diseases of Wheat

In some seasons diseases greatly affect the economical production of wheat in much of Texas. The relatively mild winters, if combined with high humidity during the winter and early spring, provide favorable conditions for the development and spread of airborne diseases. Leaf and stem rust are limiting factors in grain production in South Central Texas, and often in other areas. Soil-borne diseases, such as foot and root rots, take-all and pythium root rot, have at times been factors in production. Wheat mosaic could become serious, but as yet it has not been present to an alarming degree.

Some diseases, such as stinking smut, may be controlled by seed treatment; the root rots may be controlled or reduced by proper rotation and crop sequences; and others, such as the rusts, can only be controlled by growing resistant varieties. An extensive breeding program is in progress to develop improved varieties of wheat for the areas of production in Texas which will be resistant to the airborne and other type diseases.

The more important diseases which attack wheat under Texas conditions are given in Table 1 together with information on the disease and known means of control. Figure 5 shows heads of wheat infected with loose smut and with stinking smut (bunt) contrasted with normal heads and grains of wheat. Figure 6 shows infected stems from a stem rust susceptible wheat variety (Comanche) on the left and the resulting grain at the bottom, in contrast with a resistant wheat variety (Quanah) on the right and the resulting grain at the top.

Insects of Wheat

Insects are a serious hazard in the production of wheat. Numerous insects attack the plant from seeding time to maturity, while others are a constant threat to stored grain. In some seasons, in-

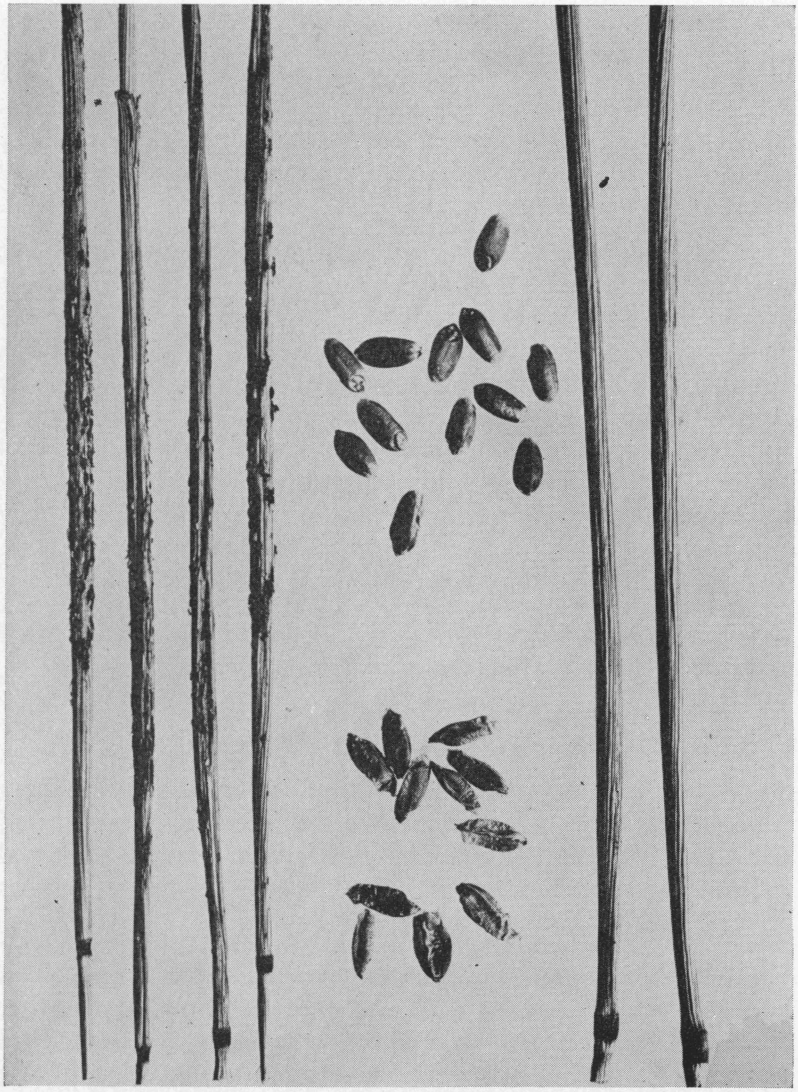

Figure 6. Stem rust susceptible wheat variety (Comanche) on the left and kernels at the bottom. Stem rust resistant wheat variety (Quanah) on the right and kernels at the top.

sects become a major problem in the production of the crop, as for example, the greenbug infestation which destroyed much of the wheat crop in 1950 and 1951. Often damage by insects is

aggravated by unfavorable environmental conditions for the crop which causes the crop to be less able to withstand the attacks.

New insecticides appear on the market frequently and recommendations for the control of insects change rapidly. The value of many insecticides is greatly influenced by temperature, humidity, and wind movement.

The rotation of crops is important in the control of insects attacking wheat, as well as other crops. Early seeding of wheat and the use of volunteer grain for livestock pasture often increase the insect hazard by supplying feed for insects and carrying them through the early fall until the new crop is established. This is especially true of greenbugs and other aphids. Spider mites survive from season to season by laying eggs on the wheat stems before maturity. The eggs do not hatch until conditions become favorable the following fall. Wheat sown on wheat land may then be attacked and damaged by mites that survive. Wheat on rotated or fallow land may not encounter this infestation.

The more important wheat field insects in Texas are listed in Table 2 (page 22) with information on control.

Grain Sanitation Program

Wheat is principally a human food and the Food and Drug Administration has jurisdiction over the interstate shipments of any food. Wheat marketed by the farmer may be presumed to be in interstate shipment and thus comes under the regulations of the Food and Drug Administration.

Wheat in storage can become contaminated by stored grain insects (weevils), rodents (rats and mice), and bird and poultry excreta. Unused treated seed wheat occasionally is marketed for human food, and this practice results in the violation of the regulations of the United States Food and Drug Administration, as does any sort of poison or filth.

Stringent sanitary control measures are expected to be followed by the Food and Drug Administration and all wheat producers should become familiar with them.

(Continued on Page 23)

Table 1. Brief Description and Suggested Means of Control of Some Important Diseases Attacking Wheat in Texas.

DISEASE	CONDITIONS FAVORING SPREAD OF THE DISEASE	PRINCIPAL METHOD OF SPREAD	PART OF PLANT ATTACKED	HOW THE DISEASE AFFECTS THE PLANT	RESISTANT VARIETIES*	OTHER METHODS OF CONTROL
Leaf rust	Showers, dews, temp. 50-75 F	Airborne	Leaf, leaf sheath	Leaf tissue destroyed	Westar, Quanah, Ponca, Frisco	No practical fungicidal control
Stem rust	Showers, dews, temp. 65-80 F	Airborne	Leaf, leaf sheath, stems	Tissues of Plant damaged or shriveled	Quanah, Frisco	No practical fungicidal control
Septoria leaf blotch	Cool, humid, temp. 45-60 F	Airborne	Leaf	Leaf tissue destroyed	None locally adapted	No practical fungicidal control
Septoria glume blotch	Cool, humid, temp. 60-75 F	Airborne	Nodes and floral bracts	Nodes & glumes blackened	None locally adapted	No practical fungicidal control
Powdery mildew	Cool, humid, temp. 45-60 F	Airborne	Leaf	Leaf tissue destroyed		No practical fungicidal control
Stinking smut	Cool soil, 60-65, late seeding	On seed	Seed	Destroys the seed	Comanche, Quanah	Ceresan M or other fungicides
Loose smut	High humidity at flowering time	Airborne	Entire floral parts	Destroys the entire head	Ponca, Pawnee	Hot water treatment
Mosaic	Not known	Insects	Roots, stems, leaves	Roots are destroyed, plant stunted	None known	Crop rotation
Root and foot rots	Warm soil	Soil	Roots, crowns	Roots, destroyed, plants stunted	None known	Crop rotation
Black chaff	High humidity, showers, heavy dews	Airborne	Glumes and grain	Kernel is discolored and damaged	None known	None known
Basal glume rot	High humidity, showers, dew	Airborne	Bracts and culms	Kernel is blackened	None known	None known

*Varieties resistant to present prevalent races. New races may appear to attack these varieties in the future.

Table 2. Control of Insects Attacking Wheat

PESTS	TREATMENT (Pounds Technical Material)	REMARKS
Wireworms	1 oz. lindane, or 1 oz. gamma BHC per bushel of seed	Insecticide should be thoroughly mixed with the seed just before planting.
Cutworms and armyworms	2 to 3 lbs. toxaphene, or 1 to 2 lbs. DDT as a spray or dust, or 2 to 3 lbs. toxaphene-DDT per acre as a spray	A thorough application should be made to the soil and young plants.
Mites	0.25 lb. to 0.50 lb. parathion per acre, applied twice, a week apart; or 0.25 lb. TEPP per acre applied as a spray	Do not allow livestock to graze grain within 14 days after applying parathion. If it is desirable to graze grain within 3 days following treatment, use TEPP.
Greenbugs	0.25 lb. parathion applied as spray	Do not allow livestock to graze grain within 14 days after applying parathion. Parathion will control greenbugs more effectively when temperatures are 50° F or above.
Chinch bugs	2 to 3 lbs. toxaphene, or 1 to 1½ lbs. DDT, or 1 to 1½ lbs. chlordane as a spray or dust	These pests may be controlled by spot treatment when first found.
Flea beetles	2 to 3 lbs. toxaphene, or 1 to 1½ lbs. DDT as a spray or dust	These pests may also be controlled by spot treatment.
Grasshoppers	1½ lbs. toxaphene, or 1 lb. chlordane, or 1/16 to 1/8 lb. dieldrin, or 1/8 to ¼ lb. aldrin, or ¼ lb. heptachlor, or ½ lb. gamma BHC per acre applied as spray or dust	If grasshoppers are migrating into a field the dosages should be increased and in some cases doubled. Treatments should be made to the hatching grounds before the hoppers move into cultivated crops.

For additional information on control of insects attacking grain, see Extension Service Circular 334 from which this table was taken.

CAUTION: All insecticides are poisons and precautions given on the labels should be strictly followed. Special precautions should be taken in handling TEPP or Parathion to avoid prolonged contact with the skin or breathing the vapors or drift from either sprays or dusts.

Harvesting and storing dry grain (12 percent moisture and under) will help safeguard against stored grain insects. Proper use of fumigants to control the insects once the grain is infested will minimize the insect hazard.

Good housekeeping around and in grain storage facilities will keep down rodents. A poisoning and trapping program will be more effective if the premises are clean.

For further details on sanitary measures to undertake in the proper storage of grain, contact your local county agricultural agent.

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