# Dairy Farm Organization
# In Central
# and Northeast Oklahoma

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The trend in grade A milk production in Oklahoma is toward fewer, larger, more efficient dairy farms. In this changing environment, each individual dairyman needs to find an efficient farm organization suited to his own locality, ability and capital position. This bulletin describes some typical dairy farm organizations in Central and Northeast Oklahoma and gauges the potential for growth and for increased profits.

As he grows, the dairyman must determine how many cows to add and how to organize dairy farm resources for high profits. Adding more cows to the herd requires additional investment capital, so in this study answers were sought to questions concerning investment requirements, sources of capital, and prospects for retiring added investments from added farm income. Adding cows sometimes requires reorganization of the farm business, so in this study answers were also sought to questions concerning whether to raise replacements, to grow feed grains and hay and to engage in supplementary enterprises such as producing wheat.

Some dairymen let existing supplies of land and labor determine herd size. The demand for hired labor was examined in this study to determine how much a successful dairyman can afford to pay for competent help. The need for more land was studied by first finding the best dairy farm organization for present land holdings and then examining the profitability of renting in additional land.

The best number of cows to add depends on each individual farmer's ability and available resources. That is, where he should stop depends on where he starts. Profitable herd expansions for alternative beginning situations were examined with respect to (1) the efficiency of milk production reached with present farm practices and managerial ability, (2) existing resources used by the farmer, (3) availability of additional crop and pasture land for expansion purposes, and (4) availability of low-cost expansion capital.

# Procedure

This study was based on what 44 successful grade A milk producers were doing in 1959. The dairymen were contacted by asking farmers and agricultural extension personnel for names of competent dairy farmers with herds of 20 or more cows. The survey included the following eight counties in the Oklahoma Metropolitan Milk Marketing Area: Canadian, Craig, Delaware, Grady, Lincoln, Mayes, Oklahoma and Payne.

The 44 farms were classified according to size, and the costs and returns were estimated for various farm activities such as producing milk, grain or roughage. A description of the resource combinations, investments and incomes associated with representative organizations for each farm size is presented in this bulletin. "Representative" means what most farmers were doing. For example, since oats was the predominant feed grain crop with barley and grain sorghum rarely grown, the representative, or typical farm is described as producing oats for feed grains.

Growth potentials and opportunities for higher incomes were estimated by calculating which resource combinations would form the most profitable farm organizations attainable under specified land and capital situations, using the efficiency of milk and crop production observed for each size of farm. Linear programming analysis was used to derive the proposed solutions.

Investment requirements and income potentials were estimated for the various herd expansions. The value of labor on Oklahoma dairy farms was measured and the implications for specialization in the production of milk were assessed.

# Present Farm Organization
## Resource Combinations

The 44 dairy farmers interviewed were milking 20 to 130 cows per farm. Most of the dairymen raised herd replacements, and three were producing additional replacements for sale. Fifty-five percent were producing feed grains for the dairy herd, usually oats. Seven dairymen were buying all the hay needed, but the others were producing hay, usually alfalfa. Most of the farms of intermediate size were producing wheat, but most of the smaller and larger farms did not have wheat allotments.

The dairy farms observed formed six natural size groupings. Typical, or representative organizations for each group are presented in Table 1. The entire acreage available was used in the dairy enterprise on the 25-cow farms. In the other five situations, more land was available than was actually used for dairying. In some instances the additional land was used on other farm enterprises such as cotton or hogs. In

**Table 1.—Representative Organizations of Dairy Farms in Central and Northeast Oklahoma, 1959**

| Resources | Quantity of Resource Used with a Cow Herd Size of: | | | | | |
|---|---|---|---|---|---|---|
| | 20 | 25 | 32 | 46 | 60 | 84 |
| Heifers | 4 | 5 | 6 | 9 | 12 | 17 |
| Calves | 4 | 5 | 7 | 9 | 12 | 17 |
| Labor, months | 9.3 | 10.8 | 13.2 | 16.6 | 21.7 | 29.4 |
| Land, total acres | 160 | 262 | 340 | 474 | 500 | 680 |
| Native Pasture | 60 | 148 | 140 | 200 | 180 | 240 |
| Cropland | 100 | 114 | 200 | 274 | 320 | 440 |
| Wheat | -- | 18 | 40 | 26 | 40 | -- |
| Oats | 26 | 33 | 41 | 62 | 78 | 104 |
| Hay and silage | 31 | 40 | 50 | 72 | 94 | 131 |
| Rye-Vetch; Sudan | 17 | 23 | 28 | 40 | 52 | 72 |
| Other Pasture | 10 | -- | -- | -- | 30 | 46 |
| Cropland Rented Out | 16 | -- | 41 | 74 | 26 | 87 |

other instances the additional land was rented out to a neighbor. The cash equivalent of the usual rental rate was about $7 per acre of cropland and $3 per acre of native pasture.

# Input/Output Relationships

## Land requirements and cropping systems

The amount of land required per cow to meet the various needs of the dairy enterprise is presented in Table 2. Land requirements did not vary among farm sizes because the quality of the soil and the needs of the cow were not correlated with herd size. The amount of land used on the individual farms observed ranged from 152 to 1,340 acres. The average of 507 acres had 367 acres of cropland with the remaining 140 in native pasture.

The land required to support the dairy herd and replacements when all the feed grains and roughage were produced on the farm averaged 8.22 acres per cow, with 3.72 of this as cropland and the remainder as native pasture. On farms where feed grains were purchased, only 2.42 acres of cropland were required to produce the necessary hay, silage and temporary pasture. Dairymen who chose not to produce feed

grains typically purchased a 16 percent protein dairy feed. Concentrates were usually fed at the rate of one pound of feed for every four pounds of milk produced.

Low-producing pasture was used on most of the 44 farms. The usual stocking rate was 4½ acres per cow and her replacements. Native pasture was used to hold dry cows and young stock and served as a supplemental source of roughage for cows in milk. When native pasture was in short supply, 1½ acres of improved pasture was seeded per cow to substitute for the 4½ acres of native grasses. That is, one acre of improved pasture was found to be equal in carrying capacity to three acres of native grass.

Small grains provided the late fall and winter pasture. Wheat and oats used for pasture were usually harvested later for grain. A one-year rotation of small grain and vetch with sudan, stocked at the rate of seven cows on six acres, supplied additional fall and winter grazing as well as succulent pasture during the dry months of July and August.

Alfalfa hay, the principal source of dry roughage, was fed at the rate of 1.9 tons per cow per year in combination with 4 tons of sorghum silage. When one calf and one replacement heifer were kept for each five mature animals, 2.3 tons of hay and 4.75 tons of silage were needed for each cow and her replacements. According to Table 2, the hay and silage requirement could be produced for one cow and her replacement on 1.56 acres of cropland.

Efficiency of grain and forage production did not differ significantly among the dairy farms except that the larger farms realized some economies through owning combines and balers rather than depending on custom work. Crop yields and other efficiency factors for grain and forage production are indicated in Table 3.

**Table 2.—Acres of Grain and Roughage Required per Cow, Average of 44 Dairy Farms in Central and Northeast Oklahoma, 1959**

| Land Use | Acres of Land Required per Cow when: | |
| --- | --- | --- |
| | Replacements were Bought | Replacements were Raised |
| Hay and Silage | 1.30 | 1.56 |
| Rye and Vetch; Sudan | .86 | .86 |
| Oats* | 1.20 | 1.30 |
| Native Pasture** | 3.70 | 4.50 |
| Total | 7.06 | 8.22 |

*+0.05 adjustment for level of milk production.
**One acre of other improved pasture seeded on cropland may be substituted for three acres of native pasture.

**Table 3.—Yield and Resource Requirements for Grain and Forage Production; Average of 44 Dairy Farms in Central and Northeast Oklahoma, 1959**

| Crop | Yield per Acre | Seed Used per Acre | 10-20-10 Fertilizer Used per Acre | Custom Harvest Costs per Acre | Labor Required per Acre |
|---|---|---|---|---|---|
| | | | pounds | dollars | hours |
| Wheat | 18 bu. | 1 bu. | 100 | $4.25 | 3.4 |
| Oats | 36 bu. | 2.1 bu. | 50 | 4.25 | 3.4 |
| Alfalfa | 3 tons | 20 lbs. | 100 | 5.25 | 7.0 |
| Sorghum Silage | 6 tons | 7 lbs. | 100 | 10.00 | 10.0 |
| Sudan Pasture | | 20 lbs. | 100 | | 3.6 |
| Rye-Vetch Pasture | | | | | |
| Rye | | 1 bu. | 50 | | 3.6 |
| Vetch | | 15 lbs. | | | |

## Livestock

Holstein cattle were found on 41 of the 44 farms observed. Production for the Holsteins averaged from 7,200 to 13,000 pounds of milk on individual farms. Figure 1 indicates the average amount of milk produced per cow per year for each of the six sizes of farm. The highest producing cows were found in the medium sizes of herd. The highest herd average was reached in the 32- and 46-cow herds, where production averaged 9,600 pounds per cow.

## Labor requirements

Labor requirements were found to vary with herd size. The highest labor requirements per cow were found in the smaller herds, but no additional labor economies of scale were noticed as herds expanded beyond 46 cows. Labor requirements calculated for each size of farm are presented in Table 4.

On the most labor-efficient farms, one man could care for fifty mature cows in a 3,000-hour work year if he had no responsibility for the care of replacement stock or for field work. As indicated in Table 4, sixty hours per cow per year were required to care for mature cows on farms with herds of 46 cows or more as compared with 86 hours per cow on the less efficient 20-cow herds. The labor requirements per cow increase when replacements are produced on the farm and when dairymen produce the needed hay, silage and pasture.

If the operator of a 20-cow herd cared for replacements and did the field work as well, he would work an average of 110 hours per cow per year. At this rate, one man could handle a 27 cow herd in a 3000
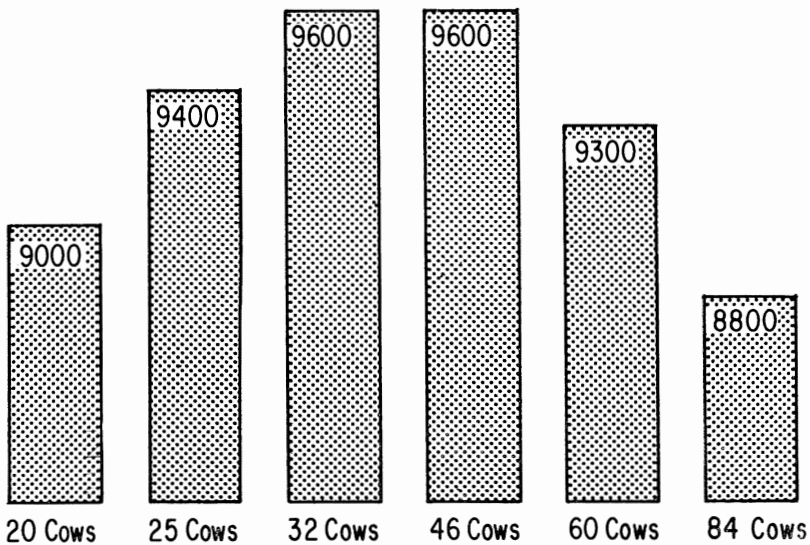
**Fig. 1    Pounds of milk produced per cow, based on herd averages for various sizes of holstein herds, central and northeast Oklahoma, 1959.**

hour work year. With the labor efficiency observed on the 25-cow farms, the herd could be expanded to 30 cows before labor in addition to the operator would be required.

Most of the farms with 46 cows or less depended entirely on the family labor supply. Expansion beyond this size usually would require a dependable source of hired labor. Herds of 70 or more cows would require at least one full time man in combination with the operator to care for the cows and provide replacements and roughage. Reliable, competent hired labor was not always available at the usual wage rates, according to the dairymen interviewed.

**Table 4.—Labor Requirements for Various Sizes of Dairy Farms in Central and Northeast Oklahoma, 1959**

| | Hours of Labor Required Per Cow Per Year When: | | | |
| | Replacements were Bought | | Replacements were Raised | |
| Herd Size | Livestock Only | Livestock and Roughage | Livestock Only | Livestock and Roughage |
|---|---|---|---|---|
| 20 cows | 86 | 103 | 92 | 110 |
| 25 cows | 77 | 94 | 82 | 100 |
| 32 cows | 70 | 87 | 75 | 95 |
| 46 and over | 60 | 77 | 64 | 87 |

# Investments

## Investment requirements

The investment capital required to finance each of the six sizes of farm studied varies from $32,375 to $119,000, as indicated in Table 5. The smaller farms were operating at 75 to 80 percent of the capacity of the fixed plant. Larger herds were usually operating at approximately full capacity of the present dairy equipment. A 250-gallon bulk tank with 24 feet of pipeline was used to handle the milk on the smaller sizes of farm compared to a 900-gallon tank with 40 feet of pipeline used in the 84-cow herds.

A 2-stall milking parlor was considered adequate by the dairymen with 25 cows or less, whereas a 4-stall parlor was used for herds of 46 cows and more. Parlors with 3 stalls were commonly used for herds of intermediate sizes. A 2-plow tractor was used on the two smaller sizes of farm, a 3-plow tractor on the intermediate sizes, and two tractors, one of each size, were typically found on farms milking 60 or more cows. Balers appeared on farms with more than 46 cows and combines on farms with more than 60. Custom work was used for baling and combining on the smaller farms.

The average investment per cow was highest in the 32-cow herds. The increasing investment per head from the 20- to the 32-cow herds is largely explained by more land per cow on the larger farms. The 25-cow herds had more than twice as much native pasture available as the 20-cow herds, and the 32-cow herds had more than twice as much cropland. The 32-cow farms had $5 per head more investment in specialized dairy equipment, and $10 per head more invested in buildings, than the 25-cow farms. The decreasing investments per head from the 32- to the 84-cow herds reflects economies of scale associated with distributing fixed costs over more cows.

**Table 5.—Investment Requirements for Representative Dairy Farm Organizations in Central and Northeast Oklahoma, 1959**

| Assets | Investment in dollars with a Cow Herd Size of: | | | | | |
|---|---|---|---|---|---|---|
| | 20 | 25 | 32 | 46 | 60 | 84 |
| Total Assets | 32,375 | 42,150 | 65,400 | 78,825 | 91,625 | 119,000 |
| Total Assets per Cow | 1,619 | 1,686 | 2,044 | 1,714 | 1,527 | 1,417 |
| Livestock | 4,800 | 6,000 | 7,680 | 11,000 | 14,400 | 20,160 |
| Farm Machinery | 7,265 | 7,265 | 8,030 | 11,740 | 19,465 | 20,100 |
| Buildings and Improvements | 5,305 | 5,305 | 6,705 | 7,750 | 9,540 | 9,540 |
| Specialized Dairy Equipment | 3,660 | 3,660 | 4,855 | 5,720 | 6,155 | 6,735 |

## Sources of investment and operating capital.

The present as well as the optimal farm organization depends on the offers of credit to farmers by bankers, insurance companies, production credit agencies, the Farmers Home Administration, dealers, merchants, finance companies and individuals. The dairymen interviewed were not asked to list the quantities of credit offered to them, either used or unused. Rather, some likely quantities of investment and operating capital credit offers from alternative sources at usual interest rates were reconstructed according to known lending policies of various credit institutions. The estimated quantities of capital from alternative sources available to each of the six sizes of farm studies are listed in Table 6.

Two equity positions, 60 percent and 90 percent, were used to approximate the actual net worth situations of the 44 dairymen. The 90 percent equity position was used to approximate the relatively large equity which most farmers have in their business. The 60 percent portion was used to approximate the situation in which most farmers find themselves when they have their land mortgaged and are using one or two other sources of credit as well. The manner in which credit offers tend to improve as net worth, or equity improves, is apparent from a comparison of the upper and lower sections of Table 6.

As an example of the role of capital supply in limiting the size of business, Table 7 focuses attention on the supply schedule for invest-

**Table 6.—Estimated Investment and Operating Capital Available to Representative Dairy Farmers**

| Source* | Dollars Available with a Cow Herd Size of: | | | | | |
|---|---|---|---|---|---|---|
|  | 20 | 25 | 32 | 46 | 60 | 84 |
| *When there was a 60 percent equity:* | | | | | | |
| Net Worth | 19,425 | 25,300 | 39,250 | 47,300 | 54,975 | 71,400 |
| Land Mortgage, 6% | 9,350 | 13,500 | 24,650 | 25,700 | 29,500 | 35,750 |
| Intermediate Credit, 8% | 5,600 | 6,350 | 7,800 | 10,500 | 12,500 | 17,500 |
| Farm Supply Dealers, 12% | 1,500 | 1,500 | 1,650 | 2,500 | 3,000 | 4,000 |
| *When there was a 90 percent equity:* | | | | | | |
| Net Worth | 29,125 | 37,950 | 58,850 | 70,950 | 82,475 | 107,100 |
| Land Mortgage, 6% | 12,150 | 17,500 | 29,500 | 33,425 | 38,300 | 46,450 |
| Intermediate Credit, 8% | 6,350 | 6,950 | 8,700 | 11,725 | 13,700 | 19,200 |
| Farm Supply Dealers, 12% | 1,800 | 1,800 | 2,000 | 3,000 | 4,000 | 5,000 |

*Sources not listed include merchant credit and other forms of credit which usually charge 16 percent or more interest. The amount of credit obtainable from such sources is variable. A reasonable working assumption is $2,000 of merchant credit at 16% and a like amount of other credit at 20% for all sizes of farms.

**Table 7.—Estimated Capital Supply Schedule with Associated Equity for a Representative Farmer with a 60 Percent Equity in a 46-Cow Herd**

| Source | Quantity Offered | Interest Rate | Cumulative Total | Percent Equity |
|---|---|---|---|---|
| Net Worth | $47,300 | -- | $47,300 | 100.0 |
| Mortgage | 25,700 | 6% | 73,000 | 64.8 |
| Intermediate Credit | 10,500 | 8% | 83,500 | 56.6 |
| Dealer Credit | 2,500 | 12% | 86,000 | 55.0 |
| Merchant Credit | 2,000 | 16% | 88,000 | 53.8 |
| Other Credit | 2,000 | 20% | 90,000 | 52.6 |

ment and operating capital for the dairyman with a 60 percent equity in a 46-cow farm. With these prospects for obtaining funds, the farmer's choice ranges from full ownership in a dairy farm with less than 30 cows to nearly half ownership in a herd of about 65 cows. He is presently operating with a 60 percent equity in a herd of 46 cows. To complete the example, it will be shown in a later section of this bulletin that the most profitable farm organization on the present 474 acres is an expansion to a 55 percent equity in a 60-cow herd. (See Table 9).

Graphically, the situation may be represented as in Figure 2 where the beginning investment of $78,825 is represented by point "A" and the optimal investment of $86,450 by point "B".

For investments of less than $86,450, each additional dollar invested returns more than sixteen cents per year in net revenue. Additional investments up to this point are profitable insofar as repayment
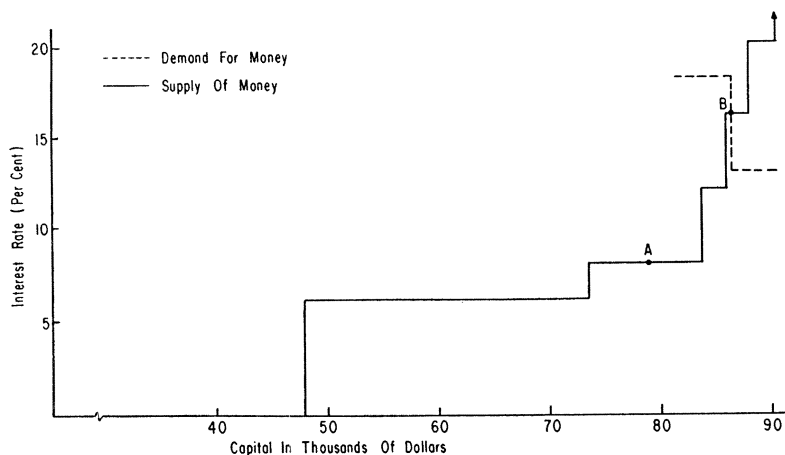


**Fig. 2  Estimated supply of and demand for investment and operating capital for representative dairymen beginning with a 60 percent equity in a 46-cow herd in central and northeast Oklahoma.**

schedules can be arranged conveniently. On the other hand, each additional dollar invested beyond $86,450 would result in a loss in net revenue of three cents per year. Expansion cannot profitably extend beyond the point where farm demand for capital equals the supply of $86,450 and where interest for more borrowed funds is 16 percent per year.

# Incomes

Incomes associated with the present organization on the six representative sizes of farm are presented in Table 8. Farm income is the same whether the dairyman has a 60 or a 90 percent equity because it is the total return to all labor and capital. Net farm income is the disposable income of the farmer and his family. It includes labor income and returns to owned assets, but is net of interest payments on existing farm debts.

Net farm income is the quantity which profit-maximizing farmers seek to make as large as possible through adjustments in farm size and organization. It is the purpose of the next section to examine other farm organizations that are more profitable than the present organizations.

### Table 8.—Farm Incomes Realized from Representative Dairy Farm Organizations in Central and Northeast Oklahoma, 1959

| Kind of Income | Farm Earnings in Dollars with a Cow Herd Size of: | | | | | |
|---|---|---|---|---|---|---|
| | 20 | 25 | 32 | 46 | 60 | 84 |
| *When there was a 60 percent equity:* | | | | | | |
| Farm Income | 4,120 | 6,280 | 8,660 | 11,755 | 13,620 | 17,185 |
| Interest on Farm Debt | 850 | 1,080 | 1,600 | 2,010 | 2,340 | 3,095 |
| Net Farm Income | 3,270 | 5,200 | 7,060 | 9,745 | 11,280 | 14,090 |
| 5% Return to Net Worth | 970 | 1,265 | 1,960 | 2,365 | 2,750 | 3,570 |
| Labor Income | 2,300 | 3,935 | 5,100 | 7,380 | 8,530 | 10,520 |
| *When there was a 90 percent equity:* | | | | | | |
| Farm Income | 4,120 | 6,280 | 8,660 | 11,755 | 13,160 | 17,185 |
| Interest on Farm Debt | 195 | 250 | 395 | 470 | 550 | 715 |
| Net Farm Income | 3,925 | 6,030 | 8,265 | 11,285 | 13,070 | 16,470 |
| 5% Return to Net Worth | 1,455 | 1,900 | 2,940 | 3,550 | 4,125 | 5,355 |
| Labor Income | 2,470 | 4,130 | 5,325 | 7,735 | 8,945 | 11,115 |

# Growth Potentials

Growth potentials were estimated for the dairy farms studied in Central and Northeast Oklahoma by calculating which resource combinations would form the most profitable farm organizations attainable under specified land and capital situations, using the efficiency of milk and crop production observed for each size of farm. The two capital situations studied were for farmers with 60 and 90 percent equities in their present farm businesses. The two land situations studied were for expansion of herd on present acreage and for expansion of herd on additional rented land. In the latter case, the restriction was imposed that the land available for rental in the neighborhood was not more than enough to double the present land holding. Thus, four possible land and capital combinations were examined: Present acreage and limited capital; extended acreage and limited capital; present acreage and plentiful capital; and extended acreage and plentiful capital. The four situations are discussed in the order presented above.

## Potential Farm Organizations

Inasmuch as six sizes of farms were examined in each of the four land and capital situations, a total of 24 potential farm organizations was derived. Each of the 24 organizations is considered optimal in the sense that it represents the profit maximizing resource combination calculated for these dairy farms, subject to the restrictions under which it was derived. For some situations it will be shown that an alternative farm organization to that presented can be expected to provide almost the same level of income. In no situation is it likely that farmers using the rates of efficiency of milk and crop production observed for each farm size can expect other farm organizations to be more profitable than the organizations proposed for each land and capital situation.

### Growth potential on present acreage with 60 percent equity

Herd increases of one-fourth to one-third present herd size are indicated for most dairymen who have 60 percent equities and who must confine expansion to present land holdings. The most profitable farm organizations for the expanded herds are presented in Table 9.

Farmers with 25 cows or less cannot profitably expand beyond present capacity of the milking facilities, according to the results of the analysis. Those beginning with 25 cows were operating at capacity of the existing facilities, and the analysis indicated that the present size of herd is optimal for the capital situation under consideration. Because the beginning farm organization shown in Table 1 is the optimal organization for the 25-cow herd, the data are not repeated in Table 9.

Farmers beginning with 20-cow herds were operating at about 74 percent of capacity of the existing facilities. The analysis indicates that expansion up to but not beyond capacity is profitable. Expansions of

larger herds were sufficiently profitable to justify additional investments in larger bulk tanks, remodeled barns, and other necessary additions to the fixed plant.

As land becomes limiting, the feed grains enterprise is the first to be given up for the sake of larger dairy herds, according to the results in Table 9. Only in the expansion from 32 to 40 cows are all the feed grains needed produced on the farm. These farmers initially owned more acres per cow than the others, according to Table 1. Farm production of hay and replacements as well as the wheat enterprise are retained for all sizes of farm in Table 9.

Oat production is a matter of virtual indifference with respect to profit maximization when harvesting the grain depends on custom work. In the expansion from 46 to 60 cows, oat production was abandoned, yet enough land was available to produce most of the feed grains needed by the herd. The decision to plant the available 79 acres to oats rather than to accept $7 per acre in rent would not decrease farm income more than $43 per year. While the smaller farms are producing some or all of the oats, according to the profit maximizing solutions of Table 9, the decision not to produce feed grains on the farms would

**Table 9.—Growth Potential for Dairy Farms in Central and Northeast Oklahoma on Present Acreage with 60% Equity**

| Resources | Most Profitable Farm Organization with Beginning Cow Herd Size of:* | | | | |
|---|---|---|---|---|---|
| | 20 | 32 | 46 | 60 | 84 |
| Final Number of Cows | 27 | 40 | 60 | 75 | 108 |
| Heifers | 5 | 8 | 12 | 15 | 21 |
| Calves | 6 | 8 | 12 | 15 | 22 |
| Labor, months | 12.3 | 16.4 | 20.5 | 26.3 | 37.4 |
| Land, total acres | 160 | 340 | 474 | 500 | 680 |
| Native Pasture | 60 | 140 | 200 | 180 | 240 |
| Cropland | 100 | 200 | 274 | 320 | 440 |
| Wheat | -- | 40 | 26 | 40 | -- |
| Oats | 15 | 51 | -- | 45 | 97 |
| Hay and Silage | 42 | 62 | 94 | 117 | 168 |
| Rye and Vetch; Sudan | 23 | 34 | 52 | 65 | 93 |
| Other Pasture | 20 | 13 | 23 | 53 | 82 |
| Cropland Rented Out | -- | -- | 79 | -- | -- |

*Data for the 25-cow farms are not presented here because the beginning farm organization shown in Table 1 was optimal for the 25-cow herd when there was a 60 percent equity.

not sacrifice more than $8 to $40 of net revenue per year. However, losses of $200 to $400 per year would result in the 75- and 108-cow expansions respectively if the 45- and 97-acre oat fields were rented out and oats were purchased at $37.50 per ton. This is because combines are owned on the two larger sizes of farm and the decision to buy all feed grains would leave some existing machinery idle.

## Growth potential on extended acreage with 60 percent equity

When dairymen with 60 percent equities have the opportunity to rent additional land to facilitate expansions, they can profit greatly from low cost pastureland but have little need for additional cropland. With more native pasture available, less improved pasture is needed and the cropland thus released can profitably be used for producing oats. Oat production on the farm makes a valuable contribution to net revenue for the two larger sizes of herd, but dairymen on the smaller farms may be virtually indifferent as far as earning profits are concerned if they have the usual proficiency for oat production and if they depend on custom work for harvesting the grain.

The most profitable farm reorganizations, shown in Table 10, indicate that dairymen with limited capital will reach larger final herd sizes when additional land is available in the neighborhood than when it is not, that native pasture land is more important in the expansion than

### Table 10.—Growth Potential on Extended Acreage with 60% Equity

| Resources | Most Profitable Farm Organization with Beginning Cow Herd Size of:* | | | | |
|---|---|---|---|---|---|
| | 20 | 32 | 46 | 60 | 84 |
| Final Number of Cows | 27 | 43 | 62 | 75 | 109 |
| Heifers | 5 | 8 | 12 | 15 | 22 |
| Calves | 6 | 9 | 13 | 15 | 22 |
| Labor, months | 12.4 | 17.5 | 21.1 | 26.8 | 37.9 |
| Land, total acres | 220 | 394 | 553 | 658 | 920 |
| Native Pasture, total | 120 | 194 | 279 | 338 | 480 |
| Native Pasture Rented In | 60 | 54 | 79 | 158 | 240 |
| Cropland | 100 | 200 | 274 | 320 | 440 |
| Wheat | –– | 40 | 26 | 40 | –– |
| Oats | 35 | 55 | –– | 98 | 135 |
| Hay and Silage | 42 | 67 | 97 | 117 | 170 |
| Rye and Vetch; Sudan | 23 | 38 | 53 | 65 | 94 |
| Cropland Rented Out | –– | –– | 98 | –– | 41 |

*Data for the 25-cow farms are not presented here because the beginning farm organization shown in Table 1 was optimal for the 25-cow herd when there was a 60 percent equity.

cropland, and that oat production is slightly more attractive when land is plentiful than when it is not. Otherwise, the two land situations for limited capital are similar.

The discussion above shows that changes in land availability for a given equity position has some effect on the best farm organization. Changes in the availability of additional investment capital may have more to do with the ultimate form organization than the availability of additional land according to the following analysis of growth potential when there is a 90 percent equity.

## Growth potential on present acreage with 90 percent equity

Herd increases of one-half to full present herd size are indicated for most dairymen who have 90 percent equities and who must confine expansion to present land holdings. The most profitable farm organizations for the expanded herds are presented in Table 11.

Farmers beginning with 20 cows would find it unprofitable to expand further with the relatively plentiful supply of investment capital associated with 90 percent equity positions than with the capital-scarce 60 percent equity positions. Because the farm organization for the 20-cow herd shown in Table 9 is optimal for both the 60 and the 90 percent equity situations on present acreage, the data are not repeated in Table 11. For all other sizes of farm, dairymen may attain larger, more

### Table 11.—Growth Potential on Present Acreage with 90% Equity

| Resources | Most Profitable Farm Organization with Beginning Cow Herd Size of:* | | | | |
|---|---|---|---|---|---|
| | 25 | 32 | 46 | 60 | 84 |
| Final Number of Cows | 37 | 58 | 97 | 103 | 145 |
| Heifers | 7 | 11 | 4 | 12 | 12 |
| Calves | 8 | 12 | 5 | 12 | 12 |
| Labor, months | 15.3 | 22.5 | 30.5 | 33.6 | 46.5 |
| Land, total acres | 262 | 340 | 474 | 500 | 680 |
| Native Pasture | 148 | 140 | 200 | 180 | 240 |
| Cropland | 114 | 200 | 274 | 320 | 440 |
| Wheat | 18 | 20 | -- | -- | -- |
| Oats | -- | -- | -- | -- | -- |
| Hay and Silage | 58 | 90 | 132 | 150 | 202 |
| Rye and Vetch; Sudan | 32 | 50 | 83 | 88 | 124 |
| Other Pasture | 6 | 40 | 59 | 82 | 114 |

*Data for the 20-cow farms are not presented here because the farm organization shown in Table 9 was optimal for the 20-cow herd for both the 60 and the 90 percent equity situations on present acreage.

profitable farm organizations when capital is plentiful than when it is scarce.

Oat production is notable in Table 11 by its absence. Dairymen cannot afford to produce feed grains when expansion capital is plentiful and land is scarce. Planting an oat field would curtail the roughage base and necessitate smaller herd sizes. Oat production in the expansion from 60 and 84 cows would mean, through smaller final herd sizes, lost opportunities for adding to farm income $2,450 and $2,785, respectively.

Losses from oat production on the intermediate sizes of farm would be $240 to $590. For the smaller farms, where costs of producing milk are higher, the opportunity cost of producing more oats and less milk is of less importance, only $66 for the 25-cow farm. One may conclude that on the smaller, less efficient farms, dairymen may remain indifferent to oat production rather than become adverse to it, even when capital becomes plentiful and land remains scarce.

Lucrative supplementary enterprises such as wheat production may be given up by efficient dairymen in order to expand herds. In the expansion from 60 to 103 cows, the 40-acre wheat allotment was abandoned for the sake of the larger herd. The decision to do so added $900 per year to farm income even though it meant leaving the combine idle. Abandoning the 26-acre wheat allotment in the expansion from 46 to 97 cows added only $80 to farm income. In this case, custom work was hired for the wheat harvest. Table 11 indicates that only half the 40-acre wheat allotment is retained in the expansion from 32 to 58 cows. However, to do so only increases farm income by $22 per year. Some dairymen might not be willing to give up half their wheat allotment for $22.

Replacement production is curtailed but not eliminated in the expansions from 46 cows and more, but is retained in the expansions from 32 cows and less. Hay production is continued for all sizes of farm, but the two expansions to more than 100 cows lead to opportunity costs for land now in hay such that herd sizes could be increased using purchased hay for part of the roughage if a good quality hay were available for $18 or $19 per ton.

Hiring competent farm labor may be a major difficulty faced by dairymen in expanding from the present farm organizations depicted in Table 1 to the profit maximizing organizations presented in Table 11. Dairymen with final herd sizes of 103 to 145 head will be using 1 to 1½ more hired men after the expansion than before. However, these dairymen have had some experience with finding quality labor to help in the present farm organization. In the expansion from 25 to 37 cows, only 4½ more months of labor are required for a total of 15.3 months. For some farmers all of this can be supplied by the family, while for others one to three months of hired labor are needed. It would seem, then, that the most important labor problems would arise for the farmers who are currently handling 32 and 46 cow herds with family labor and will need to hire a competent, full-time hired man to effect a profitable expansion.

## Growth potential on extended acreage with 90 percent equity

When dairymen with access to more land at reasonable cost have 90 percent equities in their present farm organization, the most profitable herd sizes attainable are about 45 percent larger than when the expansion is confined to present acreage, according to the results presented in Table 12. With more land available it is always more profitable to retain the wheat enterprise, to produce herd replacements, and to raise all the roughage required by the herd.

In most instances it is more profitable to raise feed grains than to buy oats for $37.50 per ton. Oat production is not indicated for the expansion from 46 to 106 cows; but with the typically observed yield of 36 bushels per acre, a 139-acre oat field would supply all the required feed grains and would not be expected to reduce income more than $74 below the high profit organization presented in Table 12. For the smaller farms where harvest depends on custom work it is a matter of virtual indifference whether oats are produced on the farm as long as land is not needed to increase the roughage base and expand the size of herd. On the larger farm where harvesting equipment is owned by the operator it pays to raise oats when more cropland is available at reasonable cost.

## Table 12.—Growth Potential on Extended Acreage with 90% Equity

| | Most Profitable Farm Organization with Beginning Cow Herd Size of:* | | | | |
|---|---|---|---|---|---|
| Resources | 25 | 32 | 46 | 60 | 84 |
| Final Number of Cows | 48 | 70 | 106 | 138 | 197 |
| Heifers | 9 | 14 | 21 | 27 | 39 |
| Calves | 10 | 14 | 22 | 28 | 40 |
| Labor, months | 20.6 | 28.2 | 35.8 | 49.3 | 69.7 |
| Land, total acres | 413 | 591 | 708 | 1000 | 1336 |
| Native Pasture | 216 | 280 | 400 | 360 | 480 |
| Native Pasture Rented In | 68 | 140 | 200 | 180 | 240 |
| Cropland | 197 | 311 | 308 | 640 | 856 |
| Wheat | 18 | 40 | 26 | 40 | -- |
| Oats | 63 | 90 | -- | 179 | 244 |
| Hay and Silage | 75 | 109 | 165 | 215 | 307 |
| Rye and Vetch; Sudan | 41 | 60 | 91 | 119 | 169 |
| Other Pasture | -- | 12 | 26 | 87 | 136 |
| Cropland Rented In | 83 | 111 | 34 | 320 | 416 |

*Data for the 20-cow farms are not presented here because the farm organization shown in Table 10 was optimal for the 20-cow herd for both the 60 and the 90 percent equity situations on extended acreage.

All the native pasture available is used in the expansions beginning with 32 cows or more. Since some cropland is seeded to other pastures, it follows that more pasture would be rented and substituted for cropland if it were offered at rental rates not in excess of three dollars per acre per year.

Some cropland is rented in for each of the expansion situations when the operator begins with a 90 percent equity. This is in contrast to the finding that dairymen with limited capital could not profitably use additional cropland for a cash rent of $7 per acre. Cropland would be rented for each of the expansions in Table 12 to reach the recommended herd size, even if it became economic through lower yields or lower prices to purchase feed grains rather than raise on the farm the oats required by the herd.

The expansion to a herd of 197 dairy cattle ranging over more than two sections of land is a projection somewhat larger than the herds actually observed. The projection assumes that the feeding methods, labor requirements and livestock and field management practices observed on herds of 70 to 130 cows would hold for herds of about 200 cows. One of the dairymen interviewed indicated confidence in his ability to profitably extend his herd to nearly 200 head on about two sections of land without any particular changes in dairying methods. However, he and other farmers expressed the view that dairy operations large enough to require two sections of land under the usual practices might benefit from a change in technology which would concentrate the entire herd on only a few acres. That is, the land would become more important as space in which to hold cattle than as a factor in the production of grain, forage and replacements.

## Potential Investment Requirements and Incomes

Relationships between investment capital and expected incomes for the most profitable reorganizations of farm resources are presented in Tables 13 and 14. These tables show that optimal investment and maximum income depend more on the supply of money offered to a dairyman than on the supply of land.

As a general rule, farmers beginning with 60 percent equities could borrow capital to make moderate, profitable expansions which would reduce equities to about 55 percent of total assets. On the other hand, the range of most profitable final equities for farmers beginning with 90 percent ownership in the beginning total assets is 60 percent to 85 percent. For the latter cases, more cows are added, final percentage equities are higher and the marginal rate of interest is lower than for the cases where farmers begin with only a 60 percent equity.

Eight percent interest was the maximum that dairymen beginning with a large equity would need to pay for expansion capital under the supply and demand conditions stated. Farmers with smaller initial equities might need to pay as much as 16 percent interest to reach their opti-

mal organizations. That is, when capital in relatively short supply places a ceiling on the maximum size of farm, farmers can afford to pay higher rates of interest to get the necessary expansion capital. While the highest rate of interest needed to reach the most profitable organization was 16 percent in this study, some dairymen could pay as much as 20 percent before deciding to settle for a smaller dairy farm.

**Table 13.—Estimated Income and Investment for the Most Profitable Dairy Farm Reorganizations Beginning with 60% Equity**

| Item | With a Beginning Cow Herd Size of: | | | | |
|---|---|---|---|---|---|
| | 20 | 32 | 46 | 60 | 84 |
| *For expanded herds on present acreage* | | | | | |
| Final Number of Cows | 27 | 40 | 60 | 75 | 108 |
| Total Investment (dollars) | $34,425 | $71,125 | $86,450 | $97,350 | $128,125 |
| Investment per Cow | 1,275 | 1,778 | 1,441 | 1,278 | 1,186 |
| Marginal Rate of Interest | 12% | 8% | 16% | 12% | 12% |
| Farm Income | 5,760 | 9,540 | 13,400 | 15,750 | 20,880 |
| Net Farm Income | 4,745 | 7,480 | 10,735 | 12,935 | 16,920 |
| Labor Income | 3,775 | 5,520 | 8,370 | 10,185 | 13,350 |
| Added Investment | 2,050 | 5,725 | 7,625 | 5,725 | 9,125 |
| Added Labor Income | 790 | 420 | 990 | 1,655 | 2,830 |
| Years Needed to Recover Added Investment from Added Labor Income | 2.6 | 8.4 | 7.7 | 3.4 | 3.2 |
| *For expanded herds on extended acreage* | | | | | |
| Final Number of Cows | 27 | 43 | 62 | 75 | 109 |
| Total Investment | $34,750 | $73,325 | $87,800 | $97,350 | $129,075 |
| Investment per Cow | 1,287 | 1,705 | 1,416 | 1,306 | 1,417 |
| Marginal Rate of Interest | 12% | 12% | 16% | 12% | 8% |
| Farm Income | 5,925 | 9,910 | 13,810 | 16,480 | 21,765 |
| Net Farm Income | 4,870 | 7,610 | 10,840 | 13,595 | 17,680 |
| Labor Income | 3,900 | 5,650 | 8,475 | 10,845 | 14,110 |
| Added Investment | 2,375 | 7,925 | 8,975 | 6,300 | 10,075 |
| Added Labor Income | 915 | 550 | 1,095 | 2,315 | 3,590 |
| Years Needed to Recover Added Investment from Added Labor Income | 2.6 | 14.4 | 8.2 | 2.7 | 2.8 |

Final labor incomes are attractive relative to beginning labor incomes for each expansion situation, but in some instances the ability to repay the borrowed funds from added income is such that it would take several years for the farm family to realize any direct, monetary benefits from the decisions to borrow more money and expand the dairy herd.

An analysis of added costs and returns indicates that it is usually justifiable to borrow enough capital to expand the herd to the limits of present plant capacity, because the additional investment requirement is not high relative to the additional returns. For example, in the expansion from 20 to 27 cows on present acreage (Table 13) the additional investment requirement is only $2050, or $293 per cow. The added investment could be recovered from added income in two years and seven months, after which the labor income would be $3,775, or $790 more than the labor income the dairyman was able to earn by caring for 20 cows and working part-time off the farm.

Borrowing for the sake of a larger, more profitable farm may necessitate sacrifices in terms of less disposable income for the farm family during the years that the loans are being repaid. The extent to which this is so is illustrated by the expansion from 32 to 43 head on extended acreage presented in Table 13. In this case, $7,925 is borrowed to add 11 cows and the required complement of machinery and equipment. This amounts to an added investment of $720 per cow. Given the assumptions of the analysis, $6,300 of this could be obtained on intermediate term credit from a credit agency such as the local bank or the production credit association. Ordinarily, such loans are expected to be retired in less than three to five years. The remaining $1,625 could be borrowed at 12 percent interest from a local farm supply dealer in feed, machinery or equipment, using additional purchases as collateral for the loan. Such loans are expected to be retired in less than one to two years. It would take 14 years and five months to save enough out of added income to retire the $7,925 from additional income provided by 11 more cows. To retire the loans according to the usual repayment schedules would require that the family be willing to sacrifice about $1,500 of income for the first few years for the sake of a larger, more profitable business in the future.

If the farmer with 32 cows had a 90 percent equity rather than the 60 percent equity discussed above, an expansion would be easier to pay for out of added income. According to Table 14, the dairyman could add 38 cows and the necessary machinery, equipment and buildings for an average additional investment of $740 per head. $22,950 of the needed $28,125 can be borrowed on a land mortgage with 20 years to pay (see Table 6). The remaining $5,175 can be borrowed either from the banker or from the production credit agency at about 8 percent interest with five years to pay. The added income of $2,515 is sufficient to cover the principle payments on both loans, and the standard of living for the family can be raised after the first five years.

The analysis of added costs and returns indicates that repayment schedules need not present problems in reaching the profit maximizing

organizations indicated for herds beginning with 60 or more cows. Herd increases from 25 percent to more than 100 percent of present herd size can be paid for from added income in less than four years for all land and capital situations.

**Table 14.—Estimated Income and Investment for the Most Profitable Dairy Farm Reorganizations Beginning with 90% Equity**

| Item | When the Beginning Cow Herd Size was: | | | | |
|---|---|---|---|---|---|
| | 25 | 32 | 46 | 60 | 84 |
| | *For expanded herds on present acreage:* | | | | |
| Final Number of Cows | 37 | 58 | 97 | 103 | 145 |
| Total Investment | $50,600 | $82,800 | $108,350 | $107,875 | $142,225 |
| Investment Per Cow | 1,368 | 1,428 | 1,117 | 1,047 | 981 |
| Marginal Rate of Interest | 6% | 6% | 8% | 6% | 6% |
| Farm Income | 7,600 | 11,020 | 18,090 | 18,990 | 24,710 |
| Net Farm Income | 6,480 | 9,580 | 15,765 | 17,365 | 22,600 |
| Labor Income | 4,940 | 6,640 | 12,215 | 13,240 | 17,245 |
| Added Investment | 8,450 | 17,400 | 29,525 | 16,250 | 23,225 |
| Added Labor Income | 520 | 1,315 | 4,480 | 4,295 | 6,130 |
| Years Needed to Recover Added Investment from Added Labor Income | 16.2 | 11.2 | 6.6 | 3.8 | 3.8 |
| | *For expanded herds on extended acreage:* | | | | |
| Final Number of Cows | 48 | 70 | 106 | 138 | 197 |
| Total Investment | $61,200 | $93,525 | $114,550 | $125,875 | $167,525 |
| Investment per Cow | 1,275 | 1,336 | 1,081 | 912 | 850 |
| Marginal Rate of Interest | 6% | 8% | 8% | 8% | 8% |
| Farm Income | 8,760 | 12,965 | 20,000 | 27,445 | 36,310 |
| Net Farm Income | 7,245 | 10,780 | 17,180 | 24,740 | 32,405 |
| Labor Income | 5,345 | 7,840 | 13,630 | 20,615 | 27,050 |
| Added Investment | 19,050 | 28,125 | 37,725 | 34,250 | 48,525 |
| Added Labor Income | 925 | 2,515 | 5,895 | 11,670 | 15,935 |
| Years Needed to Recover Added Investment from Added Labor Income | 20.6 | 11.8 | 6.1 | 2.9 | 3.0 |

Average investments per cow decline as herds are expanded, according to the tables. In Table 5, the average investment per cow for the 84-cow herd was $1,417. In Table 14, the expansion to 197 cows brings about investment economies of scale such that the average investment per cow is only $850. Some of the indicated economies are derived from more efficient use of labor and equipment, but some are from using rental land rather than owned land. This latter effect makes the investment economies of scale appear much greater than they would be if the stipulation were made that land must be purchased rather than rented. The maximum investment economies attributable to more efficient use of labor and equipment, for all cases studied, is $240 per head. Other indicated economies are attributable to the provision for renting rather than purchasing land.

# The Demand for Dairy Labor

Four out of each five farms observed in this study were family size farms, yet two-thirds of the expansion situations studied required more labor than the operator and his family could supply. In one situation, five full-time men and one part-time man were needed to handle the dairy business. It is therefore important to know the value of hired labor in the expanded situations.

Several of the dairymen interviewed stated that they were not expanding their herds because the quality of help they needed was not available at the usual farm wage of $1.00 to $1.25 per hour, or $3,000 to $3,750 per year, to cover wages, housing, and perquisites. They were firmly convinced that higher wages could not be justified. While even the best of labor cannot add much value to farm income during slack seasons, it was shown in one of the situations studied that the hired man added $11,100 to farm income for a year's work, or $7,350 more than the $3,750 wage allowed.

Data for evaluating operator and hired labor when herd expansions are confined to present acreage are presented in Table 15. When there is a 60 percent beginning equity in the 60-cow herd, the table shows that the average value of all labor used in the present farm organization is $2.13 per hour. That is, if the operator were to pay himself and his hired hands at the rate of $2.13 per hour, there would be no residual income after all expenses including 5 percent interest on the operator's equity are paid for. A herd expansion from 60 to 75 cows would provide enough additional income to give everyone a raise of ten cents an hour for an average wage rate of $2.23.

When the hired man is paid the usual $1.25 for his services in the present organization of 60 cows, the operator's labor income is $2.84 an hour. If additional help can be hired for $1.25, the expansion from 60 to 75 head increases the operator's labor income from $2.84 to $3.40. The higher rate of return to the operator's labor is, of course, to the

benefit of the dairyman, and the farm organizations proposed as optimal in this study are ones which maximize this value subject to the restrictions imposed on the analysis.

In the example of the 60-cow farm, nine months and 21 days of hired labor are used in addition to the operator's labor in the present farm organization. It is assumed that this labor commands a wage of $1.25 an hour. For the expanded herd of 75 cows, 14 months and 9 days of hired labor are needed in addition to the operator, or an additional four months and 18 days.

Suppose the right man is found to supply the additional labor, but he wants more than $1.25 an hour; and further suppose that when the present hired man finds out that the new one is getting higher wages he will expect a raise. The maximum wage rate that may be afforded in this situation for the entire 14 months and 9 days of hired labor is presented in the right hand column of Table 15. In this column we find that a wage rate up to $1.71 could be paid for all labor after the expansion without adversely affecting the operator's labor income.

This means that if the hired men receive $1.71 per hour there is no advantage in expanding the herd because the operator's labor income from the 75-cow herd after paying the higher wage rate would be exactly the same as from the 60-cow herd at the lower wage rate. It also means that for any average wage rate less than $1.71, say $1.50, it would pay to give the hired man a raise and expand the herd to 75 cows.

The value of labor when there is a 90 percent beginning equity and when herd expansions are confined to present acreage is presented in the lower section of Table 15. These values are higher than the corresponding values for the 60 percent equity situation because the savings in interest payments on borrowed capital are treated as additional residual returns to labor after the farmer's equity has been assigned a return of 5 percent. Two things of interest to note in comparing the results of the two equity positions shown in Table 15 are related to (1) the increased potential for the operator to raise the value of his own labor through a larger, more profitable organization, and (2) the ability to pay higher wage rates when capital is plentiful than when it is scarce. Hired labor might receive ten cents to fifty cents per hour more in the later situations than in the former before it would become unprofitable to expand.

The values of labor presented in Table 15 are for expansions confined to present acreage. Comparable values for expansions on extended acreage are not sufficiently different to justify tabulation.

While the going wage is equivalent to $3,750 per year, wages less than $5,000 per year on farms with limited capital and wages less than $6,000 per year on farms with plentiful capital would not be too high to prevent the average dairyman in this study from paying the higher wage as he expands his business to the indicated, profit maximizing farm organizations. Higher wages do, of course, mean lower profits for a given farm organization; if wages were to increase from $3,750 to, say,

**Table 15.—The Value of Labor with Herd Expansions Confined to Present Acreage on Dairy Farms in Central and Northeast Oklahoma**

| Present Herd Size | Average Value, All Labor | | Operator's Labor Income | | Average Wage Rate Payable |
|---|---|---|---|---|---|
| | Representative Organization | Expanded Organization | Representative Organization | Expanded Organization | |
| *When there was a 60% beginning equity:* | | | | | |
| 20 | $ .99 | $1.26 | $ .99 | $1.26 | -- |
| 25 | 1.45 | 1.45 | 1.45 | 1.45 | -- |
| 32 | 1.66 | 1.68 | 1.70 | 1.84 | $1.63 |
| 46 | 2.13 | 2.15 | 2.46 | 2.79 | 1.71 |
| 60 | 2.13 | 2.23 | 2.84 | 3.40 | 1.71 |
| 84 | 2.17 | 2.28 | 3.51 | 4.45 | 1.69 |
| *When there was a 90% beginning equity:* | | | | | |
| 20 | $1.07 | $1.33 | $1.07 | $1.33 | -- |
| 25 | 1.52 | 1.56 | 1.52 | 1.65 | $1.88 |
| 32 | 1.73 | 1.76 | 1.78 | 2.21 | 1.75 |
| 46 | 2.21 | 2.36 | 2.58 | 4.17 | 2.22 |
| 60 | 2.17 | 2.38 | 2.98 | 4.41 | 2.15 |
| 84 | 2.25 | 2.41 | 3.70 | 5.71 | 1.96 |

$4,500 in the expansion process, it would take longer than indicated in Tables 13 and 14 to recover the incremental investment capital from added income.

# Specialization on the Dairy Farm

Growth patterns developed in this study indicate specialization rather than diversification on the larger, more profitable dairy farms in the future. Dairymen can maximize profits over the years by concentrating their efforts on producing milk for sale. This study indicates that oat production is the first target in the specialization program. Wheat production and replacement production are both likely to be abandoned for the sake of more milk production when land is limiting and capital is relatively plentiful. The hay producing enterprise remained profitable in all situations studied.

# Feed Grain Production

Feed grain production can usually be retained in the most profitable farm organization when additional cropland is available at reasonable cost. However, the oats enterprise would almost always be discarded for the sake of expansion on present acreage. This result is reflected in Table 16 which shows oat prices per ton above which it would be profitable to raise rather than buy oats for feed grains in the expanded farm organization.

The table shows that when expansion is confined to present acreage, profit maximizing dairymen would almost always prefer to pay more than the current price of $37.50 per ton and expand the herd rather than produce oats and carry fewer cows. For example, in the expansion from 60 to 75 cows on present acreage with a 60 percent beginning equity, one could pay up to $41.36 per ton to buy oats before it would pay to raise them.

On the other hand, the table shows that, when more land is available for expansion, dairymen would almost always prefer to produce oats rather than buy them unless the price of oats fell below $37.50. In the expansion from 60 to 75 cows on extended acreage it would not pay to abandon the oats enterprise unless the price of oats fell below $33.17 per ton. Dairymen with larger herds and a well mechanized oats enterprise on more than 75 acres will produce oats according to Table 16; while the dairymen with smaller oat fields, who depend on custom harvesting, will not. This is because oat prices would have to fall more than $4 per ton in the former case and less than $1.50 in the latter to make oat production an uneconomic enterprise.

**Table 16.—Breakeven Prices\* for Raising Rather Than Buying Oats on Dairy Farms in Central and Northeast Oklahoma**

| Present Herd Size | 60% Beginning Equity | | 90% Beginning Equity | |
|---|---|---|---|---|
| | Present Acreage | Extended Acreage | Present Acreage | Extended Acreage |
| 20 | $42.40 | $36.74 | $43.01 | $34.85 |
| 25 | 36.52 | 36.52 | 39.30 | 36.52 |
| 32 | 36.55 | 35.00 | 41.81 | 36.55 |
| 46 | 38.20 | 39.60 | 43.82 | 38.20 |
| 60 | 41.36 | 33.17 | 62.41 | 32.98 |
| 84 | 42.09 | 32.24 | 58.89 | 32.24 |

\*Oat prices per ton above which it would be profitable to raise rather than buy oats for feed grains in the expanded farm organization.

It is as easy to decide with the toss of a coin as with economic analysis whether the oats enterprise can be retained profitably in the expansion of the smaller herds studied on extended acreage; the added income from the oats is minute relative to total income and the advantage could be eliminated either by a small decrease in the price of oats or by a two or three bushel per acre decrease in average oat yields. These dairymen are indifferent to the oats enterprise if they have average facility for producing feed grains.

# Wheat Production

If the price of wheat were to fall to $1 per bushel and other farm prices remained at present levels, profit maximizing dairymen represented by this study would abandon their wheat enterprise for the sake of a larger dairy herd. At present price support levels for wheat, only the dairymen with large, efficient herds and with limited land and plentiful capital can afford to give up the wheat allotment. Table 17 shows the wheat prices above which it would be profitable to produce wheat rather than give up the allotment in the expanded farm organization.

The table indicates, for example, that the dairyman beginning with a 60 percent equity in a 46-cow herd would retain his 26-acre wheat allotment in his expansion to 60 cows on the present acreage as long as the price of wheat remains above $1.52 per bushel. Were wheat prices to fall below this level, it would pay to use the wheat acreage for more hay and pasture in support of a larger dairy herd.

# Replacement Production

Most of the farmers interviewed said they would have to pay about $220 per head for replacement heifers of quality comparable to the replacements produced on the farm. At this price, advantages of purchase are realized only on farms with low costs of milk production, limited

**Table 17.—Breakeven Prices\* for Producing Wheat on Dairy Farms In Central and Northeast Oklahoma**

| Present Herd Size | 60% Beginning Equity | | 90% Beginning Equity | |
| --- | --- | --- | --- | --- |
| | Present Acreage | Extended Acreage | Present Acreage | Extended Acreage |
| 25 | $1.02 | $1.02 | $ .98 | $1.02 |
| 32 | 1.45 | 1.50 | 1.68 | 1.45 |
| 46 | 1.52 | 1.58 | 1.92 | 1.52 |
| 60 | 1.59 | 1.41 | 3.00 | 1.59 |

\*Wheat prices per bushel above which it would be proitable to produce wheat rather than give up the allotment in the expanded organization.

acreage, and abundant growth capital, according to the results presented in Table 18. The table shows the replacement prices above which it would be profitable to raise dairy replacements for herd use in the expanded farm organization.

If quality replacements could be acquired for $200 per head, purchased replacements would be profitable in the expanded farm organization in more than half the situations presented in the table. Were the price of springer heifers to fall to $175, all the dairymen represented in this study would profit by purchasing herd replacements rather than producing them.

At current prices of $220 per head, one would not expect much buying and selling of replacement heifers among dairy producers in Central and Northeast Oklahoma. Table 18 shows that the price is not low enough to compete with on-farm opportunities for raising replacements for use in the herd; and Table 19 shows that the price is not high enough to encourage raising dairy replacements for resale as a supplementary enterprise in the most profitable organizations. The latter table shows that the dairyman with a 60 percent equity in a 25-cow herd would be interested in selling less milk in order to raise replacements for resale if he could get a price of $203 at the farm gate. If the dairyman had a 90 percent equity in the 25-cow herd, he could not afford to let producing replacements for resale interfere with his expansion to 48 cows on the present 262 acres at prices less than $238 per head.

Producing replacements for resale did not appear in the profit maximizing organization of the 25-cow herd because, while the enterprise would be profitable at $203, the dairymen interviewed indicated that they could not realize more than $200 at the farm gate for the sale of replacements although they paid as much as $220 to buy replacements delivered at the farm gate. The difference of $20 is largely explained by transportation and marketing charges.

## Table 18.—Breakeven Prices* for Buying Replacements on Dairy Farms In Central and Northeast Oklahoma

| Present Herd Size | 60% Beginning Equity | | 90% Beginning Equity | |
|---|---|---|---|---|
| | Present Acreage | Extended Acreage | Present Acreage | Extended Acreage |
| 20 | $208 | $207 | $207 | $201 |
| 25 | 180 | 180 | 211 | 180 |
| 32 | 210 | 186 | 220 | 210 |
| 46 | 203 | 175 | 220 | 203 |
| 60 | 208 | 198 | 270 | 208 |
| 84 | 195 | 183 | 250 | 195 |

*Replacement prices above which it would be profitable to raise dairy replacements for herd use in the expanded farm organization.

**Table 19.—Breakeven Prices\* for Selling Replacements on Dairy Farms In Central and Northeast Oklahoma**

| Present Herd Size | 60% Beginning Equity | | 90% Beginning Equity | |
|---|---|---|---|---|
| | Present Acreage | Extended Acreage | Present Acreage | Extended Acreage |
| 20 | $242 | $240 | $234 | $227 |
| 25 | 203 | 203 | 238 | 203 |
| 32 | 240 | 211 | 252 | 240 |
| 46 | 240 | 208 | 257 | 240 |
| 60 | 258 | 251 | 311 | 258 |
| 84 | 251 | 243 | 294 | 251 |

\*Replacement prices above which it would be profitable to raise dairy replacements for resale in the expanded farm organization.

## Hay Production

Seven of the 44 dairymen interviewed were buying all their hay. The results of the analysis of costs and returns indicate that those who have cropland capable of producing three tons of good quality alfalfa hay per acre will profit by raising, not buying, hay. In no case studied were farmers able to pay as much as the current price of $25 per ton for alfalfa hay rather than produce all the hay needed on the farm.

With the usual efficiency of production observed, few dairymen could afford to pay more than half the going price for a ton of hay. However, in the 60- and 84-cow herds, where capital is abundant and land is scarce, opportunities are such that good quality hay would be worth buying if it were delivered at the farm gate for $19.70 and $18.45, respectively.

# Summary and Conclusions

The objectives of this study were to describe some typical dairy farm organizations in Central and Northeast Oklahoma and to examine the potential for increasing profits. The methods of analysis used was to estimate the average efficiency of milk production for six sizes of farm in a sample of 44 dairy farms in Central Oklahoma, and to use linear programming analysis to estimate the most profitable farm organizations obtainable subject to various land, capital, and productivity restrictions.

Some central finds of the study were:

1. The availability of investment capital is the greatest deterrent on expansion of individual dairy farms.

2. Herd increases from one-fourth to one-third present herd size are profitable when there is a 60 percent equity in the beginning farm organization.

3. Herd increases from one-half to full herd size are profitable when there is a 90 percent equity in the beginning farm organization.

4. When land is not available for expansion, slightly larger investments are needed to attain slightly lower incomes than when land is available at reasonable prices.

5. Pasture land is more important than cropland in expanding the herds.

6. Specialization in milk production is important in the most profitable organization of farm resources.

7. Specialization is more important when land is scarce than when it is plentiful.

8. Specialization is reached by discarding production of oats, wheat, replacements, and hay, in that order.

9. Herds of 25 cows and less indicate little growth potential.

10. Herds of 32 and 46 cows indicate some growth potential, but some difficulty may be met in meeting repayment schedules of borrowed funds.

11. Herds of 60 and more cows have attractive growth potential.

12. Labor income increases averaging 20 percent more than present incomes can be reached when there is a 60 percent equity in the beginning farm organization.

13. Labor income increases averaging 50 percent more than present incomes can be reached when there is a 90 percent equity in the beginning farm organization.

14. Average hired wage rates as high as $1.70 to $2.00 per hour need not deter expansion.