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# Bulk Handling of Milk on Texas Dairy Farms



TEXAS AGRICULTURAL EXPERIMENT STATION

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# Summary

This report summarizes information obtained in the North Texas and Corpus Christi areas during the spring and summer of 1957 on dairy farms which have converted their operations to the bulk system of producing and handling milk.

Texas dairy farmers are operating larger units, milking more cows, selling more milk and generally becoming more commercialized. They also are making efforts to increase their efficiency by utilizing methods which contribute to more efficient production and marketing of fluid milk.

Bulk handling of milk on the farm generally adds to efficient operation. About 27 percent of Texas' 8,600 Grade "A" dairy farmers are operating under the bulk system. Approximately half of the 2,500 bulk tanks on Texas dairy farms were installed during 1957, and the rapid rate of converting to bulk operation is continuing.

In general, the larger dairymen were the first to substitute bulk tanks for 10-gallon cans, but many smaller producers are converting to bulk operation.

Bulk equipment owners who, at the time of the interview, had been operating under the bulk system 1 year or longer, had increased their milk production 24 percent at the end of 12 months and the number of cows in their milking herds 19 percent. The increase in production by bulk producers was about three times greater than the increase of the average producer on the market and eight times greater than the increase of the average producer still delivering milk in cans.

Tank owners in North Texas reported reductions in hauling costs ranging from 5 to 40 cents per hundredweight of milk; producers in the Corpus Christi area reported reductions from 4 to 36 cents in changing from cans to bulk tanks. North Texas producers reported that the average difference in hauling rates between the can and bulk system was 15 cents per hundredweight; in the Corpus Christi area, the average difference was 10 cents. Savings in transportation charges is the largest monetary advantage of the bulk system of handling milk.

Dairymen interviewed in North Texas had tanks ranging from 150 gallons to 1,000 gallons, while tanks in the Corpus Christi area ranged from 200 gallons to 1,000 gallons. The average tank in North Texas had a capacity of 400 gallons of milk, and in the Corpus Christi area the average tank held about 550 gallons.

Forty-nine percent of the dairymen interviewed in North Texas and 25 percent in the Corpus Christi area had purchased pipelines in addition to tanks. The cost of pipelines installed averaged $2,235 per farm.

The high cost of tanks and other bulk equipment is the main obstacle to the rapid adoption of the bulk system for handling milk. Lack of credit is not a problem since most producers can obtain financing at reasonable terms. Many farmers hesitate to convert to bulk equipment because they are uncertain about the profitability of the system. The cost of tanks ranges from $2,130 or $11.83 per gallon of capacity for a 180-gallon tank to $5,250 or $5.25 per gallon of capacity for a 1,000-gallon tank.

Dairy farmers purchase bulk equipment to save on transportation costs, to reduce physical requirements of labor and to produce more sanitary milk. Other reasons include pressure from handlers, replacement of wornout can equipment and attainment of more accurate milk weights and butterfat tests.

Present production, seasonality of production, future expansion expected in output, milk pickup schedule and possible delays in milk pickups should be considered in determining the proper size of bulk tank. The general rule for determining the proper tank size is two and one-half times the average daily production for every day pickup and four times daily production for every other day pickup, if future production is expected to increase one-third more than the present output.

# Bulk Handling of Milk on Texas Dairy Farms

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THE 12,800 TEXAS DAIRY FARMERS SELLING MILK operate in 248 of the 254 counties in the State. These dairymen produced an estimated 3.2 billion pounds of milk and sold about 2.6 billion pounds during 1957. The farm value of milk and cream sold to plants and dealers by farmers amounted to 138 million dollars, with 115 million dollars coming from sales of whole milk. The gross farm income from dairying accruing to Texas farmers during 1957 was 170 million dollars.

The dairy industry in Texas has become highly commercialized during recent years. While the number of commercial dairies in the State decreased from 42,000 in 1954 to 12,800 in 1957, total milk production and sales of milk, butter and cream by farmers have not decreased appreciably.

During this same period, however, total volume of fluid milk sold by Texas farmers more than doubled while the volume consumed on farms where produced, and not entering commercial channels, decreased by two-thirds.

The average Texas dairy producer selling milk during 1957 marketed seven times more milk than the average producer did during 1944 and five times more than in 1949. In addition to supplying fluid milk to a greatly increased urban population, Texas commercial dairymen also are producing and marketing the milk consumed by about half of the rural residents in the State who, according to the U. S. Census of Agriculture, did not have milk cows in 1954. In 1940, milk cows were found on 93 percent of Texas farms.

With these shifts and trends in the number of farmers selling milk and the volume of milk marketed per farm, the dairy farmer plays a larger role in supplying milk to urban and other rural population than ever before.

As dairy farmers expand their business, milk more cows on the average, sell more milk and generally become more commercialized, it is to their advantage to produce more efficiently by adopting as many of the innovations as possible that contribute to more efficient and economical production and marketing of their product.

Pipeline milking and the bulk tank system of storing and transporting fluid milk usually are considered the most recent and far-reaching contributions to efficiency and savings in the amount and physical requirements of labor, Figures 1 and 2.

This report summarizes information obtained during the spring and summer of 1957 from Texas dairy farmers who have converted their operations to the bulk system of producing and handling milk.

## Purpose of Study

Converting from the can to the bulk tank system of operation is one of the most important decisions facing dairymen. In addition to requiring a large outlay of capital for new equipment, shifting to the bulk system usually changes drastically the physical requirements of labor and the operations in milking and fluid milk handling. This is true especially if a pipeline system is installed along with a tank. Adjustments are necessary in production practices as well as in milk storage and handling functions.

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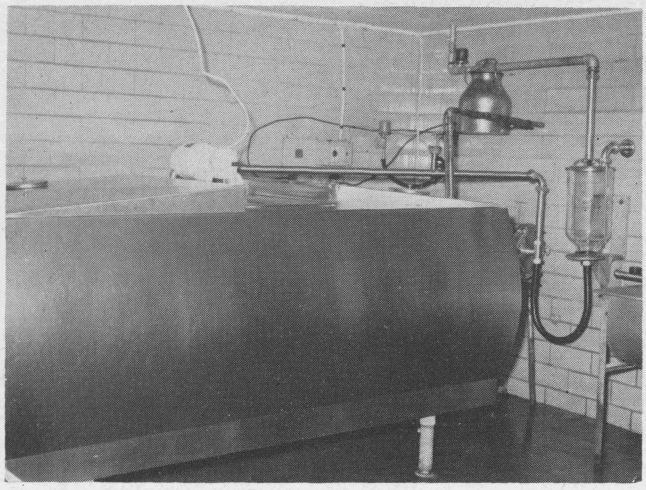

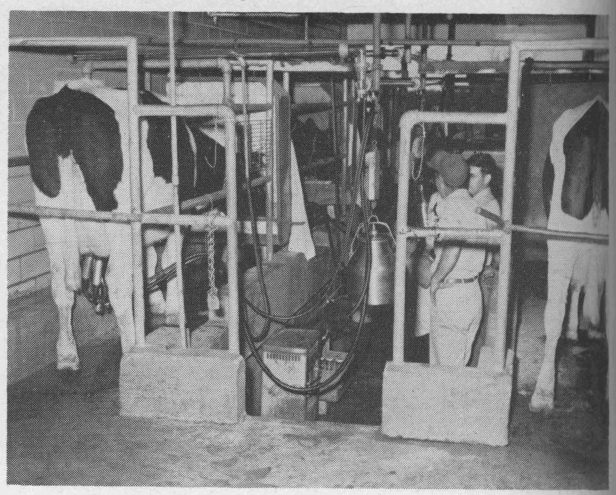

**Figure 1. Bulk tank, pipeline and modern milking parlor add generally to efficiency and to lower milk handling costs.**

Many Texas dairymen are trying to attain Grade "A" status. Producers also are encouraged to increase their production to satisfy the expanding local markets for Grade "A" milk. Throughout the State, milk distributors, processors and producers associations are encouraging dairy farmers to turn from the 10-gallon milk can and pickup truck to bulk storage and transportation facilities. These changes present the dairy industry with problems of production, handling and distribution and require additional capital investment and increased production in some areas.

Texas farmers utilizing the bulk system report reduction in transportation cost of 10 to 30 cents per hundredweight over the can system. They also report increases in butterfat content, improvements in milk quality and reductions in labor requirements.

Although the first bulk system was installed on a large Texas dairy farm during the late 1930's, a substantial volume of milk was not handled in bulk on Texas farms until the spring of 1954. Since that time, Texas farmers have converted rapidly to the bulk system. About 2,500 of the 8,600 Grade "A" dairymen in the State are operating under the bulk system. In the North Texas market, 61 percent of the producer milk is delivered in bulk to plants and receiving stations by 42 percent of the producers.

Comparisons should be made of changes in production, storage and handling costs, changes in volume and product quality and increased cap-

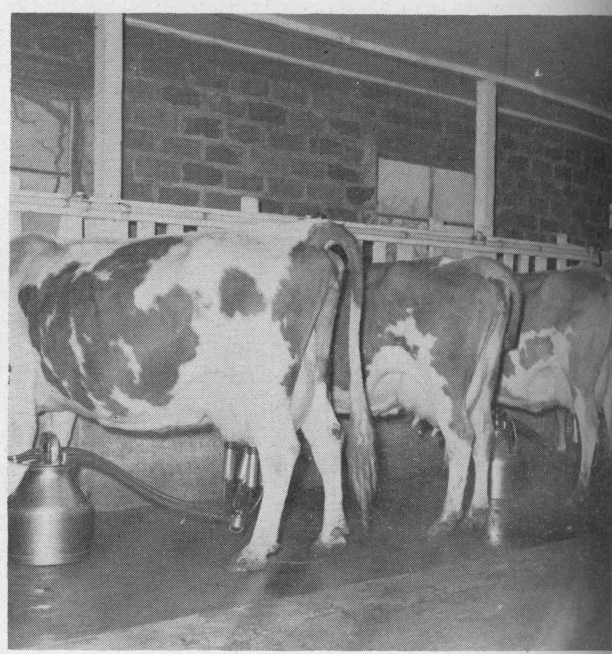

**Figure 2. Cans, can coolers and conventional-type milking parlors are being replaced with pipelines, bulk tanks and modern milking parlors by many Texas dairymen.**

ital investment. The economics involved in the difference between the can and tank system could affect materially the number of dairy farmers who make the conversion and stay in the dairy business and those who do not make the change and eventually are forced out of business.

## Objectives

The main objectives of this study are to determine the extent to which milk producers are adopting the bulk tank system of handling milk and the reasons for adopting this method. This study also attempts to find out the effects of this system for handling milk on production, herd size and composition, storage and hauling costs, labor requirements, butterfat content and general quality of the product and also to determine the optimum size of tank at various levels of production and the capital requirements and annual fixed costs for conversion to the system.

## Method of Study

The information reported in this study was obtained through personal interviews with a representative sample of dairy producers in the North Texas and Corpus Christi milk marketing areas, Figure 3.

During the spring of 1957, when the interviews were conducted, 736 of the 3,200 producers in the 24-county North Texas area and 53 of the 328 producers in the 7-county Corpus Christi area were using the bulk handling system.

A random sample of 230 producers was drawn from the list of all bulk producers in the North Texas area. In the Corpus Chrisit area the sample consisted of all tank owners in the area. Information considered reliable and complete enough for analysis was obtained from 191 tank owners in North Texas and 36 in the Corpus Christi area.

The North Texas and Corpus Christi areas were selected for the study primarily because producers of these areas had made the greatest progress in converting to bulk method of milk handling. These areas had 72 percent of the 1,100 tanks on Texas farms as of January 1957. The producing and marketing areas are well defined geographically and extend over several counties; they are located at opposite ends of the State, representing wide differences in climate, soil and pasture conditions and general dairy farm operating conditions.

During 1957, dairy farmers in the 34 counties included in those two areas comprised 42 percent of Grade "A" milk producers in the State. Those farmers marketed 38 percent of the 2.6 billion pounds of whole milk sold by Texas farmers in 1957 and received 45 percent of the total 115 million dollars that Texas dairy farmers got as the farm value of fluid milk sales.

Information also was obtained from 179 dairy farmers in North Texas who were selling milk in 10-gallon cans. The same sampling procedure was used in selecting can producers as was used for bulk producers.

## Characteristics of Bulk Producers

On the average, producers in South Texas control a larger acreage and have more cows in the milking herd than those in North Texas. There was a significant difference in herd composition between the two regions. Holsteins were found on more farms in North than in South Texas and the average North Texas Holstein owner had one-third more cows than the dairyman in the South. The reverse holds true for Jerseys.

Interviews with producers operating with 10-gallon cans in North Texas indicate that they are smaller operators, on the average. They control one-fourth fewer acres and have 60 percent as many cows in the milking herd as bulk producers. During the spring of 1957 the average bulk tank owner delivered twice as much milk as the average producer handling milk in cans. The average producer using cans is about 4 years older than the bulk tank owner.

In general, the larger dairymen were the first to install bulk equipment. However, a larger proportion of the smaller producers now are buying tanks. An indication of this trend is presented in Table 1, which shows that during January 1956 less than 40 percent of the 307 bulk operators in North Texas produced under 30,000 pounds of milk each but during June 1957 about 61 percent of the 952 bulk producers were in this group.

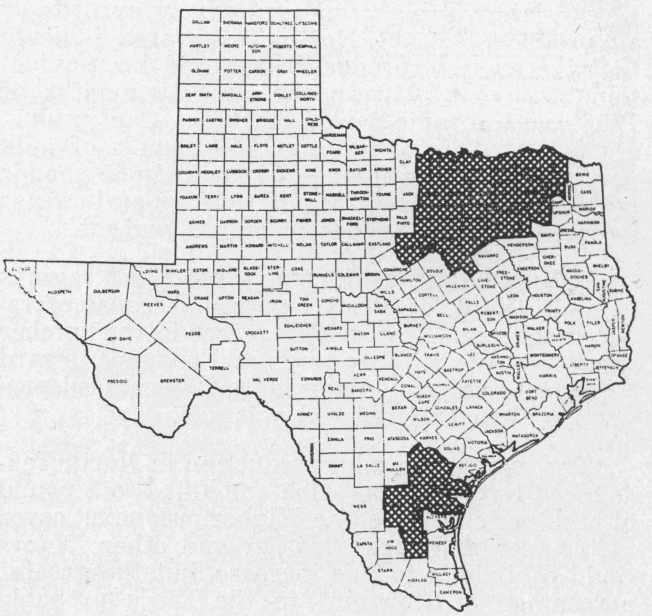

**Figure 3. Location of counties included in the survey.**

TABLE 1. COMPARISON OF RELATIVE VOLUME OF MILK PR

| Pounds of milk delivered during the month | January 1956 | | | | August 1956 | | |
|---|---|---|---|---|---|---|---|
| | Number of producers | Percent of producers | Production, thousand pounds | Percent of total bulk | Number of producers | Percent of producers | Produc thousand |
| Less than 10,000 | 2 | .6 | 18 | .1 | 11 | 2.0 | 8 |
| 10,000 to 19,999 | 38 | 12.4 | 592 | 4.6 | 122 | 21.8 | 1,94 |
| 20,000 to 29,999 | 82 | 26.7 | 2,057 | 15.9 | 166 | 29.6 | 4,14 |
| 30,000 to 39,999 | 65 | 21.2 | 2,263 | 17.4 | 106 | 18.9 | 3,60 |
| 40,000 to 49,999 | 43 | 14.0 | 1,934 | 14.9 | 71 | 12.7 | 3,19 |
| 50,000 to 59,999 | 26 | 8.4 | 1,427 | 11.0 | 28 | 5.0 | 1,51 |
| 60,000 to 69,999 | 14 | 4.6 | 902 | 7.0 | 16 | 2.9 | 1,04 |
| 70,000 to 79,999 | 14 | 4.6 | 1,050 | 8.1 | 19 | 3.4 | 1,41 |
| 80,000 to 89,999 | 6 | 2.0 | 583 | 4.5 | 8 | 1.4 | 67 |
| 90,000 to 99,999 | 5 | 1.6 | 478 | 3.7 | 4 | .7 | 37 |
| 100,000 and over | 12 | 3.9 | 1,665 | 12.8 | 9 | 1.6 | 1,17 |
| Total | 307 | 100 | 12,969 | 100 | 560 | 100 | 19,15 |

[1]From records of the North Texas Milk Market Administrator.

## *Effect of Bulk Operation*

### PRODUCTION

Thirty-nine percent of the tank owners in North Texas and 47 percent in the Corpus Christi area reported that bulk tanks had no noticeable effect on the volume of milk they produced. However, 37 percent of the North Texas tank owners reported a slight increase and 9 percent reported a considerable increase while 33 percent of the Corpus Christi producers reported a slight increase and 6 percent a considerable increase in the amount of milk produced. Fourteen percent of the producers in both areas did not specify the effect of bulk operation on milk volume.

Milk production records for 145 of the 191 bulk producers in the North Texas area indicate that the total production increased 24 percent from the 3-month period preceding the dates they obtained bulk equipment to the same 3 months 1 year later, Table 2. Milk delivery records of all producers in the North Texas area indicate that the average producer increased his production 8 percent between the first 10 months of 1956 and the same period of 1957. Can producers delivered an average of 643 pounds of milk per day during the spring of 1956 and 665 pounds per day during the spring of 1957, or an increase between the two periods of only 3 percent.

Bulk handling equipment gives a net savings in milk volume of about 1 percent because of reduced spillage. However, increases in the number of cows in the milking herds and changes toward more Holsteins contribute more to increased production than this reduced wastage.

The increase in total production in North Texas after 1 year of operation amounted to 1 pound of milk per day per cow. Higher producing cows, better feed and care, weather and other factors could contribute to this increase, but the greater percentage of Holsteins in the herds probably contributed the greater part.

Efforts of tank owners to minimize overhead costs of bulk equipment ownership by obtaining maximum utilization of tank capacity is another incentive to increased production. Many farmers installed tanks that were one-third to one-half larger than required for every other day pickup. Some were utilizing their tanks to only 25 percent of capacity. While the average tank was approximately 400 gallons, the average producer still handling milk in cans produced 65 gallons per day and can get by with a 200-gallon tank. Thus more 200-gallon tanks are needed to accomodate the smaller producers.

### SIZE AND COMPOSITION OF HERD

Dairymen interviewed in North Texas had an average of 52 cows in the milking herd before they obtained bulk handling equipment, and an average of 61 cows while operating in bulk. Corpus Christi producers reported an average of 60 cows before installing bulk tanks and 72 at time of interview. Excluding farmers who reported no change in size of herd (and including only those reporting either an increase or a decrease) the average North Texas dairyman added about 12 cows to his herd while Corpus Christi area producers increased their herds by almost 24 cows on the average. Changes in size and composition of herds are indicated in Tables 3, 4 and 5.

Comparisons of size and composition of herds of 145 bulk tank owners in North Texas before and after installing tanks indicate that they had increased their milking herds by 1,429 cows, or an average of 10 cows each. However, 78 percent of this increase was Holstein cows, 16 percent Jerseys and 6 percent other breeds.

### BUTTERFAT

Sixty-one percent of the tank owners reported no noticeable change in the butterfat content of their milk with bulk tanks, while 37 percent reported a higher fat content and 2 percent, a lower fat content.

DAIRYMEN HAVING BULK TANKS, NORTH TEXAS MARKET[1]

| | December 1956 | | | | June 1957 | | | |
|---|---|---|---|---|---|---|---|---|
| ent of l bulk | Number of producers | Percent of producers | Production, thousand pounds | Percent of total bulk | Number of producers | Percent of producers | Production, thousand pounds | Percent of total bulk |
| .4 | 17 | 2.4 | 116 | .4 | 31 | 3.3 | 202 | .7 |
| 10.2 | 106 | 15.0 | 1,745 | 6.6 | 243 | 25.5 | 3,898 | 13.2 |
| 21.6 | 221 | 31.3 | 5,421 | 20.6 | 307 | 32.2 | 7,580 | 25.6 |
| 18.8 | 136 | 19.3 | 4,728 | 18.0 | 171 | 18.0 | 5,871 | 19.8 |
| 16.7 | 85 | 12.0 | 3,801 | 14.5 | 88 | 9.2 | 3,948 | 13.4 |
| 7.9 | 49 | 6.9 | 2,546 | 9.7 | 47 | 4.9 | 2,593 | 8.8 |
| 5.5 | 27 | 3.8 | 1,726 | 6.6 | 22 | 2.3 | 1,428 | 4.8 |
| 7.4 | 24 | 3.4 | 1,809 | 6.9 | 17 | 1.8 | 1,264 | 4.2 |
| 3.5 | 10 | 1.4 | 865 | 3.3 | 13 | 1.4 | 1,098 | 3.7 |
| 2.0 | 12 | 1.7 | 1,140 | 4.4 | 3 | .3 | 290 | 1.0 |
| 6.1 | 20 | 2.8 | 2,372 | 9.0 | 10 | 1.1 | 1,405 | 4.8 |
| 100 | 707 | 100 | 26,269 | 100 | 952 | 100 | 29,577 | 100 |

The total amount of butterfat contained in the milk marketed by 145 North Texas tank owners before and after obtaining tanks shows a fat content decrease from 4.04 to 3.90 percent, or .14 percentage points, Table 2. This 3.5 percent decrease in total butterfat content may be accounted for by changes in herd composition and the 11 percent increase in Holstein cows.

### BACTERIA

Thirty-eight percent of the tank owners in North Texas and 40 percent in the Corpus Christi area reported no noticeable change in the bacteria count of their milk after they installed bulk equipment. However, 56 percent of the North Texas producers and 60 percent of the Corpus Christi producers reported decreases in bacteria count of their milk, while 6 percent of the North Texas producers reported a slight increase in bacteria.

### TRANSPORTATION COST

Although studies in other areas on bulk handling equipment show some reductions in bacteria count, less spillage of milk and savings of physical labor, the most significant savings are reductions in milk hauling costs.

Producer milk is transported to plants in trucks owned by farmers, trucks belonging to milk handlers or cooperative associations that purchase the milk, or in trucks owned by contract haulers. Seventy-three percent of the farmers in North Texas and 70 percent in the Corpus Christi area had their milk hauled under contract during the spring of 1957. Trucks belonging to handlers or cooperative associations hauled the milk for 23 percent of the North Texas farmers and for 30 percent of those in the Corpus Christi area.

The hauling costs of tank owners in North Texas ranged from 15 to 40 cents per hundredweight compared with charges ranging from 20 to 60 cents reported by Corpus Christi producers, Table 6. Before installing a tank the average North Texas tank owner interviewed paid 38 cents per hundredweight to have his milk hauled in cans. After installation of a tank, the average hauling rate was reduced to 23 cents. In the Corpus Christi area, the average reduction was from 53 cents to 43 cents.

In North Texas, 96 percent of the dairy farmers reported reductions in hauling rates between cans and tanks of 10 to 20 cents per hundredweight of milk. Of these, 23 percent reported reductions of 10 cents, 48 percent reported reductions of 15 cents and 25 percent reported reductions of 20 cents.

Analyses of the total cost to all North Texas producers for transporting milk from the farms to plants during May 1957 show that milk hauled in cans costs an average of 37 cents per hundred pounds while milk hauled in bulk tanks costs an average of 23 cents or a difference of 15 cents per hundred pounds. Transportation cost data for individual producers are not available but, based on total costs of transporting milk from the farms to plant locations in North Texas, the range in cost to producers per hundred pounds of milk marketed during May 1957 was as indicated in Table 7.

## *Reasons for Purchasing Bulk Equipment*

The average tank owner gave two or more reasons for purchasing bulk handling equipment. The reasons given most frequently and the percentage of farmers interviewed are: to reduce the physical requirements of labor, 53 percent; to save on transportation charges, 48 percent; to produce more sanitary milk, 39 percent; to reduce the amount of labor and therefore milk more cows, 30 percent; pressure by handlers who refused to pick up or receive milk in cans, 22 percent; and to replace worn out can equipment, 22

TABLE 2. CHANGES IN MILK AND BUTTERFAT PRODUCTION BEFORE AND AFTER INSTALLING BULK HANDLING EQUIPMENT, 145 FARMERS, NORTH TEXAS

| Item | Milk production, 90-day period | Butterfat content of milk, percent fat |
|---|---|---|
| Total Production | | |
| Before tank, pounds | 12,596,000 | 4.04 |
| After tank, pounds | 15,690,000 | 3.90 |
| Percent change | 24 | — .14 |
| Production per cow | | |
| Before tank, pounds | 1,660 | |
| After tank, pounds | 1,738 | |
| Percent change | 4.1 | |

percent. Other reasons are: to obtain more accurate weights of the milk marketed, 8 percent and to get more accurate butterfat tests, 3 percent.

## INFLUENCE OF HANDLERS

As the proportion of producer milk in cans received in plants decreases relative to bulk receipts, many handlers attempt to avoid the high cost of dual milk receiving by accepting only bulk milk. Under such a situation farmers still handling milk in cans and selling it to those plants must convert to bulk handling or find a handler willing to accept milk in cans. Farmers unable or unprepared to install tanks may suffer inconveniences or economic losses. However, the economic effect on farmers usually is reduced when handlers announce their intention in time for producers to install tanks.

Seventy-four percent of the tank owners interviewed in the Corpus Christi area and 37 percent of those in North Texas reported that handlers had encouraged them to install tanks.

Of the North Texas producers encouraged by handlers to purchase tanks, 53 percent reported they were forced to purchase bulk equipment because handlers purchasing their milk quit accepting milk in cans. In the Corpus Christi area 16 percent of the producers reported they were encouraged by handlers to install tanks. Other forms of handler encouragement consisted of informing farmers about the benefits of bulk handling and granting producers premiums for bulk milk.

# *Advantages and Disadvantages of Bulk Handling*

Because of the high cost of bulk tanks, dairy farmers contemplating converting from cans to tanks should consider carefully both the advantages and disadvantages of bulk operation.

## LOWER HAULING COSTS

From the monetary standpoint the greatest advantage of bulk handling of milk is the reduction in milk hauling costs. Reductions in haul-

TABLE 3. SIZE AND COMPOSITION OF HERD, CAN AND TANK SYSTEMS, NORTH TEXAS

| Number of cows in herd | Number of farms | Breed of cattle[1] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Jersey | | Holstein | | Other breeds | |
| | | Number of farms with Jerseys | Average number of cows per farm | Number of farms with Holsteins | Average number of cows per farm | Number of farms with other breeds | Average number of cows per farm |
| | | | | Can system | | | |
| No can experience | 15 | | | | | | |
| Less than 10 | 1 | 1 | 5.0 | 1 | 4.0 | | |
| 10 to 19 | 3 | 3 | 8.0 | 3 | 8.3 | | |
| 20 to 29 | 27 | 23 | 12.7 | 19 | 13.6 | 10 | 12.6 |
| 30 to 39 | 28 | 19 | 19.4 | 20 | 20.4 | 8 | 19.1 |
| 40 to 49 | 30 | 22 | 21.6 | 23 | 26.5 | 8 | 25.4 |
| 50 to 59 | 26 | 21 | 27.7 | 22 | 26.5 | 13 | 14.2 |
| 60 to 69 | 22 | 17 | 25.8 | 16 | 42.4 | 7 | 36.1 |
| 70 to 79 | 19 | 17 | 27.4 | 16 | 40.5 | 11 | 25.3 |
| 80 and over | 20 | 16 | 36.3 | 16 | 88.9 | 8 | 28.9 |
| Total | 191 | 139 | 23.2 | 136 | 34.1 | 65 | 22.0 |
| | | | | Tank system | | | |
| Not given | 1 | | | | | | |
| Less than 10 | | | | | | | |
| 10 to 19 | | | | | | | |
| 20 to 29 | 15 | 15 | 10.7 | 15 | 12.0 | 7 | 7.3 |
| 30 to 39 | 38 | 25 | 16.1 | 29 | 23.6 | 9 | 20.0 |
| 40 to 49 | 22 | 19 | 17.9 | 16 | 27.8 | 9 | 20.9 |
| 50 to 59 | 33 | 26 | 21.0 | 29 | 29.7 | 16 | 19.4 |
| 60 to 69 | 22 | 18 | 21.8 | 18 | 40.3 | 9 | 30.3 |
| 70 to 79 | 25 | 21 | 36.8 | 17 | 48.4 | 12 | 18.0 |
| 80 and over | 35 | 28 | 32.1 | 32 | 78.4 | 15 | 23.3 |
| Total | 191 | 152 | 23.1 | 156 | 40.0 | 77 | 20.4 |

[1]Some farmers had more than one breed of cattle.

TABLE 4. SIZE AND COMPOSITION OF HERD, CAN SYSTEM AND TANK SYSTEM, CORPUS CHRISTI AREA

| Number of cows in herd | Number of farms | Breed of cattle[1] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Jersey | | Holstein | | Other breeds | |
| | | Number of farms with Jerseys | Average number of cows per farm | Number of farms with Holsteins | Average number of cows per farm | Number of farms with other breeds | Average number of cows per farm |
| | | | | Can system | | | |
| No can experience | 5 | | | | | | |
| Less than 10 | | | | | | | |
| 10 to 19 | | | | | | | |
| 20 to 29 | 6 | 6 | 22.0 | 2 | 5.0 | 1 | 8.0 |
| 30 to 39 | 7 | 6 | 28.0 | 4 | 15.2 | 1 | 2.0 |
| 40 to 49 | 4 | 2 | 40.0 | 3 | 32.0 | | |
| 50 to 59 | 3 | 1 | 56.0 | | | 2 | 53.0 |
| 60 to 69 | | | | | | | |
| 70 to 79 | 1 | 1 | 28.0 | 1 | 42. | | |
| 80 and over | 10 | 9 | 109.4 | 1 | 10.0 | | |
| Total | 36 | 25 | 58.0 | 11 | 28.1 | 4 | 29 |
| | | | | Tank system | | | |
| Less than 10 | | | | | | | |
| 10 to 19 | | | | | | | |
| 20 to 29 | 1 | 1 | 25 | 1 | 2.0 | | |
| 30 to 39 | 12 | 9 | 23.4 | 8 | 18.0 | 2 | 20.5 |
| 40 to 49 | | | | | | | |
| 50 to 59 | 5 | 3 | 52.0 | 2 | 29.0 | 2 | 27.5 |
| 60 to 69 | 2 | 1 | 27.0 | 2 | 54.0 | | |
| 70 to 79 | 1 | 1 | 34.0 | 1 | 33.0 | 1 | 5.0 |
| 80 and over | 15 | 13 | 108.0 | 4 | 49.5 | 2 | 42.5 |
| Total | 36 | 28 | 66.3 | 18 | 30.2 | 7 | 26.6 |

[1]Some farmers had more than one breed of cattle.

ing rates under the bulk system arise from consolidation of can routes and converting to every other day pickup, and result in decreased mileage and time required per hundredweight of milk handled.

## SAVINGS IN LABOR

Although it was difficult to determine the exact savings in labor requirements by changing to bulk operation because the number of cows milked increased after the change, there are indications of reduction in man hours per hundred pounds of milk. Tank owners reported utilizing less time for milking and barn feeding, and cleaning and sterilizing milk rooms and barns. Bulk handling equipment contributes to reductions in the physical requirements of labor when a pipeline is used with a tank and lifting heavy cans of milk is eliminated.

## SAVINGS IN CANS AND CAN COOLERS

These can be applied to the depreciation and upkeep cost of tanks.

## WASTAGE AND STICKAGE

In addition to spilling of milk from cans during handling and some butterfat sticking to can lids, losses usually occur through some milk not draining out of cans. These show up as a difference in weight and a decreased fat test. Under bulk handling these losses are minimized.

## MILK WEIGHED ON FARM

Since milk volume is taken while the milk is in the tank, bulk operators appear better satisfied with volume determination and any spillage in handling is for the account of the handler or hauler.

## UNIFORM FAT TEST

Thorough mixing of the milk in the tank before fat samples are taken assures more uniformity in the fat sample.

## IMPROVEMENT IN MILK QUALITY

Some handlers offer premiums for milk with low bacteria count. Although bulk tanks will not insure milk quality, they make it easier to maintain milk quality and thus benefit from premiums paid for low bacteria milk.

## HIGH INITIAL COST

Other expenses usually are associated with bulk equipment such as the cost of remodeling and rewiring the milk room and improving the road leading to the milk room to accomodate the larger tank trucks.

## POSSIBLE LOSS OF MILK

If milk in a tank is rejected because of quality, the supply from four milkings is lost if it is on an every other day pickup schedule; under the can system only one can may be rejected.

TABLE 5. CHANGES IN SIZE AND COMPOSITION OF HERD ON FARMS CHANGING TO BULK METHOD OF OPERATION, NORTH TEXAS AND CORPUS CHRISTI AREAS

| Breed[1] | Total number of farms | Farms with increase | | | Farms with decrease | | | Net change | |
|---|---|---|---|---|---|---|---|---|---|
| | | Farms reporting | Total increase | Average increase per farm reporting | Farms reporting | Total decrease | Average decrease per farm reporting | Total cows | Average per farm reporting |
| | | | | North Texas | | | | | |
| Jersey | | 45 | 400 | 8.9 | 23 | 231 | 10.0 | + 169 | + 2.5 |
| Holstein | | 70 | 1389 | 19.8 | 18 | 253 | 14.0 | +1136 | +12.9 |
| Other | | 26 | 176 | 6.8 | 10 | 126 | 12.6 | + 50 | + 1.4 |
| Total | 112[2] | 131 | 1965 | 15.0 | 51 | 610 | 12.0 | +1355 | +12.1 |
| | | | | Corpus Christi area | | | | | |
| Jersey | | 10 | 288 | 28.8 | 4 | 58 | 14.5 | + 230 | +16.4 |
| Holstein | | 9 | 178 | 19.8 | 1 | 15 | 15.0 | + 163 | +16.3 |
| Other | | 4 | 37 | 9.2 | 0 | 0 | 0.0 | + 37 | + 9.3 |
| Total | 18[3] | 23 | 503 | 21.9 | 5 | 73 | 14.6 | + 430 | +23.9 |

[1]Some farmers had more than one breed of cattle.
[2]Excludes 15 farms which had no can experience and 64 farms reporting no change in total number of cows.
[3]Excludes 5 farms which had no can experience and 13 farms reporting no change in total number of cows.

TABLE 6. TRANSPORTATION CHARGES AND MILES TO PLANT, NORTH TEXAS AND CORPUS CHRISTI AREAS

| Transportation charge, cents per hundred pounds | Can system | | Tank system | |
|---|---|---|---|---|
| | Number of farms reporting | Average number of miles to plant | Number of farms reporting | Average number of miles to plant |
| | | North Texas | | |
| Not given | 28[1] | | 7[1] | |
| 15 | | | 1 | 9.0 |
| 20 | | | 88 | 32.0 |
| 25 | 6 | 24.8 | 87 | 71.8 |
| 30 | 23 | 31.6 | 6 | 124.2 |
| 35 | 10 | 36.8 | 1 | 30.0 |
| 40 | 115 | 65.0 | 1 | 125.0 |
| 42 | 1 | 65.0 | | |
| 43 | 2 | 18.5 | | |
| 45 | 2 | 39.0 | | |
| 50 | 1 | 105.0 | | |
| 55 | 1 | 30.0 | | |
| 60 | 2 | 40.0 | | |
| Total | 167 | 54.6 | 184 | 54.3 |
| | | Corpus Christi area | | |
| Not given | 9[1] | | 1 | |
| 20 | | | 1 | 32.0 |
| 25 | | | | |
| 35 | | | 3 | 46.7 |
| 40 | 1 | | 4 | 61.0 |
| 41 | 1 | | 4 | 69.5 |
| 42 | | | 1 | 68.0 |
| 44 | | | 3 | 73.3 |
| 45 | 1 | 75.0 | 4 | 75.5 |
| 46 | | | 1 | 78.0 |
| 47 | | | 1 | 80.0 |
| 50 | 10 | 69.3 | 12 | 102.1 |
| 51 | 1 | 50.0 | | |
| 60 | 2 | 64.0 | 1 | 71.0 |
| 61 | 1 | 80.0 | | |
| 62 | 1 | 68.0 | | |
| 65 | 6 | 89.1 | | |
| 75 | 4 | 115.0 | | |
| Total | 27 | 78.2 | 35 | 78.2 |

[1]Includes farmers who had no can experience, farmers who did their own hauling and farms for which data were not available.

## Bulk Tank Cost

The average cost of milk tanks installed on North Texas dairy farms is shown in Table 8. These costs include the basic unit with a calibration chart, the compressor, freight and installation charges. For a 400-gallon tank, these average about $2,200 for the basic unit, $600 for the compressor and $320 for freight and installation. Usually there are other cost items associated with ownership and operation of a bulk tank averaging about $100 per farm. This includes $50 for labor and material to rewire the milk room, $20 for an agitator timer and $30 for cleaning brushes and fluid, wall opening and tank sanitary cap.

The cost per gallon capacity ranges from $11.83 for a 180-gallon tank to $5.25 for a 1,000-gallon tank.

## Comparison Between Investment and Savings

Texas tank owners believe that tanks should last an average of 17 years, while most tank dealers estimate that the basic tanks should last 15 or more years. However, tanks have not been in use long enough for anyone to know exactly how long they will last under operating conditions.

At total savings of 15 cents and 10 cents per hundredweight of milk as indicated for North Texas and Corpus Christi producers and 15-year tank life, and allowing 3 percent of the installed tank cost for upkeep and repairs, insurance and taxes, the break-even points between additional investment for bulk equipment and total savings are shown in Table 9.

Maximum savings can be obtained only when tanks are utilized to capacity. After considering

differences in ownership and use costs between cans and bulk equipment, North Texas tank owners with savings of 15 cents per hundredweight of milk can expect to break even on an additional investment for bulk equipment of about $452 per hundred pounds of milk marketed per day over the estimated 15-year life of tanks. Corpus Christi producers reporting average savings of 10 cents per hundredweight, can expect to break even on an additional investment of $301 per hundred pounds of milk marketed per day. With an average production of 665 pounds per day, North Texas producers still selling milk in cans could afford to repay an additional investment of $3,016 for bulk equipment over an estimated tank life of 15 years with savings of 15 cents per hundredweight of milk, Figure 4.

In addition to direct savings in transportation costs, producers may want to include less noticeable savings such as reduced labor requirements, cans and can cooler replacement, reduced milk spillage and stickage, when these apply to their operation.

Figure 4 shows how a dairy farmer, producing 600 pounds of milk per day, may determine how much he can afford to pay for bulk equipment and break even at the end of 15 years if his savings will amount to 15 cents per hundredweight during that time. He can do this by locating the 15-cent point on the horizontal axis of Figure 4. Directly above this point on the vertical axis to the line representing 600 pounds, the two lines intersect at a point which the scale on the left indicates will support an additional investment of about $2,700.

A farmer may know that bulk equipment will cost him $3,000 and that he will save 10 cents per hundredweight if he markets his milk in bulk. By using Figure 4, he can determine how much milk he will have to sell per day to break even over a 15-year period by buying the equipment. In this case he locates the $3,000 figure to the left of the chart; the vertical line directly across represents the 10 cents per hundredweight savings. At that point the chart indicates that he will have to market about 1,000 pounds of milk per day to pay for the equipment out of savings during 15 years.

## Pipeline Cost

Ninety-six of the 191 bulk operators interviewed in North Texas and 10 of the 36 in the Corpus Christi area had pipelines along with tanks. However, pipeline owners enjoy decreased

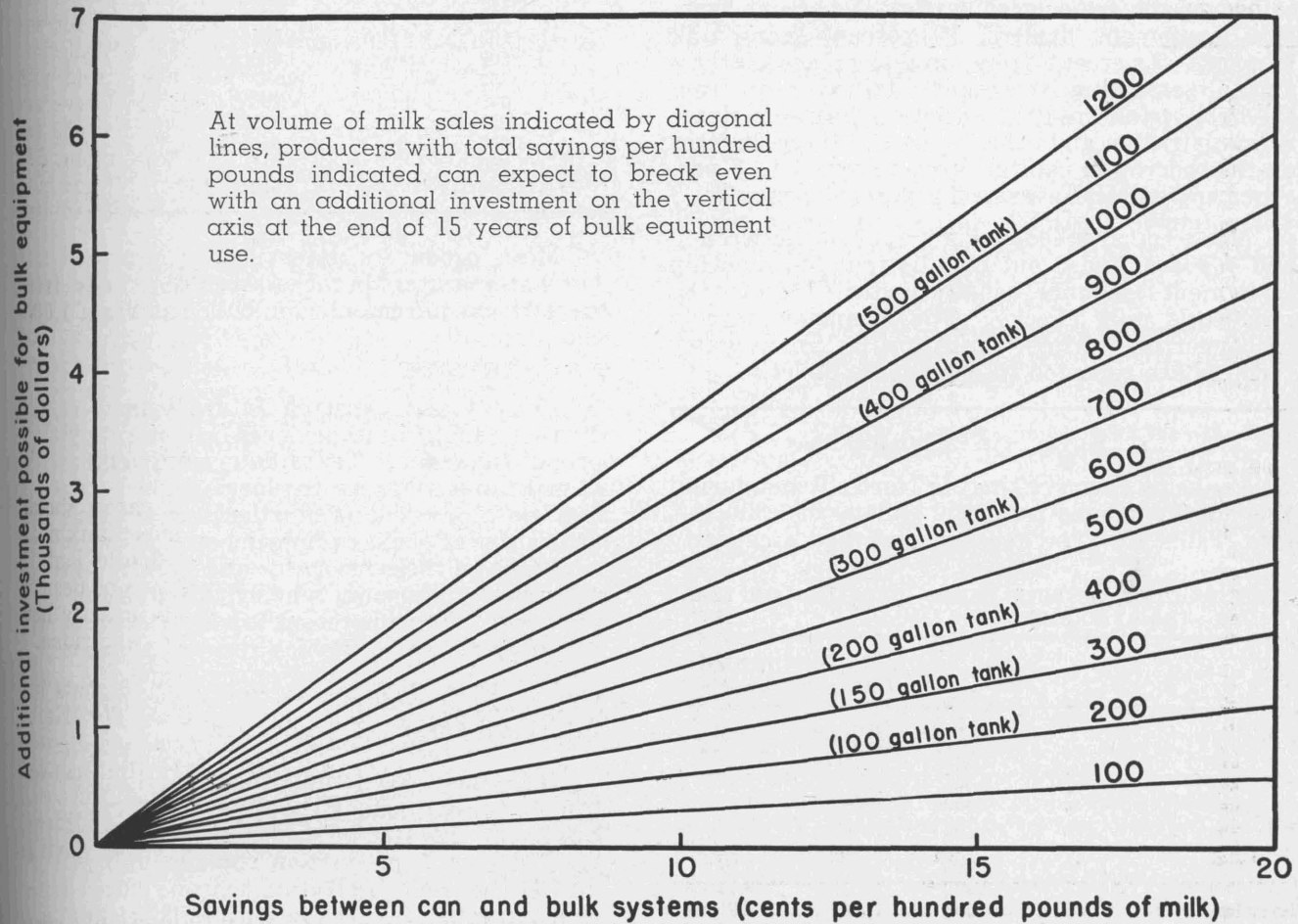


Figure 4. Relationship between savings through bulk handling of milk and additional investment possible for bulk equipment.

TABLE 7. AVERAGE COST OF TRANSPORTING 100 POUNDS OF MILK, NORTH TEXAS MARKET

| Plant location | Can | Bulk | Difference |
|---|---|---|---|
| | | Cents | |
| Location A | 37 | 24 | 13 |
| Location B | 29 | 21 | 8 |
| Location C | 41 | 26 | 15 |
| Location D | 40 | 25 | 15 |
| Average, all locations | 37 | 23 | 14 |

physical labor requirements attributable to this equipment only at a substantial cost. The cost of pipelines installed averaged $2,235 per farm. Glass pipelines had average cost of $2,294 as compared with $1,882 for metal pipelines. However, the average length of metal pipes reported was 51.7 feet compared with 72.4 feet for glass and on a linear foot basis, metal pipelines averaged $36.40 per foot as compared with $31.70 for glass. Where applicable, costs of pipelines should be considered with tank costs in any analysis of total savings versus additional investment for bulk operaton.

## Financing

Eighty-three percent of farmers having bulk milk handling equipment obtained credit to purchase tanks. Forty percent of those farmers obtained credit from local banks, 35 percent from bulk equipment dealers, 10 percent from milk handlers, 5 percent from producers associations and the remaining 10 percent obtained credit from the Production Credit Association, Farmers Home Administration and other sources. Interest rates on this borrowed capital ranged from 4 to 8 percent per year and averaged 5 percent per year.

Most loans called for repayment between 3 and 4 years, and 9 out of 10 stipulated monthly repayment amounts usually deducted from the producer's milk checks. The financing aspects of converting to bulk operation by Texas dairy farmers are reported in a separate bulletin.

## Size of Tanks

Tanks on farms visited in North Texas during this survey ranged from 150 gallons to 1,000 gallons, Table 10. The average tank had a capacity of 400 gallons and 27 percent of the producers had tanks of this size. Ninety-three percent of the producers interviewed had purchased tanks ranging from 250 to 600 gallons. Thirty-four percent of all tanks had a capacity of 250 and 300 gallons, and 33 percent were 500 to 600 gallons.

TABLE 8. COST OF BULK TANKS INSTALLED ON TEXAS DAIRY FARMS

| Size of tank | Cost to farmer | Cost per gallon of capacity |
|---|---|---|
| Gallons | Dollars | |
| 180 | 2,130 | 11.83 |
| 250 | 2,330 | 9.32 |
| 300 | 2,750 | 9.17 |
| 400 | 3,120 | 7.80 |
| 500 | 3,650 | 7.30 |
| 600 | 4,000 | 6.67 |
| 700 | 4,300 | 6.14 |
| 800 | 4,645 | 5.81 |
| 1,000 | 5,250 | 5.25 |

In the Corpus Christi area, the size of tanks ranged from 200 to 1,000 gallons and the average tank had a capacity of 450 gallons. Twenty-nine percent of the producers in that area purchased a 300-gallon tank and 20 percent purchased a 500-gallon tank. Eleven percent purchased a 400-gallon tank and the same number purchased a 600-gallon tank.

TABLE 9. BREAK-EVEN POINTS BETWEEN TOTAL SAVINGS AND ADDITIONAL INVESTMENT

| Daily milk production | Additional investment possible for bulk | |
|---|---|---|
| | Total savings of 10 cents per cwt. over 15 years | Total savings of 15 cents per cwt. over 15 years |
| Pounds | Dollars | |
| 100 | 301 | 452 |
| 150 | 452 | 798 |
| 200 | 602 | 904 |
| 250 | 753 | 1,130 |
| 300 | 903 | 1,356 |
| 350 | 1,054 | 1,582 |
| 400 | 1,204 | 1,808 |
| 500 | 1,505 | 2,260 |
| 600 | 1,806 | 2,712 |
| 700 | 2,107 | 3,164 |
| 800 | 2,408 | 3,616 |
| 900 | 2,709 | 4,068 |
| 1,000 | 3,010 | 4,520 |
| 1,100 | 3,311 | 4,972 |
| 1,200 | 3,612 | 5,424 |

Most producers interviewed purchased new hot water heaters because those they had did not meet the requirements for bulk handling.

### PROPER SIZE

Present and expected future volume of production should be considered in determining the proper tank size. Texas dairymen who have obtained tanks that are too large for most economical use at present production can get maximum utilization of their equipment only through large additions to their resources and greatly increased milk sales. Farmers who have purchased tanks too small for their present production must resort to daily milk pickup which results in higher hauling charges. Additional expenditures for larger bulk handling equipment will be necessary for any future expansion of production.

Dairymen contemplating purchasing bulk tanks should consider the following factors in deciding on the size of tank: present production; seasonality of production, or amount produced during the peak production season; future expansion expected in production; milk pickup schedule; and possible delays in pickups.

Although pricing regulations in milk marketing orders are designed to reduce seasonal fluctuations in milk deliveries by producers, most Texas markets operating under Federal Marketing Orders still have large seasonal fluctuations in fluid milk delivered by local producers. Bulk operation has not resulted in reduced seasonality of production. Seasonality of average daily production for the 191 bulk tank owners included in this study and all milk producers in the North Texas area from the spring of 1954 through the spring of 1957 are shown in Table 11.

The average dairyman contemplating installing a tank should allow for about 25 percent between his low and peak production season.

Since 93 percent of the producers interviewed in North Texas and 89 percent interviewed in the Corpus Christi area had their milk hauled by contract haulers under every other day pickup schedules, tanks should be large enough to hold 2 full days' production. An extra allowance should be made to hold one additional milking to take care of possible delays in the pickup schedule.

North Texas bulk equipment owners increased production an average of 24 percent after 1 year of bulk operation. The average dairyman should allow for a future increase of one-third more than his present production.

On the basis of this analysis, the general rule in figuring the proper tank size is two and one-half times the average daily production for every day pickup and four times daily production for every other day pickup if an allowance of one-third of present production is desired to hold future increases in production.

## Producers Using Cans

Interviews with North Texas dairymen using cans indicate that they hesitate to purchase bulk equipment because of the high initial cost, reluctance to borrow money, uncertainty of the profitableness of bulk operation, lack of sufficient volume of milk production and age.

A large number of the can producers expressed a desire to convert to bulk operation. Almost 50 percent reported they had discussed the matter with tank dealers. However, 43 percent of these stated they had not discussed the matter of obtaining credit for that purpose.

The number of bulk operators on the North Texas market increased from 736 in January 1957 to 1,325 in January 1958, indicating that many of those can producers fulfilled their desire to convert their operation to bulk.

Eighty-six of the 179 can producers interviewed anticipated no difficulty in getting their milk hauled to the plant if they handled milk in bulk. About 5 percent thought they could not get their milk picked up by a contract bulk hauler. However, as larger proportions of producers in an area convert to bulk operation and the relative route densities between can and bulk tanker-truck routes shift in favor of bulk milk, can producers may find it increasingly difficult to get contract haulers to pick up their milk. In such a situation differences in transportation charges may shift further in favor of the bulk method.

If the trend toward handling bulk milk experienced in Texas during 1956 and 1957 continues at the same rate, it is doubtful that any Grade "A" milk will be handled in cans in the State by the end of 1962. The result could mean great hardships for dairymen still handling milk in cans at that time.

Thus, every dairy farmer planning to remain in the dairy business should start planning now for the day when a market will no longer exist for milk handled in cans.

TABLE 10. NUMBER OF FARMERS WITH TANKS OF VARIOUS SIZES

| Size of tank, gallons | North Texas area | Corpus Christi area |
|---|---|---|
| | — — — Number of farmers — — — | |
| 150 | 1 | 0 |
| 200 | 1 | 3 |
| 250 | 32 | 2 |
| 300 | 33 | 10 |
| 400 | 50 | 4 |
| 500 | 34 | 8 |
| 600 | 29 | 4 |
| 700 | 6 | 2 |
| 800 | 4 | 2 |
| 1,000 | 1 | 1 |
| Total | 191 | 36 |

TABLE 11. SEASONALITY OF MILK PRODUCTION, NORTH TEXAS MARKET, SPRING 1954 THROUGH SPRING 1957

| Season[1] | Daily average production for the season | | | |
|---|---|---|---|---|
| | 191 tank producers | | All producers on the market | |
| | Daily average production, pounds | Percent daily average is of period | Daily average production, pounds | Percent daily average is of period |
| Spring | 1146 | 104 | 720 | 110 |
| Summer | 1076 | 98 | 606 | 93 |
| Fall | 957 | 88 | 609 | 94 |
| Winter | 1205 | 110 | 671 | 103 |
| Yearly av. | 1099 | 100 | 657 | 100 |

[1]Spring includes March through May; summer, June through August; fall, September and October; winter, December through February.

## *Acknowledgments*

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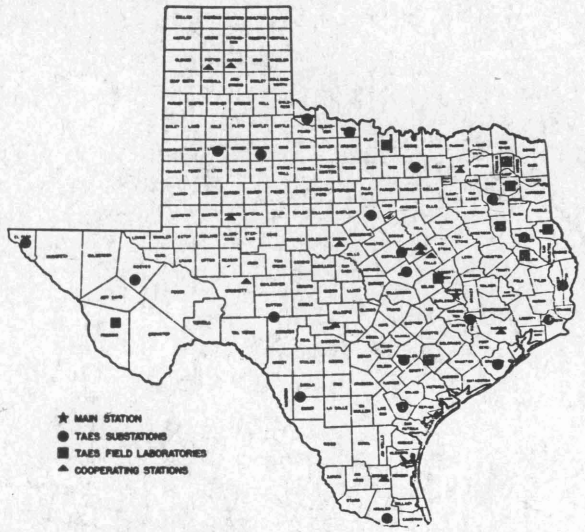


**Location of field research units of the Texas Agricultural Experiment Station and cooperating agencies**

# State-wide Research

★

**The Texas Agricultural Experiment Station is the public agricultural research agency of the State of Texas, and is one of ten parts of the Texas A&M College System**

## ORGANIZATION

IN THE MAIN STATION, with headquarters at College Station, are 16 subject-matter departments, 2 service departments, 3 regulatory services and the administrative staff. Located out in the major agricultural areas of Texas are 21 substations and 9 field laboratories. In addition, there are 14 cooperating stations owned by other agencies. Cooperating agencies include the Texas Forest Service, Game and Fish Commission of Texas, Texas Prison System, U. S. Department of Agriculture, University of Texas, Texas Technological College, Texas College of Arts and Industries and the King Ranch. Some experiments are conducted on farms and ranches and in rural homes.

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THE TEXAS STATION is conducting about 400 active research projects, grouped in 25 programs, which include all phases of agriculture in Texas. Among these are:

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Conservation and use of water
Grasses and legumes
Grain crops
Cotton and other fiber crops
Vegetable crops
Citrus and other subtropical fruits
Fruits and nuts
Oil seed crops
Ornamental plants
Brush and weeds
Insects
Plant diseases
Beef cattle
Dairy cattle
Sheep and goats
Swine
Chickens and turkeys
Animal diseases and parasites
Fish and game
Farm and ranch engineering
Farm and ranch business
Marketing agricultural products
Rural home economics
Rural agricultural economics

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