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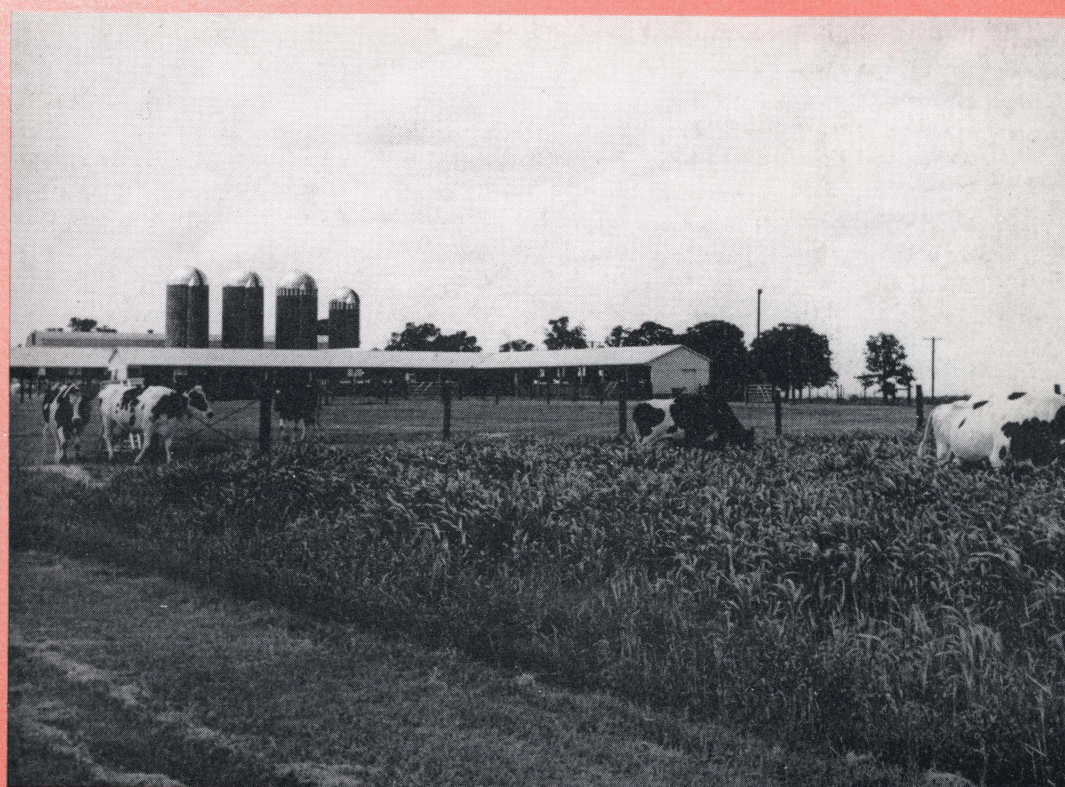
# Planning for Profitable Dairying





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College Station, Texas

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## Cover Picture

**Cows in the A&M College of Texas dairy herd on good Sudan pasture.**

# Summary


Six factors influence greatly the profits from Grade "A" milk production, as shown by this study of dairy farm operations in East and Central Texas, with additional data from experimental dairy herds at Substation No. 2 at Tyler, Texas.

1. High average production is extremely important to profitable dairying. At the average price paid for milk testing 4 percent butterfat in 1959, each 1,000 pounds increase in production per cow increased gross sales by $50. With a well-managed herd of 100 cows, the added cost of producing and marketing this milk was only about $15 per cow.

2. An increase in the number of good cows offers an opportunity to reduce unit costs and improve income for many dairies. Costs per hundred-weight of milk for improvements and equipment decrease with larger herds. Such savings result from spreading overhead costs, such as interest and depreciation, over a larger milk volume. Efficient labor utilization always is an important consideration. Lowest production costs are associated with milking herds of 100 and 150 cows among dairy systems that include silage usage. These herds are operated with two and three full-time workers, respectively. Without silage, milking herds up to 120 and 175 cows are operated by two and three men, respectively. In each case there is efficient use of improvements and equnpment and full utilization of labor.

3. Milk production costs are lowered by feeding concentrates according to individual cow performance. This results in good cows getting enough feed to maintain their production potential. It avoids waste of high-priced nutrients on cows that would not profit from them.

4. In Central Texas, the highest profits usually are obtained with the use of silage regardless of the milking herd size. This study indicated that, at the prices used, the practice of feeding silage is not profitable with small herds in East Texas. The annual cost of owning and operating silage harvesting equipment and the inability to hire this equipment are mainly responsible for the relatively high milk costs associated with the use of silage for herds of 60 cows or less. When 80 or more cows are involved, it is profitable for East Texas dairymen to produce and feed silage.

5. It is recommended that cows freshen every 12 months and that the lactation period be 305 days for profitable dairying. Lengthening the interval of freshening reduces milk production. Each month added to the freshening interval reduces profits by about $13 per cow with cows freshening every 12 months and milking 10,000 pounds annually. Each month added to the freshening interval decreases income by approximately $16 per cow for cows that averaged 12,000 pounds of milk when freshening every 12 months.

6. Normally, prices paid for Grade "A" milk favor the practice of breeding cows for fall freshening.

On the basis of milk prices that prevailed during 1956-59, 10,000 pounds of milk from a cow freshening October 1 bring $15 more than the same amount of milk from a cow freshening March 1. For cows milking at the 12,000-pound level, the advantage in favor of October freshening amounts to approximately $18 per cow.

# Planning for Profitable Dairying

A. C. Magee, B. H. Stone, R. E. Leighton and S. E. Carpenter*

DAIRY FARMING IN TEXAS shifted rapidly to Grade "A" production during World War II and the postwar period. Production of Grade "A" milk tends to be concentrated in the eastern half of the State where most of the large centers of population are located, Figure 1.

A strong demand for fresh fluid milk encouraged many farmers with little or no dairy experience to shift to the enterprise. Frequently, these new producers were inefficient, and milk production costs were often high. Even so, favorable milk prices made dairying profitable at the time of rapid expansion.

During the past several years production costs trended upward at the same time that milk prices were declining. These trends have focused attention on the importance of efficient management and careful planning for profitable milk production.

Reducing costs is frequently mentioned as one way to increase the profits in dairying. If the price remains the same, the dairyman who can lower his cost of producing 100 pounds of milk will have a little more profit per hundredweight but a much greater total profit. The individual dairy farmer and his family, however, are usually more interested in total net income than in profit per production unit. Although measures that reduce costs are very important, dairymen must look for additional means to improve their individual situation.

Research was undertaken to study various management problems associated with milk production and the factors that contribute to efficient and profitable dairying.

One study included detailed information about production and production practices from approximately 100 representative East Texas dairies. These were located in Hopkins, Franklin, Titus, Wood, Camp, Upshur, Smith and Nacogdoches counties. This study covered 1954-59, and a summary of the results has been published in MP-486 entitled "Production, Production Requirements and Costs—East Texas Dairy Farms."

A similar study was conducted in McLennan, Bell, Coryell and Bosque counties in Central Texas. This work included approximately 60 Grade "A" dairies and was completed in 1958.

These studies indicate several possibilities for improving profits on Texas dairy farms. For example, the average cow on the farms studied in East Texas was fed 1 pound of concentrate feed for each 1.9 pounds of milk produced. Roughages were fed at a relatively low level. Even the most profitable 10 percent of the herds studied averaged only 2.3 pounds of milk for each pound of concentrate fed.

The feeding practices recommended by dairy scientists were for more liberal use of good quality roughage and called for less concentrates than were common among Texas dairymen. Normally, the recommended ration was considerably cheaper than that fed on the farms studied in both East and Central Texas.

Closely associated with the proportionate use of concentrates and roughage are the problems connected with the production and use of forages, particularly in East Texas. Here high quality forage can readily be grown, but harvesting, storing and feeding pose some troublesome problems. For example, climatic conditions make it difficult to harvest hay without extensive loss in quality. Although

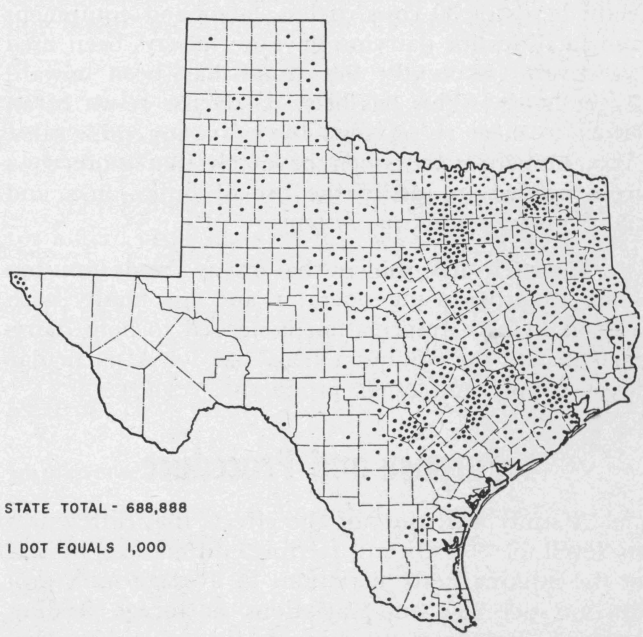


**Figure 1. Distribution of cows kept primarily for milk production in Texas, 1954 (U.S. Census). About three-fourths of the milk cows are in the eastern third of the State near the large population centers.**

*Respectively, professor and junior economist, Department of Agricultural Economics and Sociology; professor, Department of Dairy Science; and associate dairy husbandman, Substation No. 2, Tyler, Texas.

there is risk from weather, the problem of curing hay is not as difficult in Central Texas as it is in East Texas. The weather hazard at harvest time can be overcome largely by growing silage crops. However, because of the scarcity of machinery for custom harvesting, East Texas dairymen who use silage must have their own harvesting equipment.

The high cost of owning and operating this equipment, together with the large labor requirements for both harvesting and feeding, make silage an expensive roughage, particularly for the owners of small herds. Consequently, the choice of roughage is an important management decision on many Texas dairy farms.

The East Texas study shows the average annual milk production per cow ranged from 3,500 pounds to 10,300 pounds and the average for all cows was 6,200 pounds. In Central Texas it ranged from 5,000 pounds to nearly 11,000 pounds. Here the average for all cows studied was 6,600 pounds of milk annually.

At 1959 costs and milk prices, dairying was not profitable in either area unless production was above average.

The top herds in both Central and East Texas studies sold an average of approximately 9,000 pounds of milk per cow annually. Based on 1959 price relationships, returns from these herds were modest. An even higher level of production seems necessary for a consistently profitable dairy business.

Dairying in Texas developed first as a family operated business and small herds were numerous. With herds of 30 cows or less, labor and equipment and facilities for dairying have not always been used effectively. Recently the trend has been toward larger herds. This has been partly the result of an effort to meet rising costs by increasing milk sales. Also, numerous dairymen have felt that more cows were needed to justify the use of bulk tanks and more modern milking systems.

Research has shown that many herds are too small to provide the operator and his family with a good living. Information is needed to help dairymen decide the optimum herd size for a particular labor supply and other productive resources.

## Purpose and Procedure

A study was made of the effects that differences in levels of concentrate feeding, differences in size of the milking herd, variations in average milk production per cow and variations in forage feeding practices may have on dairy profits. Consideration was given also to ways of improving the use of labor and equipment and to other ways of increasing management efficiency.

In making this study, models for various dairy situations or systems were set up and a budget analysis used to evaluate each system. Budgeting is a systematic way of estimating in advance which dairy system probably would be most profitable.

Data obtained from field studies previously described, together with information provided by the experimental dairy herds at the Agricultural and Mechanical College of Texas and at Substation No. 2, Tyler, were used in setting up and evaluating the numerous dairy situations considered.

Complete farm budgets were prepared for dairy farms which included 30, 60, 80, 100, 120 and 150 cows in the milking herd.

Dairymen with the high producing herds among those studied in Central and East Texas sold an annual average of 9,000 pounds of milk per cow. In some instances herd averages of 10,000 pounds per cow were obtained and a few herds with annual milk production records averaging 12,000 pounds were observed. These three levels of production were considered in the analysis.

Feeding practices recommended by dairy scientists were compared with those used by farmers. Two forage rations were considered also: one that included silage and one that did not.

Requirements for dairying in East and Central Texas were sometimes quite similar. However, certain important differences occurred between the two areas in the practices and requirements associated with dairying. These differences are pointed up in the following discussion. Separate budgets were prepared for each area because of these dissimilarities.

## Requirements for Dairying

Requirements for dairying include items of investment capital as well as items of annual cost. Capital needs for land, improvements, equipment and cows are considered.

### CAPITAL REQUIREMENTS

**Land—East Texas**

Land used for dairying in East Texas included permanent pasture, a small amount of woods pasture, an acreage planted to oats-vetch and in some instances a silage crop. Open pastureland was largely in Bermudagrass, whereas coarse native grasses were predominant in woods pasture. Wooded areas contributed little to the grazing resources on dairy farms, but almost every farm in the area had some of this type of land.

Bermudagrass is normally expected to provide grazing for about 120 to 130 days annually. Bermudagrass is at its best during the spring and early

summer and until the grass becomes too mature or growth is checked by dry weather. On the farms studied, 2 acres of Bermudagrass were required per cow and her replacement since an acre of Bermudagrass provided about 60 days of grazing for one cow.

The amount of grazing furnished by oats-vetch in East Texas varies with weather and fertilizer practices. Cooperating farmers averaged 80 to 90 days of winter and spring grazing for one cow from an acre of oats-vetch.

These grazing yields were used in calculating the acreage required to provide 7 months grazing for one dairy cow, column 1, Table 1. On this basis, a total of 3.8 acres of permanent pasture and oats-vetch is needed per cow for the milking herd and for normal herd replacements. Hay fed to the dairy herd generally was purchased. Dairymen who fed silage utilized an additional .8 acre per cow in the milking herd for the silage crop. When no replacements are raised, the acreage required per cow is approximately 75 percent of the above amounts.

A 50-cow milking herd requires about 200 acres for grazing, based on land requirements shown in Table 1. An additional 40 acres are needed to grow an ample supply of silage. To keep 100 cows, from 380 to 460 acres are required, depending on whether silage was used. A farm of approximately 700 acres is needed to provide the grazing and silage for a milking herd of 150 cows.

The investment in land for dairying in East Texas is shown in Table 2. Open land was valued at $100 per acre and wooded pasture at $50 per acre. As calculated in this study the investment in land amounted to $445 per cow when silage was grown. Without silage production, the calculated land investment per cow was $365.

### Land–Central Texas

Crops produced on dairies in Central Texas were usually limited to those grown for roughage. As a rule, all forage with the exception of alfalfa was homegrown. Harvested roughages included cane or other carbonaceous hay and silage. Permanent grassland was grazed and oats-clover and Sudan were planted for grazing. Very little homegrown grain was used.

Permanent grass occupied about 30 percent of the acreage of dairy farms studied and provided good grazing during May and June. Over a 4-year period, an average of 45 days of grazing for one cow was obtained per acre. Sudangrass was utilized largely during July and August and often furnished some grazing until frost. An acre of Sudangrass furnished about 3 months pasture for one cow. Oats and clover were seeded together and used for pasture also. Under favorable conditions oats made some grazing in the late fall, but February, March and April was the usual grazing period.

**TABLE 1. LAND USE PER COW FOR DAIRYING IN EAST AND CENTRAL TEXAS**

| Land use | East Texas dairies Acres per cow[1] | Central Texas dairies Acres per cow[1] |
|---|---|---|
| For pasture | | |
| Oats planted with legume[2] | 1.2 | 1.4 |
| Permanent grass | 2.3 | 2.0 |
| Woods pasture | .3 | |
| Sudangrass | | 1.5 |
| Total for pasture | 3.8 | 4.9 |
| For harvested forage—herds fed silage | | |
| Sorghum silage | .8 | .8 |
| Cane or other hay | | .7 |
| Total | .8 | 1.5 |
| Total land required with silage | 4.6 | 6.4 |
| Total land required without silage | 3.8 | 5.6 |

[1]Includes requirements for normal number of replacement heifers.

[2]Vetch was commonly seeded with oats in East Texas whereas clover was used in Central Texas.

Under average conditions, dairy cows had 7 months of relatively good grazing each year. The acreage of different grazing types required per cow in the milking herd is shown in column 2, Table 1.

Cane was the most common of the hay crops grown. Average yields of 2 tons per acre were obtained without fertilizer. Although some dairies did not use silage, the best results were obtained by those that did. Several crops were made into silage, but forage sorghum was the most extensively used.

An acre and a half per cow were needed for silage and hay, which added to the acreage needed for pasture, made a total of 6.4 acres per cow. This acreage was sufficient for raising replacement heifers.

Three hundred and twenty acres were required for a herd of 50 cows on this basis. A 150-cow dairy required nearly 1,000 acres.

Land investment for dairying in Central Texas is shown in Table 2. Here all land was valued at $150 per acre making a total land investment of $960 per cow, Figure 2.

## Improvements

For purposes of budgeting, investment in improvements was based on the 1959 costs of modern dairy facilities in the areas studied. Included were a Grade "A" milking barn, hay storage and loafing barn, a maternity shed, a place for raising replacement heifer calves, a water system and fencing. Silage storage was included when that roughage was used. Improvements varied with the size of herd.

The estimated investment in improvements for 30, 100 and 150-cow dairies is shown in Table 2. These figures represent half of the current costs, new, of the facilities needed with each size of herd.

### Dairy Equipment

Investment in dairy equipment included an electric milker and pipeline system and sufficient bulk storage to hold 2 days production. The number of milking units and the capacity of the bulk tank varied according to the milk volume handled.

A water heater, wash vat, milk pump and other items used in the barn and milk room were included in the estimated investments (50 percent of new cost), Table 2.

Dairy equipment for a high producing herd normally costs more than for the same size herd of low producers. For example, a 400-gallon bulk tank costing about $3,100 served a 50-cow herd averaging 6,000 pounds of milk per cow annually. This assumed an every-other-day pickup. An 800-gallon tank that cost about $4,650 was required for a 50-cow herd giving 12,000 pounds of milk per cow. Such differences were taken into account in the calculation of the needs for dairy equipment among herds producing at different levels. The total investment was practically the same in each area, although there were minor variations in the cost of individual equipment items.

### Farm Machinery and Other Equipment

In East Texas each dairy was equipped with a tractor, plow, fertilizer distributor, drill, mower, trailer and pickup truck. Machinery to plant and cultivate, as well as to harvest the crop, was also needed when silage was produced.

A 1-row tractor was used normally on dairies with 30 cows or less provided silage was not grown. Otherwise, 2-row tractors were the rule and were common for even the small dairies that produced silage.

The heavy black soils of Central Texas require the use of sturdy machinery and tractors capable of heavy work. Farms with 60 cows or less were usually equipped with a 2-row tractor whereas 4-row equipment was used on the larger farms. On farms where all silage and hay were homegrown, both a 4-row and a 2-row tractor were common among dairies of 100 cows or more.

As a rule, the investment in machinery on dairies in Central Texas was somewhat higher than it was in East Texas, Table 2.

### Milking Herd

High-producing cows are worth more than low producers. Consequently, the investment in the milking herd varied with the quality of cows as well as with the quantity. Cows with the capacity to produce 10,000 pounds of milk annually were

**TABLE 2. CALCULATED INVESTMENT ASSOCIATED WITH DAIRIES OF VARIOUS SIZES[1]**

| Item | Investment per dairy | | | | | |
|---|---|---|---|---|---|---|
| | 30-cow herd | | 100-cow herd | | 150-cow herd | |
| | Fed silage | Not fed silage | Fed silage | Not fed silage | Fed silage | Not fed silage |
| | Dollars | | | | | |
| **Dairies in East Texas** | | | | | | |
| Land[2] | 13,350 | 10,950 | 44,500 | 36,500 | 66,750 | 54,750 |
| Improvements[3] | 4,965 | 4,820 | 8,460 | 7,500 | 10,335 | 8,825 |
| Dairy equipment[3] | 2,650 | 2,650 | 4,130 | 4,130 | 5,930 | 5,930 |
| Machinery and other equipment | 4,780 | 2,500 | 5,875 | 3,100 | 7,125 | 4,350 |
| Cows—the milking herd[4] | 12,000 | 12,000 | 40,000 | 40,000 | 60,000 | 60,000 |
| Total | 37,745 | 32,920 | 102,965 | 91,230 | 150,140 | 133,855 |
| Average per cow | 1,258 | 1,097 | 1,030 | 912 | 1,001 | 892 |
| **Dairies in Central Texas** | | | | | | |
| Land[2] | 28,800 | | 96,000 | | 145,200 | |
| Improvements[3] | 5,400 | | 9,175 | | 12,375 | |
| Dairy equipment[3] | 2,648 | | 4,928 | | 5,790 | |
| Cows—the milking herd[4] | 12,000 | | 40,000 | | 60,000 | |
| Machinery and other equipment[5] | 3,575 | | 8,823 | | 8,845 | |
| Total | 52,423 | | 158,926 | | 232,210 | |
| Average per cow | 1,747 | | 1,589 | | 1,548 | |

[1]For herds averaging 10,000 pounds of milk per cow annually. The investment for bulk tank may be different for higher or lower levels of production.

[2]Includes the acreage required to raise replacement heifers.

[3]Investment calculated at 50 percent of the current cost new.

[4]Cows with capacity to produce 10,000 pounds of milk were valued at $400 each.

[5]Silage harvesting equipment not included. Field cutter hired on a custom basis.

**Figure 2. A milking herd of approximately 100 cows on pasture. Anywhere from $100,000 to $160,000 is needed to finance a dairy enterprise of this size.**

valued at $400 each. This is the basis for calculating the investment in the milking herd as shown in Table 2. Prices of $350 and $450 per cow were used, respectively, in preparing budgets for herds producing 9,000 and 12,000 pounds of milk per cow. Dairy cow prices did not vary greatly from one part of the State to another. Therefore, the above values were used for both East and Central Texas.

Land and cows made up a very large proportion of the total investment for dairying in all cases. A larger investment was required for dairying in Central than in East Texas, mainly because of higher land values.

## DAIRY PRODUCTION REQUIREMENTS

The amount of feed, grazing, seed, fertilizer, labor, power and other physical requirements needed with different dairying systems were determined for budgeting purposes. All other requirements involving either cash or overhead costs were included also, as presented in the following discussion.

### Feed Requirements

A study of the feed costs of cooperating dairymen indicated opportunities for substantial savings by using the recommendations of dairy scientists. These recommendations were used in calculating the feed needs in all situations described herein. The following recommendations are for cows weighing 1,200 to 1,400 pounds and freshening at an interval of 12 months, and they apply in both East and Central Texas:

1. Feed 1 pound of concentrates for each 3.5 pounds of milk produced during a 10-month lactation period. Any single rule of thumb for feeding concentrates tends to underfeed the high producer and overfeed the low producer. The information supplied by the new Dairy Herd Improvement Association Electric Data Processing Machine program is probably the best feeding guide available. When poor quality roughages are fed, higher rates of concentrate feeding are necessary.

2. Dry cows should receive 4 pounds of concentrates daily for the first 6 weeks of the dry period and 12 pounds daily for 2 weeks just before freshening, or 6 pounds daily for the last 8 weeks before freshening, Figure 3.

3. When silage or good nonlegume hay are the principal roughage, concentrates averaging 18 to 20 percent protein should be fed. When alfalfa or other good legume hay is used with silage or nonlegume hay and when high rates of concentrates are fed with low quality roughage, feed a 16 percent

**Figure 3. Dry cows that are in good condition for freshening. A dry period of 60 days is recommended between lactation periods. Liberal feeding of concentrates for 8 weeks just before freshening also is recommended.**

TABLE 3. ANNUAL FEED REQUIREMENTS PER COW AS RECOMMENDED FOR DAIRY HERDS AVERAGING 9,000, 10,000 AND 12,000 POUNDS OF MILK PER COW ANNUALLY

| | Milk production per cow annually, pounds | | | | | |
|---|---|---|---|---|---|---|
| | Requirements per cow—herds fed silage | | | Requirements per cow—herds not fed silage | | |
| | 9,000 | 10,000 | 12,000 | 9,000 | 10,000 | 12,000 |
| | Pounds | | | | | |
| Concentrates[1] | 2,925 | 3,210 | 3,780 | 2,925 | 3,210 | 3,780 |
| Alfalfa hay | 2,250 | 2,250 | 2,250 | 4,000 | 4,000 | 4,000 |
| Good nonlegume hay[2] | 750 | 750 | 750 | 2,350 | 2,350 | 2,350 |
| Other hay[3] | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Silage | 10,000 | 10,000 | 10,000 | | | |
| Minerals[4] | 40 | 40 | 40 | 40 | 40 | 40 |
| | Days | | | | | |
| Fair to good grazing[5] | 210 | 210 | 210 | 210 | 210 | 210 |

[1]18-20 percent protein when fed with silage or nonlegume hay and 16 percent protein when alfalfa or other good legume hay is used with silage or nonlegume hay.

[2]Good quality sorghum, Sudan or oats hay.

[3]Bermuda or other grass hays of average quality to be fed when cows are on lush pasture.

[4]Includes minerals other than that in mixed feeds.

[5]All forage requirements based on cows weighing 1,200 to 1,400 pounds.

TABLE 4. AVERAGE PRICES RECEIVED FOR PRODUCTS SOLD AND AVERAGE PRICES OF ITEMS USED IN PRODUCTION, 1959

| Item | Unit | East Texas area | Central Texas area |
|---|---|---|---|
| | | Dollars | |
| Products sold | | | |
| Grade "A" milk, 4 percent butterfat | cwt. | 5.00 | 5.00 |
| Cull cows | cwt. | 10.00 | 10.00 |
| Production requirements | | | |
| Dairy concentrates 16 percent protein | cwt. | 2.70 | 2.70 |
| Dairy concentrates 18 percent protein | cwt. | 2.90 | 2.90 |
| Milk replacer | cwt. | 19.00 | 19.00 |
| Alfalfa hay[1] | ton | 38.00 | 38.00 |
| Good nonlegume hay | ton | 25.00 | 25.00 |
| Grass hay | ton | 20.00 | 20.00 |
| Salt | cwt. | 1.25 | 1.25 |
| Regular hired labor | year | 2,700.00 | 3,000.00 |
| Irregular hired labor | hour | 1.00 | 1.00 |
| Seed | | | |
| Oats | bu. | 1.00 | .75 |
| Clover | cwt. | | 12.00 |
| Vetch | cwt. | 20.00 | |
| Cane for hay | cwt. | | 10.00 |
| Sorghum for silage | cwt. | 9.00 | 7.00 |
| Sudangrass | cwt. | | 6.00 |
| Fertilizer—10-20-0 | ton | 70.00 | |
| 33-0-0 | ton | 82.00 | |
| 0-46-0 | ton | | 78.00 |
| Artificial insemination | per cow | 7.50 | 8.00 |
| Milk hauling | cwt. | .30 | .25 |
| Hay baling, custom work | bale | | .25 |
| Weed control, materials | acre | | .88 |

[1]Price at harvest time.

protein ration. The feeding of alfalfa as the sole roughage is rarely economical in these areas.

4. As previously stated, the usual expectation in both areas is for 7 months of grazing during the winter, spring and summer. Normally, even this good pasture should be supplemented with some hay. Full roughage feeding for the remaining 5 months of the year is recommended for best results.

5. When feeding silage, a total of 5 tons is recommended per cow annually. This will provide 50 pounds or more daily for 5 months of full roughage feeding. The rest of the silage is for use during the remainder of the year. In addition, 2 tons of hay are recommended per cow, at least half of which should be alfalfa or other legumes.

6. For herds not given silage, 2 tons of alfalfa hay and 3,350 pounds of high-quality nonlegume hay are recommended per cow annually.

The total annual feed requirements per cow for animals averaging 9,000, 10,000 and 12,000 pounds of milk per year are shown in Table 3. A cow giving 9,000 pounds of milk required about 2,900 pounds of concentrates. Recommendations are to increase the rate at which concentrates are fed to correspond to increases in production. An additional 285 pounds of concentrates are needed for each additional 1,000 pounds of milk production.

A few dairymen raised a small acreage of corn or other grain for home feeding. However, only a small part of the concentrates used was homegrown. The normal practice was to purchase all concentrates. In preparing budgets for this study, concentrates are assumed to be purchased.

TABLE 5. ANNUAL LABOR REQUIREMENTS FOR DAIRYING—EAST TEXAS

| | Labor requirements | | | | | |
|---|---|---|---|---|---|---|
| | 30-cow herd | 60-cow herd | 80-cow herd | 100-cow herd | 120-cow herd | 150-cow herd |
| | Hours | | | | | |
| Annually per cow | | | | | | |
| Dairies without silage | | | | | | |
| Care of milking herd | 86 | 52 | 44 | 39 | 35 | 33 |
| Raise replacements | 4 | 4 | 4 | 3.5 | 3.5 | 3.5 |
| Pasture & grazing crops | 8 | 8 | 8 | 8 | 8 | 8 |
| Upkeep of facilities | 4 | 3 | 2 | 2 | 2 | 2 |
| Total per cow without silage | 102 | 67 | 58 | 52.5 | 48.5 | 46.5 |
| Additional with silage | | | | | | |
| Grow and harvest silage | 7.5 | 7 | 7 | 7 | 7 | 7 |
| Feed silage | 10 | 8 | 8 | 7.5 | 7.5 | 7.5 |
| Total for silage | 17.5 | 15 | 15 | 14.5 | 14.5 | 14.5 |
| Total per cow with silage | 119.5 | 82 | 73 | 67 | 63 | 61 |
| Annually per farm | | | | | | |
| Estimated yearly labor requirement | | | | | | |
| Farm total—without silage | 3,060 | 4,020 | 4,640 | 5,250 | 5,820 | 6,975 |
| Farm total—with silage | 3,585 | 4,920 | 5,840 | 6,700 | 7,560 | 9,150 |

Some East Texas dairymen put up grass hay and occasionally grow sorghum hay. However, because of high harvesting costs and the weather risk when hay is cured in the field, many dairymen preferred to buy the necessary hay. Consequently, in calculating costs all hay was considered purchased for East Texas dairies.

On the other hand, the practice among Central Texas dairymen was to grow all roughage with the exception of alfalfa. Here budgets were figured on that basis. The 1959 prices of purchased feed are shown in Table 4.

### Labor Requirements

A summary of labor requirements per cow for East Texas dairy herds ranging from 30 to 150 cows is shown in Table 5. Also, the total yearly labor requirements for each size of herd were estimated. Similar information for dairies in Central Texas is summarized in Table 6.

The annual cost of a year-around dairy hand averaged $2,700 and $3,000, respectively, for East and Central Texas. These rates were used in figuring the cost of regular hired hands for the respective areas. Irregular hired labor was hired largely for harvesting silage and hay. The cost of this labor was figured at $1 per hour in all the budgets.

### Seed and Fertilizer

Somewhat different rates of seeding and fertilizer practices were followed in the areas. Thus, the requirements for the two parts of the State are discussed separately. In each instance costs were figured according to local practices.

In East Texas, seed expenses were for oats and vetch utilized as grazing and for forage sorghum planted for silage. Silage crops were seeded in rows at the rate of 10 pounds per acre. The usual practice was to plant 2.5 bushels of oats with 20 pounds of vetch seed per acre.

Oats-vetch was fertilized at the rate of 200 pounds of 10-20-10 and 100 pounds 33-0-0 per acre. This same rate of fertilization was used on silage crops. Also, an annual application of 100 pounds of 10-20-10 and 100 pounds 33-0-0 was used on open-pasture land.

Seed requirements in Central Texas were for cane seeded broadcast for hay, forage sorghum

TABLE 6. ANNUAL LABOR REQUIREMENTS FOR DAIRYING—CENTRAL TEXAS

| | Labor requirements per cow | | | | | |
|---|---|---|---|---|---|---|
| | 30-cow herd | 60-cow herd | 80-cow herd | 100-cow herd | 120-cow herd | 150-cow herd |
| | Hours | | | | | |
| Annually per cow | | | | | | |
| Care of milking herd[1] | 95 | 57 | 49 | 45 | 41 | 39 |
| Raise replacements | 4 | 4 | 4 | 3 | 3 | 3 |
| Upkeep of facilities | 3 | 3 | 2 | 2 | 2 | 2 |
| Pasture and grazing crops | 10 | 10 | 9 | 7 | 7 | 7 |
| Producing hay and silage | 10 | 9 | 9 | 8 | 8 | 8 |
| Total | 122 | 83 | 73 | 65 | 61 | 59 |
| Total annual labor per farm | 3,660 | 4,980 | 5,840 | 6,500 | 7,320 | 8,850 |

[1]Includes labor feeding silage.

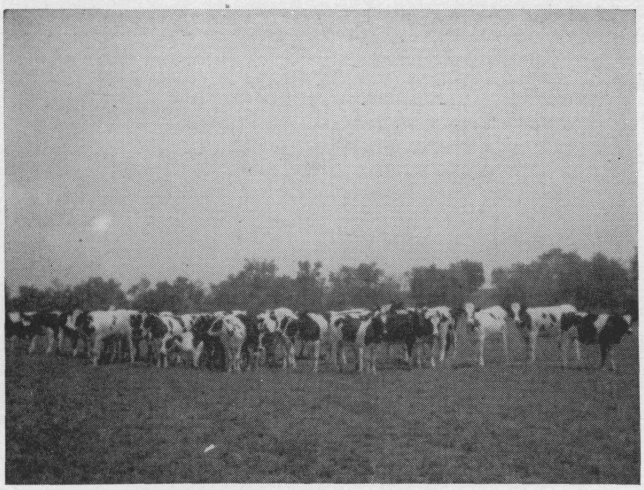

**Figure 4. Herd replacements for a dairy in East Texas. A good selection and breeding program is the most likely way to obtain superior heifers.**

planted for silage, and Sudangrass and oats-clover utilized for grazing. Usual seeding rates per acre were as follows:

| | |
|---|---|
| Cane (broadcast for hay) | 40 pounds |
| Sorghum (for silage) | 12 pounds |
| Sudan | 10 pounds |
| Oats | 2 bushels |
| Clover | 10 pounds |

The only fertilizer used consistently on the farms studied in Central Texas was 100 pounds of 0-46-0 applied to oats-clover. This rate of application was used in budgeting.

The prices used in calculating seed and fertilizer costs are shown in Table 4.

### Breeding and Herd Replacement Costs

Data on keeping a bull indicated that there was little difference in the costs of natural and artificial breeding. Artificial insemination is recommended by dairy scientists because of wide spread opportunities for herd improvement. Breeding costs were $7.50 and $8 per cow for East and Central Texas, respectively. On the average, one-fourth of the milking herd was replaced annually, Figure 4.

**TABLE 7. SUMMARY OF FEED REQUIREMENTS[1] FOR RAISING REPLACEMENT HEIFERS[2] FROM BIRTH TO FIRST CALF**

| Feed items | Pounds of feed required | |
|---|---|---|
| | East Texas | Central Texas |
| Milk replacer, dry weight | 50 | 50 |
| Concentrates, grain and dairy ration | 2,400 | 2,200 |
| Alfalfa hay | 700 | 500 |
| Other hay or hay equivalent | 1,135 | 2,800 |

[1]In addition to pasture.
[2]Of the larger breeds.

Cash costs specifically associated with raising heifer replacements consisted mainly of purchased feeds and veterinary care. Veterinary care averaged about $2 per replacement.

The amounts of various kinds of feed used for each heifer raised from birth to first calf are shown in Table 7. The 1959 costs of these feed items are shown in Table 4.

### Milk Hauling and Association Dues

These costs were based on the hundredweight of milk sold. Hauling costs vary from one part of the State to another depending on the distance milk is transported. For the farms studied in East Texas, the average hauling charge was 30 cents per hundredweight. However, among Central Texas dairies, hauling averaged 25 cents per hundredweight.

Association dues were figured at 10 cents per hundredweight of milk sold. Charges for participating in DHIA or other improvement programs were not included as a part of costs. However, for dairymen who participate, these costs should be considered in computing total production costs.

### Sanitary Supplies and Veterinary and Medicine

Sanitary supplies included washing powders, disinfectants, insecticides and other similar items used in the barns and milk room. Sanitation and medication expenses used for budgeting were based on the cost reported for the high-producing herds studied. In this instance, similar costs were reported for the two areas. On the average, sanitary supplies cost $2.80 and veterinary and medicine $5 per cow annually.

### Utilities

These costs were for electricity and gas used directly with the dairy. The amounts budgeted for utilities were based on the experience of dairymen in both areas. Because of the large milk volume cooled, the cost for electricity per cow tended to be a little higher among high-producing herds than among low producers. This cost was calculated at $2.90 per cow for 10,000-pound producers.

### Farm Taxes

Farm taxes varied from county to county and from one school district to another. On the average, cooperating dairymen in East Texas paid total taxes equal to approximately 50 cents per acre.

Total taxes paid by dairymen in Central Texas averaged about 68 cents per acre. These rates were used in calculating taxes for the respective areas.

### Machine Operating Expense and Custom Work

As used here, operating expense for power equipment included only the cost of fuel and lubri-

cation plus the cost of license and insurance in the case of pickups. Repairs, depreciation and interest charges were calculated but were included elsewhere in the budget. The operating costs of different kinds of power equipment are shown in Table 8.

Silage cutters were numerous in Central Texas, and operators of small dairies usually hired silage cut in the field in preference to investing in equipment of their own. In budgeting the expenses for the 30-cow dairy in this area, custom harvesting of silage was included. In Central Texas all hay baling was calculated on the basis of custom work and included also.

### Repairs and Upkeep

Annual repairs for buildings, fences, water facilities, dairy barns and milk room equipment, all farm machinery and trucks are included in this cost. Rates for calculating repairs on improvements and equipment were computed from data secured from farms studied, Table 9.

Upkeep of fences and the milking barn made up a large proportion of the total repair cost for improvements. Repairs for equipment tend to vary considerably from year to year on individual farms. However, annual upkeep for dairy equipment, tractors, farm pickups and all other machinery averaged from 3 to 4 percent of the original cost. On the average, repair expenditures for improvements and tractors tended to be relatively high in East Texas as compared with Central Texas.

### Depreciation

An annual depreciation figure was calculated for all improvements and equipment. These amounts were normally required to replace wornout facilities. No depreciation was included for land or cows. In the latter case the salvage value of cull cows approximated the cash cost of raising replacements. Depreciation rates for all improvements and for tractors, pickup trucks and other machinery were based on the experience reported by cooperating farmers. Average depreciation for improvements and equipment is shown in Table 9.

The average life of dairy farm buildings was approximately 20 years. Fences in Central Texas lasted longer, but the humid climate of East Texas reduced the average life of a fence to only 15 years. Although based on limited experience, a depreciation rate of 7 percent was assumed for modern dairy equipment.

### Interest on Investment

This cost was calculated for the investment items listed in Table 2. Interest on land was calculated at 4 percent and for all other capital at 6 percent.

**TABLE 8. SUMMARY OF OPERATING EXPENSES FOR POWER EQUIPMENT USED ON DAIRY FARMS[1]—1959 PRICES**

| Equipment items | East Texas unit cost | Central Texas unit cost |
|---|---|---|
| | — — — Cents per hour — — — | |
| One-row tractor | 38 | |
| Two-row tractor (light) | 50 | 50 |
| Two-row tractor (heavy) | | 60 |
| Four-row tractor | | 72 |
| Pickup truck | 4[2] | 4[2] |
| Silage cutter | 68 | 68 |

[1]Cost of fuel and lubrication plus the cost of license and insurance in the case of pickups.
[2]Cents per mile.

### Miscellaneous Requirements

The miscellaneous requirements associated with dairying included expenditures for telephone, farm magazines, social security tax for hired help and various kinds of insurance. Such costs varied greatly from farm to farm, but were estimated to total about $3 to $5 per cow in the milking herd.

## Dairy Production and Sales

The price received for milk in 1959 by individual farmers (before deductions were made for hauling), varied somewhat, but averaged approximately $5 per hundredweight for the farms studied. This price was applied to total milk production in calculating milk sales.

One-fourth of the milking herd was replaced each year, as previously stated. Death loss amounted to 1 percent of the herd and the remainder of the cows replaced was normally sold for slaughter. Cows sold in East Texas averaged 1,250 pounds and those in Central Texas nearly 1,300 pounds. Cull cow sales amounted to 300 and 325 pounds liveweight per cow in the milking herd, in the respective areas. Male calves were sold at 1 or 2 days old. Some of

**TABLE 9. AVERAGE REPAIR AND DEPRECIATION RATES FOR IMPROVEMENTS AND EQUIPMENT ON DAIRY FARMS EXPRESSED AS PERCENTAGE OF ORIGINAL COST**

| Item | Annual repairs Percent of original cost | | Annual depreciation Percent of original cost | |
|---|---|---|---|---|
| | East Texas | Central Texas | East Texas | Central Texas |
| Fence | 5.0 | 5.0 | 7.0 | 4.0 |
| All other improvements | 4.0 | 3.5 | 5.0 | 5.0 |
| Dairy equipment | 4.0 | 4.0 | 7.0 | 7.0 |
| Tractor | 3.5 | 3.0 | 10.0 | 10.0 |
| Pickup truck | 4.0 | 4.0 | 16.7 | 20.0 |
| All other machinery | 4.0 | 4.0 | 12.0 | 11.0 |

the least promising heifers were sold also from time to time.

At 1959 prices, cattle sales for dairies in East and in Central Texas were calculated to average $35 and $40 per cow, respectively.

## Factors that Affect Dairy Profits

Data concerning the requirements for dairy production were used in studying ways to increase dairy profits. These six factors were found to influence greatly the profits from milk production:

1. Annual milk production per cow.
2. The number of cows in the milking herd.
3. Feeding concentrates according to production.
4. Type and quality of roughage fed.
5. Regularity of freshening.
6. Date of freshening.

The effect of these factors on profits will be considered in order.

### MILK PRODUCTION PER COW RELATED TO PROFITS

Most costs per cow tend to be relatively fixed, with the exception of concentrates and milk hauling. A high-producing cow takes little if any more forage or labor than a low producer, and the cost of other inputs are similar in each instance. Production improvement per cow, aside from increased concentrates and hauling, spreads approximately the same costs over more milk, thus reducing production cost per hundredweight.

**TABLE 10. SUMMARY BUDGETS FOR 100-COW MILKING HERDS AVERAGING 9,000, 10,000 AND 12,000 POUNDS PER COW ANNUALLY—1959 PRICES**

| | Dairies in East Texas | | | Dairies in Central Texas | | |
|---|---|---|---|---|---|---|
| | Average annual milk production per cow | | | | | |
| | 9,000 pounds | 10,000 pounds | 12,000 pounds | 9,000 pounds | 10,000 pounds | 12,000 pounds |
| | Dollars | | | | | |
| Dairy sales | | | | | | |
| Milk | 45,000 | 50,000 | 60,000 | 45,000 | 50,000 | 60,000 |
| Cattle | 3,500 | 3,500 | 3,500 | 4,000 | 4,000 | 4,000 |
| Total | 48,500 | 53,500 | 63,500 | 49,000 | 54,000 | 64,000 |
| Dairy expenses | | | | | | |
| Cow feed purchased[1] | 14,745 | 15,572 | 17,225 | 12,807 | 13,634 | 15,287 |
| Regular hired labor | 2,700 | 2,700 | 2,700 | 3,000 | 3,000 | 3,000 |
| Irregular hired labor | 304 | 304 | 304 | 1,168 | 1,168 | 1,168 |
| Seed and fertilizer | 4,808 | 4,808 | 4,808 | 1,537 | 1,537 | 1,537 |
| Breeding costs[2] | 750 | 750 | 750 | 800 | 800 | 800 |
| Herd replacement costs[3] | 3,100 | 3,100 | 3,100 | 2,400 | 2,400 | 2,400 |
| Milk hauling | 2,700 | 3,000 | 3,600 | 2,250 | 2,500 | 3,000 |
| Association dues | 900 | 1,000 | 1,200 | 900 | 1,000 | 1,200 |
| Sanitary supplies | 280 | 280 | 280 | 300 | 300 | 300 |
| Veterinary and medicine | 500 | 500 | 500 | 500 | 500 | 500 |
| Utilities[4] | 270 | 290 | 310 | 275 | 295 | 315 |
| Farm taxes | 230 | 230 | 230 | 435 | 435 | 435 |
| Machine operation[5] | 1,420 | 1,420 | 1,420 | 2,492 | 2,492 | 2,492 |
| Repairs and upkeep | | | | | | |
| Improvements | 610 | 610 | 610 | 478 | 478 | 478 |
| Equipment | 942 | 942 | 942 | 1,059 | 1,424 | 1,424 |
| Depreciation | 3,060 | 3,060 | 3,060 | 3,340 | 3,450 | 3,450 |
| Interest on investment[6] | 4,988 | 5,288 | 5,588 | 7,316 | 7,616 | 7,916 |
| Miscellaneous expenses | 300 | 300 | 300 | 300 | 300 | 300 |
| Total | 42,607 | 44,154 | 46,927 | 41,357 | 43,329 | 46,002 |
| Cost per cwt. of milk[7] | 4.35 | 4.07 | 3.62 | 4.15 | 3.93 | 3.50 |
| Return to family labor-management | 5,893 | 9,346 | 16,573 | 7,643 | 10,671 | 17,998 |

[1]All grain and hay purchased. Silage homegrown.

[2]Artificial breeding at $7.50 per cow in East Texas and $8 per cow in Central Texas.

[3]Includes veterinary and medicine and feed purchased for heifer replacements.

[4]Electricity and gas.

[5]Cost of fuel and lubrication for tractors, trucks and other fuel-using machines.

[6]Interest on land at 4 percent and other capital items at 6 percent.

[7]The cost after cattle sales were deducted from total expense. Hired labor included, but no charge for operator or family labor.

Calculated dairy sales and expense for 100 cows milking at three levels of production in two areas are shown in Table 10. Cows that averaged 12,000 pounds of milk give 33 percent more than do the 9,000-pound producers; yet the total estimated cost is only about 10 percent higher at the 12,000-pound level.

Based on 1959 prices, milk production costs for a 100-cow dairy in East Texas are estimated to be 28 cents and 73 cents less per hundredweight with cows averaging 10,000 pounds and 12,000 pounds of milk, respectively, than with herds averaging 9,000 pounds. Similar relationships are indicated for dairies in Central Texas. Data used did not reflect differences in butterfat test because only small differences were encountered.

Under these conditions, the return to the dairy operator's labor-management from 100 cows averaging 12,000 pounds annually is calculated to be more than twice that from the same size herd milking an average of 9,000 pounds.

The estimated earnings and milk production costs for herds of various sizes, milking at different levels are shown in Tables 11 and 12. The calculated income from 60 cows averaging 12,000 pounds of milk annually is more than the income from 120 cows averaging 9,000 pounds per cow. Also, with a herd of 100 cows managed as recommended by dairy scientists, each 1,000 pounds increase in production per cow adds about $35 per cow to profits, or a total of $3,500 to the family income.

Stated differently, at the average price paid for milk during 1959 in the areas studied, 1,000 pounds of added production per cow increased gross sales by $50. With a well managed herd of 100 cows, the added cost of producing and marketing this milk is calculated to be only about $15.

Higher average production per cow is extremely important in planning for profitable dairying, but it is not easily or quickly obtained. Culling to remove low producers and replacing them by purchasing better cows has been the usual method of improving production. This has been profitable up to a point, but it has seldom been practical or profitable to depend entirely on buying high production through heavy culling and the purchase of better replacements. Gradual improvement is more feasible through a good selection and breeding program to obtain superior heifers. The DHIA is of value to all herds and with the artificial breeding program offers the greatest assistance to dairymen who raise their own replacements.

## RELATION OF COW NUMBERS TO PROFITS

Studies of dairy operations have shown that one way of reducing costs is to increase the number of cows handled by existing facilities and labor. For example, the buildings and equipment required for a 60-cow dairy will have annual overhead costs of about $1,800, or $30 per cow. When 80 cows are milked with the same facilities, this cost is reduced to $22 per cow. Producing more total milk with a fixed cost such as this reduces that particular cost per hundredweight of milk.

Labor efficiency increases as the milking herd becomes larger. Farmers with 30 cows use nearly as much time in cleaning the milking parlor, milk room and premises as do those with 60 cows. Consequently, the time required per cow to do the milking and care for the barn and milk room declines as the number of cows increases. A similar situation exists in the feeding of hay and silage. On the average, dairymen with 30 cows put in twice as much time per cow as dairymen with 100 cows, Tables 5 and 6. Because of the increased labor efficiency associated with larger herds, total labor requirements do not increase proportionately as the size of the herd increases.

With a 60-cow herd, an average of about 9 hours of labor is required each day for milking, feeding, cleaning up and other necessary care. This does not include time required to feed silage to the herd. Silage feeding was by hand and required an additional 2 hours daily for 60 cows. On the average, half as much time is required for the daily work of caring for 60 cows as is required for 150 cows. Likewise, labor costs associated with dairying are reduced when cow numbers are increased without added labor expense. Efficient use of labor contributes greatly to profits.

Increasing the number of cows offers an opportunity to reduce costs and improve income on many dairies. This must be done carefully. A substantial increase in herd size may require additional facilities and more labor and it is important that these resources be utilized effectively. Otherwise, per unit production costs may increase rather than decrease as cows are added to the herd.

The calculated labor-management wage of the operator and the cost of producing milk for six herd sizes, ranging from 30 to 150 cows are shown in Tables 11 and 12. For East Texas, calculations are for two situations: where silage is fed and where it is not fed, Table 11. All budget summaries shown for Central Texas include silage feeding, Table 12.

Costs per hundredweight of milk for improvements and equipment tend to be lower with larger herds. Such savings are largely the result of spreading overhead costs such as interest and depreciation over a larger volume of milk.

For example, in Central Texas the investment per cow for improvements is calculated to be $180 and $92 for 30-cow and 100-cow herds, respectively.

TABLE 11. CALCULATED DAIRY EARNINGS AND MILK PRODUCTION COST—EAST TEXAS—1959 PRICES

| Size of milking herd | Operator's labor-management wage[1] | | | Production cost per hundredweight of milk | | |
|---|---|---|---|---|---|---|
| | Average annual milk production per cow | | | | | |
| | 9,000 pounds | 10,000 pounds | 12,000 pounds | 9,000 pounds | 10,000 pounds | 12,000 pounds |
| | Dollars | | | | | |
| **Dairies fed silage** | | | | | | |
| 30 cows | 279 | 1,317 | 3,451 | 4.90 | 4.56 | 4.04 |
| 60 cows | 834 | 2,906 | 7,210 | 4.84[2] | 4.52[2] | 4.00[2] |
| 80 cows | 3,287 | 6,049 | 11,831 | 4.54[2] | 4.24[2] | 3.77[2] |
| 100 cows | 5,893 | 9,346 | 16,573 | 4.34[2] | 4.07[2] | 3.62[2] |
| 120 cows | 5,763 | 9,907 | 18,579 | 4.47[3] | 4.17[3] | 3.71[3] |
| 150 cows | 9,139 | 14,319 | 25,159 | 4.32[3] | 4.05[3] | 3.60[3] |
| **Dairies fed no silage** | | | | | | |
| 30 cows | 440 | 1,496 | 4,624 | 4.84 | 4.50 | 3.98 |
| 60 cows | 3,225 | 5,332 | 9,705 | 4.40 | 4.11 | 3.65 |
| 80 cows | 2,695 | 5,504 | 11,417 | 4.63[2] | 4.31[2] | 3.81[2] |
| 100 cows | 4,885 | 8,396 | 15,731 | 4.46[2] | 4.16[2] | 3.69[2] |
| 120 cows | 7,051 | 11,264 | 20,073 | 4.35[2] | 4.06[2] | 3.61[2] |
| 150 cows | 7,017 | 12,284 | 23,295 | 4.48[3] | 4.18[3] | 3.71[3] |

[1]The amount left the operator and his family after all costs were paid and allowance made for interest and depreciation. Normally the amount of family labor utilized varied with the size of herd.

[2]Costs include one full-time hired man. The full-time work of the operator is not included as a cost.

[3]Cost includes two full-time hired men. The full-time work of the operator is not included as a cost.

For 150 cows the investment per cow is $82, Table 2. Similar opportunities for savings in investment are indicated for East Texas dairies, also.

Increasing the size of herd also offers opportunities for effecting savings in the use of milking and bulk storage equipment. The average investment per cow in such equipment is $88 for a herd of 30 cows, Table 2. With a 100-cow herd the investment in this equipment averages only $41 per cow. However, further reduction in investment per cow is small between the 100 and 150-cow herd.

There are additional savings in the investment for machinery and other equipment as the number of cows in the milking herd increases.

The numerous savings in investment by increasing herd size resulted in worthwhile savings in milk production costs at any particular level of production per cow.

Dairy herds of 30 cows are operated by one man. Normally, this is considered too small a business to provide a satisfactory family income. However, at 1959 prices, labor and management wages of approximately $3,500 in East Texas and $4,500 in Central Texas are calculated for 30 cows averaging 12,000 pounds of milk annually. High production per cow is necessary to provide an adequate level of living for operators of 30-cow herds.

Year-round hired labor is not available in small quantities or on the basis of a few hours a day. When a dairyman hires help for day-to-day work, he normally has to hire a full-time worker. The greatest labor efficiency occurs with full utilization of all available labor, whether one, two, three or more workers are involved.

TABLE 12. CALCULATED DAIRY EARNINGS AND MILK PRODUCTION COST—CENTRAL TEXAS—1959 PRICES[1]

| Size of milking herd | Operator's labor-management wage[2] | | | Production cost per hundredweight of milk | | |
|---|---|---|---|---|---|---|
| | Average annual milk production per cow | | | | | |
| | 10,000 pounds | 9,000 pounds | 12,000 pounds | 9,000 pounds | 10,000 pounds | 12,000 pounds |
| 30 cows | 1,462 | 2,332 | 4,530 | 4.46 | 4.22 | 3.74 |
| 60 cows | 2,409 | 4,511 | 8,874 | 4.55[3] | 4.25[3] | 3.77[3] |
| 80 cows | 5,085 | 8,057 | 13,918 | 4.27[3] | 3.99[3] | 3.55[3] |
| 100 cows | 7,643 | 10,671 | 17,998 | 4.15[3] | 3.93[3] | 3.50[3] |
| 120 cows | 8,113 | 12,196 | 20,989 | 4.25[4] | 3.98[4] | 3.54[4] |
| 150 cows | 10,212 | 15,316 | 26,307 | 4.24[4] | 3.98[4] | 3.54[4] |

[1]Includes feeding of silage.

[2]The amount left to the operator and his family after all costs were paid and allowance made for interest and depreciation. Normally the amount of family labor utilized varied with the size of herd.

[3]Costs include one full-time hired man. The full-time work of the operator is not included as a cost.

[4]Costs include two full-time hired men. The full-time work of the operator is not included as a cost.

East Texas dairymen who do not feed silage, but have some family help with milking are caring for 60 cows with little or no hired labor. The fact that available labor is utilized fully on these farms is largely responsible for their relatively low cost for producing milk, Table 11. When silage is not fed, herds of 120 cows were operated by two men. Herds of this size make efficient use of improvements and equipment and fully utilize the labor of two men. This is reflected in the lowest calculated milk production costs among systems not using silage. Three full-time workers are generally used for herds larger than 120 cows, even without silage.

When silage is fed, a milking herd of less than 100 cows, as a rule, does not provide maximum efficiency in the use of two men's time. For example, two full-time workers are required with a 60-cow herd when silage is grown and fed. This results in poor utilization of man power and high labor costs which contribute to the relatively high cost of producing milk for this size herd, Tables 11 and 12.

For dairies using silage, a milking herd of 100 cows plus normal replacements fully utilizes the time of two men. Likewise, three men are fully occupied in caring for a 150-cow dairy. Both sizes provide for efficient use of both improvements and equipment. The lowest production costs are associated with milking herds of 100 and 150 cows among dairy systems that included the use of silage.

When there are more than 100 cows in the milking herd, three men are normally needed for dairies where silage is fed. Four full-time men are usually required with a silage-fed herd of more than 150 cows.

Since skilled and careful attention is required constantly for successful dairying, the operator of a one-man dairy has little opportunity for an off-farm vacation. In comparison, a herd of sufficient size to employ one or more additional men may be less confining. By more than one person being familiar with the operating routine, it is possible during parts of the year to free either the operator or a hired worker for a few days at a time.

Following are the approximate numbers of dairy cows that one, two or three full-time workers can look after effectively. This includes the raising of heifer replacements and the field work for the forages grown. These standards are based on studies of dairy farm operations with above average labor efficiency.

Dairies Feeding Silage

| | |
|---|---|
| One man | 40-45 cows |
| Two men | 90-100 cows |
| Three men | 140-150 cows |

Dairies Not Feeding Silage

| | |
|---|---|
| One man | 50-60 cows |
| Two men | 110-120 cows |
| Three men | 165-175 cows |

The calculated cost of producing 100 pounds of milk is relatively low with a silage fed 100-cow unit. Although the overall use of productive resources is efficient with this size herd, the calculated labor and management wage is higher for both 120 and 150-cow herds, Tables 11 and 12. The enterprise generally is profitable at the prices used, even though there is loss of efficiency in labor use with the 120-cow unit. Consequently, total earnings tend to increase with each increase in herd size.

The higher the production per cow, the greater the opportunities to increase total earnings by increasing the herd size. For a herd of 100 cows producing at the 12,000-pound level, 20 or 50 additional cows of the same quality increase expected earnings much more than the same number of cows added to herds producing at the 9,000 or 10,000-pound level. Large herds of high-producing cows offer good opportunities for relatively high farm earnings.

In line with current management practices, a sizeable increase in the number of cows in the herd involves the use of more land for roughage and grazing. Additional acreage is expensive and often impossible to find conveniently located.

This problem has been solved in some instances, by renting the additional acreage needed. However, it is risky to greatly expand the dairy enterprise on the basis of rented land unless a long-term lease is obtained.

Two other alternatives may be considered by dairymen who wish to increase their herds but cannot buy or rent land. First, fertilizer may be increased to grow more forage on the land already farmed. Advice of soil specialists in such instances should be followed for best results. Local county agents can provide assistance in this connection.

A second alternative is to buy the additional roughage needed. Here the most common practice has been to buy hay. However, the dairyman who depends on buying large amounts of hay has the risk and uncertainty associated with varying supplies and prices. The great variation in hay prices that normally occurs during drouth periods should be considered before choosing this plan.

There are a few instances where contracts have been made with a neighboring farmer to grow a certain silage crop acreage at an agreed price. The price per ton for harvested silage varies depending on who does the harvesting.

## FEEDING CONCENTRATES ACCORDING TO PRODUCTION

Feed is the largest single expense item for milk production and usually ranges from 40 to 50 percent of total costs. Varying proportions of nutrients from concentrates, hay, silage and pasture provide the feed needs for production in different seasons of the year.

Nutrient costs from these feed types differ widely. Feed cost can be influenced materially in the long run by the proportion of concentrates and roughage a dairyman uses. Pasture is usually, but not always, the cheapest source of nutrients, but it cannot be stored, Figure 5. Nutrients from concentrates usually cost more than those from harvested forage. One objective of good dairy management is the provision of adequate feeds in suitable proportions as economically as possible.

Harvested forages are relatively costly in both East and Central Texas, compared with some parts of the country. Dairymen in both areas tend to use a ration high in concentrates.

One of the best ways to lower milk production cost is to feed concentrates according to individual cow performance and month-to-month need. This results in good cows getting enough feed to maintain their production potential. It avoids wasting high-priced nutrients on cows that would not profit from them.

A study was made of the effect of certain feeding practices on milk production costs. Estimated feed costs of high-concentrate rations commonly fed to dairy cows in East and Central Texas were compared with similar costs of feeding practices recommended by dairy scientists as shown in Table 3. A summary of these costs is shown in Table 13.

At 1959 prices and with cows averaging 9,000 pounds of milk annually, the estimated feed cost per hundredweight of milk is $1.89 for the recommended ration. This cost is 9 and 8 cents per hundredweight less than that of the average ration used on the dairies studied in East and Central Texas, respectively. The annual savings amount to $7 and $8 per cow, respectively.

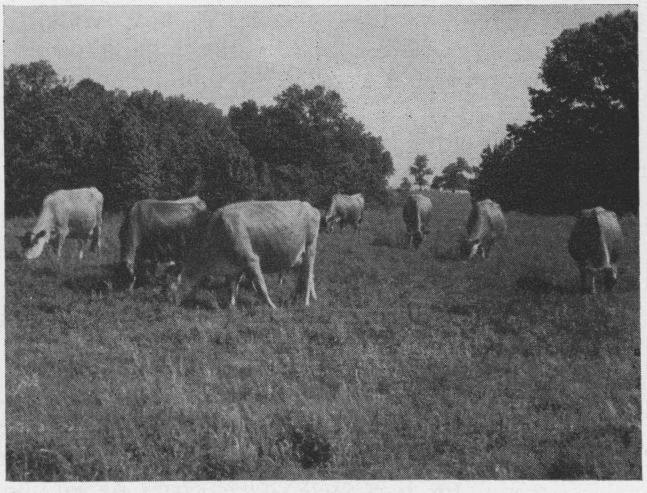

**Figure 5. Milk cows grazing on good spring pasture. Pasture usually is a cheap source of nutrients.**

**TABLE 13. FEED COSTS FOR MILK PRODUCTION WITH COWS AVERAGING 9,000 POUNDS OF MILK ANNUALLY-1959 PRICES**

| Item | Feed cost per 100 pounds of milk | | |
|---|---|---|---|
| | Ration used by farmers | | Ration recommended by dairy scientists |
| | East Texas | Central Texas | |
| | Dollars | | |
| Concentrates | 1.29 | 1.22 | .94 |
| Roughage | .69 | .75 | .95 |
| Total | 1.98 | 1.97 | 1.89 |

Even greater savings are possible as milk production per cow increases. For example, with a herd averaging 12,000 pounds of milk per cow annually and fed according to production as recommended, the calculated feed cost for 100 pounds of milk is only $1.66.

## TYPE OF ROUGHAGE IN RELATION TO COSTS

Feeding recommendations for dairy cattle commonly include the use of silage. In Central Texas the highest profits are usually obtained with this practice, regardless of the size of the milking herd. Consequently, no other plan is included among the budget summaries shown in Table 12.

However, this situation does not always exist in East Texas. Here, good yields of silage are obtained and this was the main roughage on many dairies. But the recent trend has been away from the use of silage. This has been most noticeable for dairies of average size or smaller. The added labor required for feeding and harvesting and the high cost of owning and operating silage harvesting equipment are the most common reasons given for the trend away from silage. Custom harvesting is not commonly available in East Texas because of the general scarcity of this type of equipment.

Recently self-feeding bunker silos have been used successfully with the herd of the A&M College of Texas. This system of handling silage greatly reduces the labor of feeding in preliminary trials, Figure 6.

A few dairymen have gone completely to a "dry-lot" operation. The success of these ventures depends largely on two important factors: high production per cow and contracting for top-quality hay during the summer when prices are normally lowest.

Owning field cutters greatly increases the machinery investment for small dairies and in turn

adds substantially to the overhead cost of milk production.

For herds that do not have silage, dairy scientists recommend the substitution of 1 pound of high quality hay for 3 pounds of silage. At least 2 tons of the hay should be alfalfa.

On the basis of 1959 prices, Table 4, it is shown to be more profitable to feed hay than to grow and feed silage to either a 30 or 60-cow dairy, Table 11. The operator of a 30-cow dairy in East Texas who feeds silage would have an average investment of $4,780 in machinery, upper half of Table 2. This is nearly $160 per cow or approximately double the necessary investment when silage is not fed. Here, the annual cost of owning and operating the silage harvesting equipment is nearly $15 per cow and is mainly responsible for the relatively high milk costs associated with silage versus no silage for herds of this size.

The cost per cow of owning and operating silage equipment is much lower with a 60 than with a 30-cow dairy. However, this advantage is more than offset by the increased labor costs required to grow and feed silage with the larger herd. With equipment and labor costs both relatively high, it is calculated to be more profitable to buy good quality hay than to provide silage for herds of 60 cows or less in East Texas.

This study indicated that at the prices used, the practice of feeding silage offers a substantial advantage to the East Texas dairyman when 80 or more cows are involved, Table 11.

Usually alfalfa and other hay may be purchased to the best advantage during the early summer. Later the price is often much higher. Good management would include storage to protect the hay purchased and insurance to reduce the risk of loss from fire or other damage.

Dairymen who buy hay rather than grow silage take considerable risk in hay costs during drouth years as well as the risk of getting low quality hay during wet years. It is almost impossible to avoid high costs at such times. This should be kept in mind when planning a forage program in East Texas.

A silage program can be planned, however, to reduce this risk. A reserve of silage can be built up and carried over for an unfavorable year during years when yields are above average. This advantage for the use of silage is not included in the systems summarized in Table 11. There is also a real possibility that a better quality forage is available to the dairy herd through a silage program.

## REGULARITY OF FRESHENING

Recommendations for profitable dairying called for cows to freshen every 12 months and for a 305-day lactation period. With this plan cows would

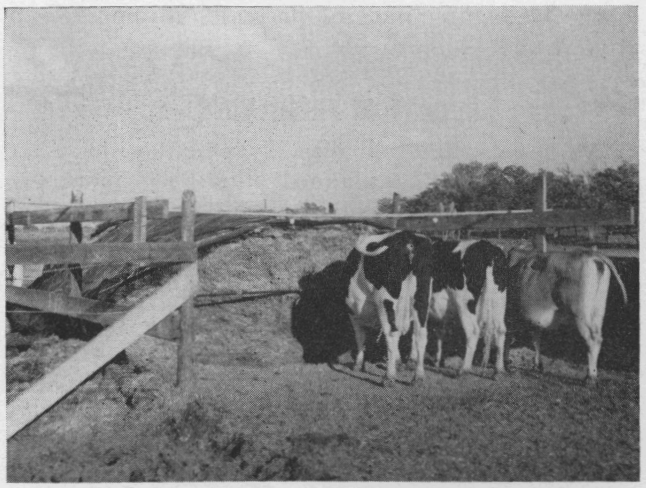

**Figure 6. The labor of feeding silage in the A&M dairy herd has been greatly reduced by the use of a self-feeding bunker silo. A movable, electrically charged bar has been effective in controlling waste.**

be dry about 60 days each year. Careful planning and management are required to follow this recommendation.

A longer freshening interval reduced milk production which in turn reduced the operator's earnings. A study was made of the difference in earnings for a herd freshening at a 13-month rather than a 12-month interval.

Cows that give milk for 10 months when bred to freshen in 12 months probably will milk for 11 months with a freshening interval of 13 months. Records from the dairy herd at Texas A&M College and the experimental herd at Substation No. 2, Tyler, indicate that a cow that gives 10,000 pounds of milk in a 10 months lactation period, produces 10,400 pounds when the lactation period and the freshening interval are both extended 1 month. However, average production per month of the lactation is higher for the 10-month than for the 11-month milking period. Consequently, a cow freshening every 12 months gives more milk in the long run than a similar cow freshening every 13 months.

The 400 pounds of milk produced during the 11th month of lactation, as indicated above, are relatively high in butterfat and averages .4 percent above the butterfat average for the previous 10 months.

Cows freshening at a 13-month interval also require less feed over a long period of time than animals freshening every 12 months.

On the basis of these data, it was calculated that with cows freshening every 12 months and milking 10,000 pounds annually, each month added to the freshening interval reduces profits by about $13 per cow. For cows that averaged 12,000 pounds of milk when freshening every 12 months, each month added

to the freshening interval decreases income by approximately $16 per cow.

## DATE OF FRESHENING

A large proportion of a dairy herd will freshen in the spring, unless planned otherwise. Normally, more than 50 percent of the year's milk production is obtained during the first 4 months of the lactation period. Thus a heavy concentration of freshening at any time of the year results in an even greater proportionate concentration of the year's milk supply.

Prices paid for Grade "A" milk normally are lower during March, April, May and June than at any other time of the year. Consequently, more than 50 percent of the annual production of cows freshening around March 1 would be marketed during this period of relatively low prices.

October, November, December and January are the months when milk prices are the highest. Therefore, when cows are freshened October 1, more than 50 percent of the year's production comes during months of most favorable milk prices.

On the basis of milk prices that prevailed during 1956-59, 10,000 pounds of milk from a cow freshening October 1 brought a total of $15 more than the same amount of milk from a cow freshening March 1. For cows milking at the 12,000-pound level, the advantage in favor of October freshening amounted to approximately $18 per cow.

On the other hand a 20-year study in the A&M College of Texas dairy herd revealed that cows freshening in February and March produced approximately 1,000 pounds more milk in the following lactation than did those cows that freshened in August, September and October.

However, dairymen probably will find it necessary to freshen a large proportion of the herd in the fall because of market demand.

## OTHER CONSIDERATIONS

Net dairy farm income can be increased by ways other than the cost reducing measures discussed. Many of these involve enterprises other than the milking herd to which this discussion has been limited. For example, the use of improved practices in the production of grazing, hay and silage crops can have an important bearing on dairy profits. Likewise there are possibilities for saving through wise buying and good selection of feed and other purchased items.

## CONCLUSIONS

There are numerous opportunities to improve dairy farm profits through reduction of milk production costs on individual farms. In many cases dairymen can profit greatly from improved production per cow, from feeding concentrates according to production, from feeding better quality forage, from increasing the number of cows and from attention to the breeding program. Also, full use should be made of other farm management practices to increase dairy farm income. Each dairy farm is different, and expert analysis and careful planning are necessary if ways to increase earnings are to be developed and applied.

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

# State-wide Research

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

## 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.

## OPERATION

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:

- Conservation and improvement of soil
- 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
- 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
- Plant diseases

Two additional programs are maintenance and upkeep, and central services.

*Research results are carried to Texas farmers, ranchmen and homemakers by county agents and specialists of the Texas Agricultural Extension Service*

**AGRICULTURAL RESEARCH seeks the WHATS, the WHYS, the WHENS, the WHERES and the HOWS of hundreds of problems which confront operators of farms and ranches, and the many industries depending on or serving agriculture. Workers of the Main Station and the field units of the Texas Agricultural Experiment Station seek diligently to find solutions to these problems.**

*Today's Research Is Tomorrow's Progress*

Texas Agricultural Experiment Station, R. D. Lewis, Director, College Station, Texas