B-997 APRIL 1963

ON-FARM STORAGE AND DISPOSAL OF SORGHUM GRAIN

THE AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
TEXAS AGRICULTURAL EXPERIMENT STATION
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IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE

summary

The sorghum grain industry in the 1950's showed tremendous increases in production, utilization, carryover stocks and storage space. Utilization increases resulted from an increased awareness and acceptance by feeders and millers of its relative feeding value, an increasing number of livestock on feed, increases in concentrates fed per animal unit, a favorable price relative to other feed grains and gains in exports to foreign markets.

Off-farm storage space in Texas, in short supply in the late 1940's and early 1950's, mushroomed in the last decade. On-farm storage space increased but not as extensively as off-farm space. Data indicate about 100-million-bushels of farm storage capacity in the State, about half of which is used for storing sorghum grain. Stocks of sorghum grain in on-farm storage January 1 increased from 9 million bushels in 1953 to 53 million in 1960.

A higher proportion, 32 percent in 1959, of the sorghum grain crop in North Central Texas is stored on the farm. Comparable proportions for the High Plains and Coastal Bend were 19 and 8 percent, respectively. Smaller acreages on individual farms and a greater proportionate use of farm-stored grain in feeding operations explain the higher proportion in North Central Texas. Feeding operations were a greater influence in the High Plains than in the Coastal Bend where more of the farm storage was for the cash market (or CCC) operations.

About two-thirds of the 1959 sorghum grain crop in the Coastal Bend, one-half in North Central Texas and two-fifths in the High Plains were sold at harvest. This pattern would be expected as a result of declining prices, as the harvest season progresses from the Coastal Bend in June into North Central Texas in August and ends in the High Plains in October and November. Most of the sales at harvest are to commercial storage operators, although about one-tenth of the crop in North Central Texas is sold to feed mills, heavily concentrated in that area.

The flat type of storage structure is most prevalent on farms in all three areas. Too, the portable auger or elevator is used by most producers for moving grain into and out of storage. However, 31 percent used hand shovels to remove sorghum grain from storage in North Central Texas. Heavier use of sorghum grain for feeding in that area necessitated removal in small amounts.

Almost three-fourths of the producers with farm storage in the Coastal Bend had drying equipment and about the same proportion had aeration. Less than 10 percent of the producers in the other areas had drying or aeration equipment. Producers in the Coastal Bend harvest at considerably higher moisture content and have higher relative humidity than in the other areas, yet they had less loss of grain in storage and fewer problems associated with moisture than the other two areas. Their use of artificial drying and aeration facilities helps to control factors adversely affecting quality in storage. The fact that a large part of the grain stored on the farm in the Coastal Bend is later moved into market channels may explain, in part, the better care generally given farm-stored grain in that area.

Almost all the growers in the Coastal Bend also fumigated their farm-stored sorghum grain, while only half in North Central Texas and one-third in the High Plains did so. About half of the producers with aeration equipment in the Coastal Bend used it for fumigating. Most of the others in that area and more than four-fifths of those in the other areas used handsprays.

contents

acknowledgments

This study was conducted under contract by the Texas Agricultural Experiment Station for the Marketing Economics Division, Economic Research Service, U. S. Department of Agriculture.

The authors wish to express appreciation to Albert Graf of the Marketing Economics Division, USDA, for his assistance in initial planning of the study and for review and suggestions that materially contributed to the finished manuscript, and to Robert Hobson of the Texas Crop and Livestock Reporting Service for his assistance in constructing the questionnaire and conducting the mailed survey.

ON-FARM STORAGE AND DISPOSAL OF SORGHUM GRAIN

Charles W. Brown and Clarence A. Moore*

Purpose and Procedure

THIS STUDY WAS MADE TO DETERMINE (1) how producers dispose of their sorghum grain at harvest, (2) the kind and amount of on-farm storage facilities and (3) the storage and quality maintenance procedures practiced in storing sorghum grain on the farm. It provides information about what producers do, rather than prescribes what they should do under specified efficiency conditions.

Three sorghum grain producing areas were selected for study, Figure 1. Areas selected produce about three-fourths of the sorghum grain grown in Texas and have diverse physical and economic conditions affecting the production, storage and marketing of sorghum grains.

Information about disposal and storage practices in their own and in other areas should enable producers to evaluate better their own disposal alternatives and their farm storage practices. It should provide a basis for better decisions about investments in farm storage. Commercial grain storage warehousemen, and those considering new commercial storage facilities in sorghum grain producing areas, will find the information useful in evaluating the probable demand for storage services, and in improving their services and enlarging their trade. Public officials can draw on the results to evaluate trends in storing and marketing sorghum grains in the State.

Area I, the High Plains, produces about three-fifths of the State's sorghum grain. It has low precipitation and humidity, relatively low winter and high summer temperatures, a level topography, and is well suited to the use of large machinery. Large acreages of sorghum are grown under both dryland and irrigated conditions.

Sorghum has been a principal crop, along with cotton, for many years in the southern part of area I, but has expanded north into predominantly wheat country in recent years. Sorghum acreage mainly increased on diverted wheat acreage in the north and diverted cotton acreage in the south. It competes with wheat for storage in the north. Harvest usually begins in September and continues through November.

Area II, North Central Texas, produces slightly less than one-tenth of the State's sorghum grain, ranging from 24 to 28 million bushels in recent years. It has higher annual precipitation than the other two areas, but lower humidity than the Coastal Bend, because of its interior position. Low winter and high summer temperatures prevail. Sorghum production competes with corn, oats, barley and wheat more on a cost-returns, rather than acreage control, basis, but has increased on land diverted from cotton. It competes with the other grains for both farm storage space and commercial storage space. There has been considerable interest in expanding beef production and feeding operations and some effort in that direction. Farming in the area has been in a depressed condition since World War II, and farmers are searching for alternative enterprises to improve their economic conditions. Sorghum grain harvest usually begins in the latter part of July and reaches a peak in August.

Area III, the Coastal Bend, has medium rainfall, relatively mild winter and summer temperatures and high humidity. Sorghum mainly is grown on land not under irrigation, and production has expanded on acreage diverted from cotton. The area grows slightly more than one-tenth of the State's sorghum grain. Harvest usually begins in early June.

The main source of information for this study was mail questionnaires sent to sorghum producers. The first questionnaire asked for general data on production, storage and disposal of sorghum grain. A second questionnaire, sent to those that had on-farm storage space, requested information about their storage facilities and practices. A total of 1,545 general and 474 storage questionnaires was returned; these were the basis of the analysis.

Production Increases

The nation's average crop of sorghum grain was almost ten times larger during 1958-62 than in 1935-39. Texas' annual production varied from 40 to 75 per-

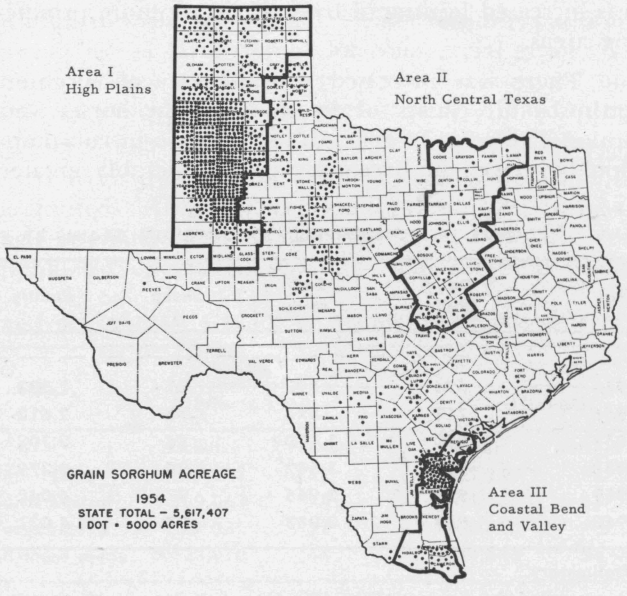

Figure 1. Sorghum grain producing areas studied.

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cent of national production, averaging slightly more than half in the late 1930's and slightly less than half in recent years.

Both higher yields and larger acreages contributed to production expansion. The average yield per acre in the late 1930's for both the United States and Texas was less than 15 bushels. It increased to about 30 bushels in the late 1950's and exceeded 40 bushels per acre in 1961.

The rather consistent increases in yield per acre in Texas since the 1930's were due to the adoption of better yielding varieties, improved cultural practices, greater use of fertilizer, increased use of irrigation and, more recently, the adoption of higher yielding hybrids.

Acreage diverted from cotton and wheat, under acreage control, paved the way for enlarging sorghum acreage, but the increasing economic advantage of the crop gave impetus to the shift. Increased mechanization in production and harvest and higher yields per acre lowered the production cost per bushel. In spite of the cost-price squeeze that prevailed for agriculture generally during the 1950's, it became more profitable to produce sorghum than other crops not under acreage control.

Changes in Utilization

Utilization of the nation's sorghum grain in 1960 was almost five times as high as in 1953. Although exports increased substantially, the greatest increase was in amounts fed to livestock.

Several factors account for the increased use of sorghums in livestock feeding. Animal units on feed increased substantially and concentrates fed per grain-consuming animal unit increased by almost 20 percent. Sorghum grain prices became more favorable relative to other feed grain prices and resulted in its substitution for other grains in the feed ration. Also, there was increased feeding of livestock in sorghum producing areas.

There was increased consumption of sorghum grain by all classes of livestock except horses and mules, Table 1. In general, the increase in consumption by classes of livestock was considerably greater than the increase in their numbers, indicating the gains were mainly in the amount fed per unit and at the expense of other feed grains. Further increase in its use by livestock appears to be the best potential for expanding sorghum utilization. Exports also may be increased under government programs and feed grain trade association promotions under Public Law 480. Industrial uses have not been large in the past, but there is some potential for expanding them.

Although demand and utilization increased substantially, production and supply of sorghums outstripped domestic and export requirements at existing price levels. This led to increasing carryover stocks, estimated at slightly more than 700 million bushels by 1960.

On-farm and Off-farm Storage and Stocks

Both off-farm and on-farm storage stocks of sorghum grain in Texas increased in the 1950's, but off-farm stocks increased more rapidly. January 1 off-farm stocks increased from 19 million bushels in 1953 to 394 million in 1960, while on-farm stocks increased from 9 to 53 million bushels.

The total on-farm storage space in Texas is not known exactly. However, more than 99 million bushels of all grain were stored on farms during the last quarter of 1958 and 92 million bushels in 1959. This indicates on-farm storage space slightly in excess of 100 million bushels. Sorghum grain occupied about half the space in 1960.

Farmers built farm grain storage facilities for several reasons. Some use them in feeding operations, others store grain under the CCC price support program or to sell later in the season, a few hold grain as a financial reserve or to level out incomes for tax purposes, and some feel that farm storage is cheaper than commercial storage. In some areas facilities were built because off-farm storage was not available when needed.

Disadvantages of farm storage vary depending on the particular conditions of individual operations. There is risk of loss caused by fire, wind, theft, spoilage and rodent and insect damage when the farmer stores in his own facilities. Proper management can

TABLE 1. CONSUMPTION OF SORGHUM GRAINS BY PRINCIPAL LIVESTOCK ON FARMS, UNITED STATES, 1955-60[1]

Year	Dairy cattle	Beef cattle	Sheep	Poultry	Hogs	Horses and mules	Other	Unaccounted[2]	Total
					1,000 Tons				
1955	694	803	81	2,323	409	33	120		4,461
1956	711	875	75	2,612	325	30	122	70	4,820
1957	990	1,400	84	3,703	520	40	210	576	7,523
1958	961	1,562	99	3,379	955	37	214	325	7,532
1959	991	2,945	97	4,042	1,736	20	203	1,154	11,188
1960	1,022	3,083	97	4,031	1,211	20	200	2,636	12,300

[1]Preliminary.

[2]Unaccounted for figures reflect differences between actual amount of feed that disappeared and the number of livestock reported.
Source: Unpublished data, ERS, U. S. Department of Agriculture.

TABLE 2. GENERAL QUESTIONNAIRE: NUMBER OF RESPONDENTS AND RESPONDENTS WITH FARM STORAGE

Area	Respondents	Respondents with farm storage	
	— — Number — —		Percent
High Plains	753	338	45
North Central	554	305	55
Coastal Bend	238	36	15
All areas	1,545	679	44

prevent spoilage, rodent and insect losses. Insurance can lessen some of the other risks.

Many farmers are unwilling to devote the necessary time to maintain and handle grain stored on the farm. This, along with increasing availability of off-farm facilities, probably explains why farm storage expanded less than commercial storage. Farmers generally are willing to let those who specialize in storage, handling and drying care for their grain.

ON-FARM STORAGE FACILITIES

Farm storage is predominantly of the flat type in the areas studied. Most farm storage in the High Plains was constructed before 1956, while in the other two areas, most was constructed during 1956-60. Most of the farm storages reported in North Central Texas are small units used to store feed and seed for farm use. A large number of the storages in the High Plains are also in small units and similarly used, although quite a few of the more recent constructions were built to hold commercial grain either under the CCC price support program or for later market sale. Most farm storages in the Coastal Bend are larger units used for commercial grain.

There were several reasons farmers in all three areas installed farm storage to handle sorghum grain specifically. In order of importance they were (1) to use in feeding operations, (2) less expensive than commercial storage, (3) lack of nearby commercial facilities and (4) to put grain into farm storage under CCC.

Slightly less than half of the sorghum grain producers in the High Plains, more than half in North Central Texas and only 15 percent in the Coastal Bend had farm storage in 1960, Table 2. About one-third of those with farm storage in the High Plains, nine-tenths in the North Central area and only one-sixth in the Coastal Bend used their storage for other grains, as well as sorghum.

This is in line with the competitive position of other grains with sorghum in the three areas. In the High Plains, wheat is the dominant competitive commercial grain crop. While oats and barley are grown in much less quantity, they probably compete with sorghum grain to a much greater extent for farm storage than for commercial storage space. In North Central Texas corn, oats, barley and wheat are grown, are used to a greater extent in feeding farm livestock,

TABLE 3. STORAGE QUESTIONNAIRE: NUMBER SENT, NUMBER OF RESPONSES AND STORAGE CAPACITY

Area	Questionnaire sent	Respondents	Respondents' total storage capacity	Respondents' average capacity
	— Number —		— — Bushels — —	
High Plains	338	306	3,321,062	10,853
North Central	305	149	1,096,228	7,357
Coastal Bend	36	19	345,660	18,193
All areas	679	474	4,762,950	10,048

and probably all compete for farm storage space. No other grain is grown on a significant commercial scale in the Coastal Bend. However, a few farmers in that area store small amounts of seed and other grains to use in feeding livestock.

The average size of farm storage units in all areas was only 10 thousand bushels, although the average in the Coastal Bend was considerably higher than this and in North Central Texas, lower.

About two-thirds of the farm storage space in all areas was built before 1956, Table 4. However, this mainly was influenced by constructions in the High Plains where the greatest amount of farm storage is located. Four-fifths was constructed in that area before 1956. Almost two-thirds of the farm storage in North Central Texas and more than three-fourths in the Coastal Bend were built during 1956-60.

The flat building is the dominant type of structure for farm storage, Table 5. More than four-fifths of the total storage space was of the flat type in both 1955 and 1960 in the High Plains and North Central Texas. Farm storage space in the Coastal Bend in 1955 was about evenly divided between the flat and round metal bin types. However, the area increased its farm storage space during 1956-60 more proportionately than the other two areas; over three-fourths was the flat type by 1960. The larger average size of units in the Coastal Bend, greater recent expansion, greater use of farm storage for commercial grain and use of aeration suggests more of the flat units in this area are probably modern steel structures than in the other areas.

Future increases in farm storage probably will be limited. Although feed lot operations are increasing, especially in the High Plains, they usually are specialized operations separate from sorghum grain

TABLE 4. ON-FARM STORAGE BY PERIODS WHEN CONSTRUCTED[1]

Area	Total capacity			
	Prior to 1956		1956-60 inclusive	
	Bushels	Percent	Bushels	Percent
High Plains	2,687,812	81	633,250	19
North Central	389,063	35	707,165	65
Coastal Bend	77,035	22	268,625	78
All three areas	3,153,910	66	1,609,040	34

[1]Quantities of storage space in the table are only for those producers answering the storage questionnaire.

TABLE 5. ON-FARM STORAGE CAPACITY BY TYPE OF CONSTRUCTION, 1955 AND 1960[1]

Location	Type	Total on-farm capacity			
		1955		1960	
		Bushels	Percent	Bushels	Percent
High Plains	Flat storage	2,383,064	89	2,830,798	85
	Round metal bin	227,713	8	307,872	9
	Silo	77,035	3	182,392	6
North Central	Flat storage	326,213	84	916,443	84
	Round metal bin	62,850	16	179,785	16
	Silo				
Coastal Bend	Flat storage	39,635	51	266,483	77
	Round metal bin	37,400	49	63,106	18
	Silo			16,071	5
All three areas	Flat storage	2,748,912	87	4,013,724	84
	Round metal bin	327,963	10	550,763	12
	Silo	77,035	3	198,463	4

[1]Quantities of storage space in the table are only for those producers answering the storage questionnaire.

production. Too, the large increase in commercial storage facilities, coupled with government efforts to decrease production and carryover stocks of grain suggests that competition among elevators to provide commercial storage space to farmers will be keen.

About four-fifths of the producers in all areas use a portable auger or elevator to put grain into farm storage. Hand shovels were used by almost one-fifth of the producers in the High Plains and North Central Texas. Similar equipment was used for removing the grain from storage, except that a higher proportion (31 percent) in North Central Texas used hand shovels. This reflects the removal in small lots to use for feeding.

DISPOSITION OF SORGHUM GRAIN AT HARVEST

The producer has several alternatives in disposing of his sorghum grain. At harvest he may either sell or store the grain. If he stores it, he may put it in farm storage or in a commercial elevator. Grain stored at harvest may or may not be placed under CCC loan. Sales of grain may be made to elevator buyers, feed mills, truckers or through various other outlets.

Data were obtained from 1,545 producers who grew more than 251 thousand acres of sorghum grain in 1959, Table 6. They produced almost 11 million bushels or about 5 percent of the total crop in the areas studied. Acreage by respondents was only a slightly smaller proportion of total acreage than their production was of total production. This indicates that respondents probably were representative of all producers for purposes of the study. Factors affecting their disposal decisions change from year to year, but data probably reflect the usual differences between areas.

Slightly less than half of the sorghum grain production was sold outright at harvest, Table 7. Two-thirds was sold by producers in the Coastal Bend, one-half in North Central Texas and two-fifths in the High Plains. Harvest begins in the Coastal Bend in June and July, moves through North Central Texas and ends in the High Plains in October and November. The market for new grain is relatively strong in early harvest and tapers off as the season advances. The average midmonth grain sorghum price for Texas consistently declined each month in 1959 from $2.02 per hundredweight in May to $1.50 and $1.49, respectively, in September and October. Thus, it becomes more feasible to store as the season advances and prices decline. This accounts for the higher proportion sold in the Coastal Bend and lower proportion sold in the High Plains.

Most sales at harvest were to elevators in all areas, but 11 percent of the crop in North Central Texas was sold to feed mills. Feed milling is concentrated more heavily in that area than in the other two.

There has been some concern about an increase in farm sales to truckers who bypass local elevators, moving the grain directly to terminals or mills. Results of the study do not support this. Sales to truckers were rather insignificant in 1959. Producers in North Central Texas sold the largest proportion (4 percent) to this outlet.

Producers in North Central Texas stored almost one-third of their sorghum grain crop on the farm and only one-fifth of the amount stored was put under the CCC loan. Small acreages are grown in the area and more sorghum grain is used on the farm as feed for livestock. Similarly, slightly less than one-fifth of the sorghum grain was stored on farms in the High Plains, much of it for livestock feed. Feeding operations are expanding in the area, but mainly on a commercial and specialized basis separate from grain

TABLE 6. SORGHUM GRAIN PRODUCTION, ON-FARM STORAGE AND ACREAGE BY AREAS, 1959

Item		Units	High Plains	North Central	Coastal Bend	All areas
Total respondents		Number	753	554	238	1,545
Sorghum grain production	Total[1]	1,000 bushels	163,231	23,197	24,877	211,305
	By respondents	1,000 bushels	7,430	1,023	2,353	10,806
	By respondents	Percent	4.6	4.4	9.5	5.1
Sorghum grain acreage	Total[1]	Acres	3,735,000	720,000	655,000	5,110,000
	By respondents	Acres	167,187	29,448	54,459	251,094
	By respondents	Percent	4.5	4.1	8.3	4.9

[1]Crop and Livestock Reporting Service, AMS, U. S. Department of Agriculture, February 10, 1960, release.

TABLE 7. DISPOSAL OF SORGHUM GRAIN AT HARVEST BY PRODUCER RESPONDENTS, 1959

Disposition	High Plains	North Central	Coastal Bend	Three area total
	Quantities			
	— — — — 1,000 Bushels — — — —			
Production by respondents	7,430	1,023	2,353	10,806
Stored on farm	1,383	323	194	1,900
Stored in commercial elevator	3,104	193	555	3,852
Sold outright at harvest	2,943	507	1,604	5,054
	Proportions			
	— — — — — Percent — — — — —			
Stored on farm				
by producer	18.6	31.6	8.2	17.6
Under CCC loan	7.7	6.2	3.5	6.7
Not under CCC loan	10.9	25.4	4.8	10.9
Stored in commercial elevator				
by producer	41.8	18.9	23.6	35.6
Under CCC loan	33.4	15.2	20.2	28.8
Not under CCC loan	8.4	3.7	3.4	6.8
Sold by producers	39.6	49.5	68.2	46.8
To elevators	35.3	32.3	63.2	41.1
To feed mills	2.0	11.1	1.8	2.8
To truckers	0.6	4.1	1.3	1.1
To others	1.7	2.0	1.8	1.8
Total disposition	100.0	100.0	100.0	100.0

production, so probably most sorghum grain stored on farms for feed is used where livestock are a supplementary enterprise. The low proportion stored on the farm in the Coastal Bend is, in part, a consequence of high humidity in that area which intensifies the risk and increases the cost of farm storage.

Most sorghum grain stored in commercial elevators was put under CCC loan. The proportion stored in commercial facilities was considerably higher in the High Plains than in the other areas. Large acreages and production and a later harvest season are contributing factors. However, the amounts stored in elevators in all areas are something of a residual. The amount stored on-farm generally is fixed by the producer's feed needs or the available storage space. Sales at harvest occur as long as the market price is more favorable than the net CCC loan rate. When the price drops below that level, the remaining sorghum grain is placed in commercial storage, usually under CCC loan.

QUALITY MAINTENANCE PRACTICES

Quality maintenance and proper handling of sorghum grain stored on farms are highly important. Grains stored for later disposal in commercial channels may have savings more than offset by deterioration in quality. If stored to feed farm livestock, considerable grain may be lost by improper handling.

Most storage problems are caused by high moisture and excessive trash which lead to damage by insects, mold and heat. Moisture problems may result from placing high moisture content grain in storage or by leakage of moisture into the storage bin. Farmers have tended to harvest grain at higher moisture content, because of increased mechanization, development of artificial drying and aeration facilities and the ever-present concern about potential weather loss, insect damage and shattering.

Quality maintenance practices differ considerably among producers and between areas. The producer storing on the farm should make sure his practices are adequate for the job in his area.[1] The condition of the grain going into storage is as important as the handling of the stored grain.

Drying and Aeration

Twelve percent is considered a safe moisture level for sorghum grain in farm storage for 1 year without aeration, or longer with aeration. Grain sorghum with 14 percent moisture has been stored safely for 9 months when aerated.[2] Moisture content above 14 percent is considered unsafe for storage.

Only one-sixth of the sorghum growers in the Coastal Bend harvested at moisture levels less than 15 percent, compared with about four-fifths in the other two areas, Table 8. While moisture content of harvested grain varies during the season, and estimates may not be exact, artificial drying is necessary for grain harvested at the high levels indicated in the Coastal Bend.

Drying and aeration are widespread in the Coastal Bend area largely because humidity and moisture problems are severe. Also, more of the farm-stored sorghums are for commercial rather than feeding purposes, either stored under the CCC price support program with its strict moisture requirements or for later sale. Slightly less than three-fourths of the producers with on-farm storage have their own drying equipment and another 12 percent custom dry at elevators. Three-fourths of the producers are equipped to aerate more than one-half and, most of them, 100 percent of their capacity.

[1]Quality maintenance recommendations are discussed in the following publication: Allen, W. S. and Sorenson, J. W., Jr., *Drying and Storing Sorghum Grain,* Texas Agricultural Extension Service, Bulletin 888, February, 1958.

[2]Sorenson, J. W., Jr., Kline, G. L., Redlinger, L. M., Davenport, M. G. and Aldred, W. H., *Research on Farm Drying and Storage of Sorghum Grain,* Texas Agricultural Experiment Station, Bulletin 885, December, 1957.

TABLE 8. PROPORTION OF GROWERS THAT HARVESTED SORGHUM GRAIN WITHIN SPECIFIED MOISTURE CONTENT CATEGORIES BY AREAS, 1959

Moisture content	Proportion of sorghum producers		
	High Plains	North Central	Coastal Bend
	— — — Percent — — —		
12 percent or less	10	26	0
More than 12 but less than 15 percent	67	58	17
15 percent and above	23	16	83

Producers with on-farm storage in the North Central and High Plains rely on field drying to bring the moisture content within storable limits. Less than 10 percent had drying facilities and a similarly low percentage had aeration equipment. In lieu of aeration, a few producers turn their sorghums during storage. Despite more favorable climatic conditions, moisture problems do occur, as shown by the fact that the main reason for loss of quality during storage was high moisture.

The necessity for drying and aeration facilities in the Coastal Bend explains, in part at least, the larger-sized individual storage units. Higher investments in drying and aeration equipment may require larger units and volumes to operate on a paying basis.

Fumigation

One-third of the producers with storage in the High Plains, about half in North Central Texas and nine-tenths in the Coastal Bend fumigated their farm-stored sorghum grain in 1959. Lower temperatures in the High Plains, when grain is moved into storage, probably aids in restricting insect infestation.

Most producers in all three areas who fumigated did so only once. However, one-fifth of those who fumigated in the High Plains and one-third in North Central Texas did so twice, and a few in North Central Texas and in the Coastal Bend fumigated from three to six times.

Most growers in the High Plains and North Central Texas used a handspray to fumigate. Slightly less than half in the Coastal Bend used their aeration systems and one-third used handsprays.

Insects are a major problem of farm storage, and farmers were not successful entirely in control practices. Insects constituted 18 percent of the reasons for loss in the High Plains, 40 percent in the North Central area and 60 percent in the Coastal Bend.

Adequacy of Practices to Maintain Quality

The adequacy of quality control practices for farm-stored sorghum grain by growers cannot be evaluated precisely from data obtained in the study. Risk of some loss may be justified in areas with low risk if the cost of its avoidance should exceed the realized savings over a period of time. However, oftentimes the loss incurred is much higher than growers realize. This is true especially of both quantity and quality losses of farm-stored grain for use in feeding. However, some quality loss may not be as important in farm feeding as for market grains. Most quality control measures involve relatively small cost, are not difficult to undertake, and probably would be justified for most farm-storage situations.

The lowest grade of sorghums was either number 1 or number 2 for 90 percent of the farm-stored grain. Number 3 was the lowest grade recorded by operators in the Coastal Bend, whereas a small proportion showed sample grades in the other two areas.

Moisture, either its content in the grain or as leakage in the storage facility, made up half the reasons for storage loss in the High Plains; and insects, birds and rodents and high grain temperature were other dominant reasons given. Insect infestation was the main reason given in North Central Texas. Birds and rodents, moisture, trash in grain and high grain temperature were next most dominant in that order.

Insects were also the main reason for loss in stored grain in the Coastal Bend, with a scattering of other reasons, none of which was dominant. It would appear from the response, that growers in the Coastal Bend are less plagued by loss in farm-stored grain than the other two areas. This may be expected in view of the greater prevalence of driers and aeration equipment and use of fumigation practices among producers in that area.

FUTURE IMPORTANCE OF ON-FARM STORAGE

Over-all farm storage is expected to decrease in importance in the total storage picture. In the 1950's, commercial storage capacities scarcely could keep pace with increased production. Some farmers were forced by necessity to provide storage for their own grain.

Today, conditions are reversed. Production has leveled off so that there is unfilled capacity in commercial houses. Elevator operators are competing with each other to store the farmers' production. This condition makes it increasingly difficult for the sorghum producer to profit from building additional storage space.

Two other trends imply that farm storage will become less important. One is the trend toward specialized livestock feeding of purchased rather than home grown feeds. The other is the trend toward use of a balanced, ground-and-mixed feed ration rather than whole grains. Both trends, if continued, mean less farm storage space will be required for grain used in livestock feeding.

However, some new farm storages will continue to be built, because there are those who believe they can store grain profitably for CCC. Others feel they can store their grain for sale later in the marketing year at less cost than the cost of elevator storage. In either case, individual units can be expected to be larger and equipped with more adequate handling facilities.

Now that the urgency to build storage space no longer exists, construction costs and prospective profits will be more dominant factors in deciding whether to build storage space.

In the High Plains and North Central areas, farmers already having storage space and those planning to build should give more consideration to the installation of aeration equipment and use more efficient practices to maintain the high quality of the grain put into storage.