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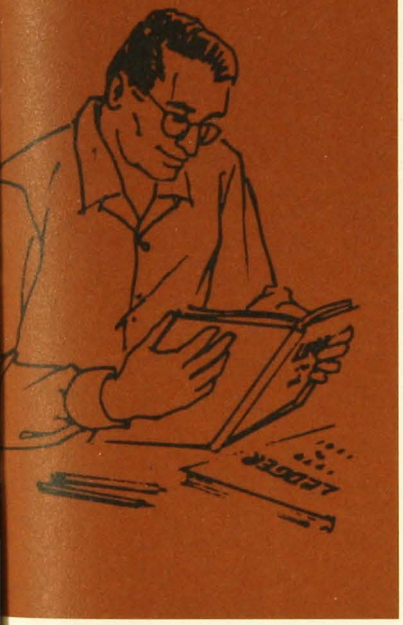

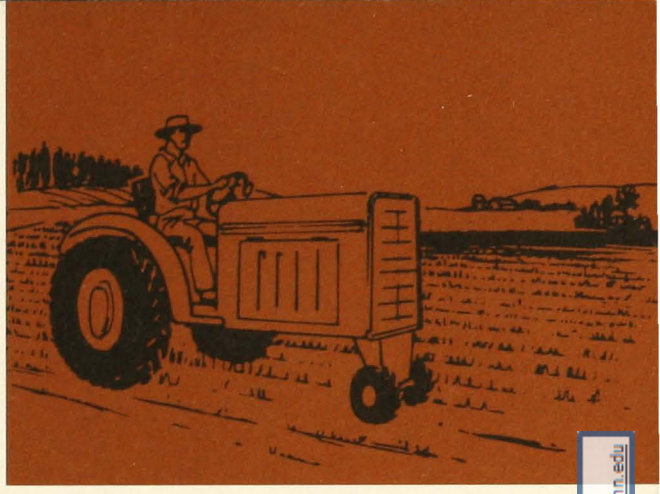

Can Modern Dairy Farms Compete for HIRED LABOR?

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Introduction

Modern dairy farm operators are having to compete more and more for available skilled laborers whose nonfarm job offers can include a 40-hour week, paid vacation, sick leave, special holidays, relatively high wages, steady work and fringe benefits, including shared medical costs and retirement plans. Dairy farm operators need to consider their methods of recruitment, employee training programs, and employee-employer relationships. These are essential to finding and keeping good workers.

Dairying presents special problems in using full-time hired workers. On most dairy farms labor needs are highly seasonal due to the summer production of feedstuffs so farm operators have difficulty providing steady year-round employment. Then, too, cows must be milked every morning and night 365 days a year. The dairy farm doesn't operate well on industry's 40-hour week, with weekends off, particularly if the dairy farm employs only one or two persons. Businesses using many employees can have more flexible work schedules because employees can rotate working weekends and holidays and cover absences due to illness.

Previous research shows that the most efficient use of modern milking parlors and loose housing dairy systems is achieved in the larger—beyond the single operator size—dairy herd.[1] Therefore, hired labor on dairy farms is essential to the economics of this system, which uses new dairy technology to produce higher income opportunities.

Many Lake States farms, which have the help of two or three men, full-time, are some type of family arrangement—for example, father and son, brothers, or father and son-in-law. If this arrangement isn't possible nonfamily labor must be hired if the dairying operation is to be expanded to take advantage of new technology and to achieve higher income. Under present working conditions and wage rates, skilled full-time farm employees are hard to find.

This study evaluates the economics of hiring labor on large modern dairy farms and considers how competitive dairying can be with nonfarm jobs for the same available labor—competitive as to wages, hours worked, and time off.

Specifically the objectives are to determine:

- what the operator of a modern dairy farm could pay a man under varying milk price and production levels,
- the circumstances in which a dairy farm operator can utilize full-time labor, year-round, and
- the effect of full-time labor working 40-hour weeks on modern dairy farms and receiving paid vacations.

Method of Study and Assumptions

A modern dairy farm equipped with labor-efficient technology was set up on paper from engineering and actual farm data. The technology used on this synthesized farm provided minimum production costs. It includes the herring-

[1] Buxton, Boyd M., *Alternative Dairy Technologies — A Comparison of Unit Cost, Net Return, and Investment.* Univ. of Minn. Agri. Exp. Sta. Bull. 490, 1968. Boyd M. Buxton and Harald R. Jensen, *Economies of Size in Minnesota Dairy Farming,* Univ. of Minn. Agri. Exp. Sta. Bull. 488, 1968.

bone milking parlor, loose housing, and mechanical feeding. Labor and cost requirements are based on this dairy technology.

The economics of labor used on this modern dairy farm are evaluated using the linear programing technique. Farm plans are designed for maximum profit obtained for situations employing one, two, three, and four full-time hired men.

This publication assumes the following:

The operator can gain control over the necessary capital to set up the farm operation. All buildings and equipment are new and built to avoid any excess capacity.

Cost and labor reflect a dairy operation that uses a herringbone milking parlor, houses the dairy herd on a manure pack in open loose housing facilities, and mechanically feeds silage from upright silos.

The sale of milk, calves, and cull cows is required to equal at least 80 percent of gross farm sales, which insures this is a relatively specialized dairy farm. Other possible sources of gross sales are corn for grain, and soybeans.

All replacement stock is raised on the farm and held in the milking herd an average of 4 years. Half of a 90 percent calf crop is assumed to be male, and sold within 2 weeks after birth. Heifers are culled at 4 weeks and again at 12 months of age, leaving one replacement for every four adult cows in the herd.

Depreciation costs assume that machinery, buildings, milk stalls, and equipment must be paid for in 15 years. Eight percent interest was charged for investment in land, buildings, and livestock.

Yields and livestock production reflect above average management. Crop yields, production costs, cultural practices, and crop alternatives are based on those for south central and southeastern Minnesota.

Farm input prices reflect projected 1975 conditions and are assumed constant.

The dairy ration meets the minimum nutrient standards for a 1,200 pound milk cow. Rations are developed for cows producing 12,000, 14,000, and 16,000 pounds of milk annually and for the replacement stock. Most of the feed requirement for the herd is produced on the farm (milk replacer and calf starter are purchased).

The ration for milk cows is based on corn silage and alfalfa hay each contributing 50 percent of the total dry matter from roughage. Cows are fed this ration and kept in drylot the entire year.

Annual labor use is divided in 14 periods based on seasonal crop demands. Hours available for farmwork in each period are based on hours worked by a sample of operators (3,716 hours annually), average hours worked by the operator's wife and unpaid family members (2,030 hours annually), available hired seasonal labor (2,032 hours annually), and full-time hired workers on 40 hour weeks with six specified holidays (2,032 hours annually).[2]

Full-time hired workers can work up to 26 hours/week overtime and receive $3 per hour overtime pay in addition to the base salary.

Custom harvesting of corn for grain, corn silage, oats, and soybeans is assumed except where custom vs. no-custom hiring is compared.

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[2] *1964 Pesticides Uses Survey,* USDA, ERS, FPED, 1965. Family and seasonal labor assumed available was the amount used by the average mechanized Lake States dairy farm in 1964.

Nonfarm Job Alternatives

If dairying is to compete effectively with nonfarm employment for hired labor, it must pay workers at least what they could earn in their next best alternative job. The first section considers what farmworkers could earn in nonfarm occupations. Other sections show what operators of larger dairy farms could pay in wages under varying milk prices and production levels.

Nonfarm employment opportunities for prospective hired farmworkers vary according to the worker's training, aptitudes, and interests and where he lives. These, together with family considerations, affect a worker's availability for doing farm work. One study has suggested that employee preference is a major factor.[3] However, the decision of whether to do farm or nonfarm work largely depends on which offers the best wages.

Even though employees may be mobile, the nearness or remoteness to good nonfarm jobs can determine how competitive farm employment is as to wages, hours, and vacation.

A highly skilled dairy farm employee can assume some management responsibilities and function without close supervision. Unsupervised abilities include machine repair and operation, recordkeeping, herd observation for illness, breeding and other problems, and mixing and applying chemicals. This type of labor assumes short run responsibility in the absence of the farm operator. Unskilled labor requires supervision at relatively unskilled tasks such as moving animals, hauling manure, loading bales, and operating a tractor.

Nonfarm Wages

Even if a person has the skills required for a full-time dairy farm employee, the question still remains, "What can this employee earn in nonfarm occupations?" Table 1 presents 1971 salaries for a representative group of nonfarm occupations for which skilled dairy farm labor probably would most likely qualify. For the occupations listed, 1971 annual salaries in Minnesota range from $3,660 to $10,200.[4] Salaries include the value of any maintenance furnished (such as room and board) in addition to cash wages. Salaries are converted to an annual basis and assume year-round employment.

Salaries have increased dramatically and undoubtedly will continue to increase to 1975. Figure 1 shows the increase in nonfarm wages from 1964 to 1969 for construction, manufacturing, trade, and all occupations. It would not be surprising to see the increases go from $6,800 in 1969 to $9,000 or $10,000 in 1975: a 32 to 47 percent increase for the 6-year period. Assuming wages will increase 40 percent from 1970 to 1975 gives some idea of the competitive wage levels facing dairy farm operators (last column, table 1).

Fringe Benefits

Nonfarm employer policies on paid vacations are reported as well as wage and salary information. Ninety-seven percent of 361,887 employees receive

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[3] Smith, Richard and Earl O. Heady, "Characteristics of Commercial Farm Operators and Their Employees," *Iowa Farm Science*, 25:32, Nov.-Dec. 1970.

[4] *Minnesota Salary Survey 1970*, Minnesota Department of Manpower Services, unnumbered report, St. Paul, Minn., p. 42.

Table 1. Median annual salaries for selected nonfarm occupations — Minnesota 1970, 1971, and projected to 1975

Occupation and description	1970 Median		1971 Median		Estimated median (state) 1975
	Twin Cities	State	Twin Cities	State	
	dollars				
Automobile service station attendant: Services motor vehicles with fuel, lubricants and accessories	4,164	4,164	4,164	3,660	5,830
Warehouseman: Performs combination of tasks to receive, store, ship and distribute materials (motor freight and warehousing industry)	8,172	8,172	10,044	10,044	11,441
Assembler (excluding electronics assembler): Manually assembles components and subassemblies of various products (all manufacturing industry)	6,360	6,096	6,648	6,552	8,534
Foundry worker: Performs any combination of labor tasks in a foundry (primary metal and fabricated metal products industries)	6,900	6,756	7,092	7,200	9,458
Medium equipment operator: Operates equipment such as heavy trucks, light graders, rollers used on resurfacing projects, etc. (all industries)	9,156	8,028	10,212	8,616	11,239
Light equipment operator: Operates equipment such as light trucks, mowers, patching rollers, etc. (all industries)	7,776	6,864	9,360	7,908	9,610
Laborer: Performs a variety of unskilled tasks requiring primarily physical strength (all industries)	7,260	6,300	7,908	6,240	8,820
Laborer foreman: Supervises the work of unskilled and semiskilled workers engaged in construction and maintenance work (all industries)	10,272	9,480	11,232	10,200	13,272
Maintenance trades helper: Assists skilled tradesmen such as plumbers, carpenters, painters, masons, brick layers, or supervises laborers (all industries)	7,680	7,296	10,104	8,544	10,214

Source: *"Minnesota Salary Survey 1970 and 1971"* Minnesota Department of Manpower Services, unnumbered report, St. Paul, Minn.

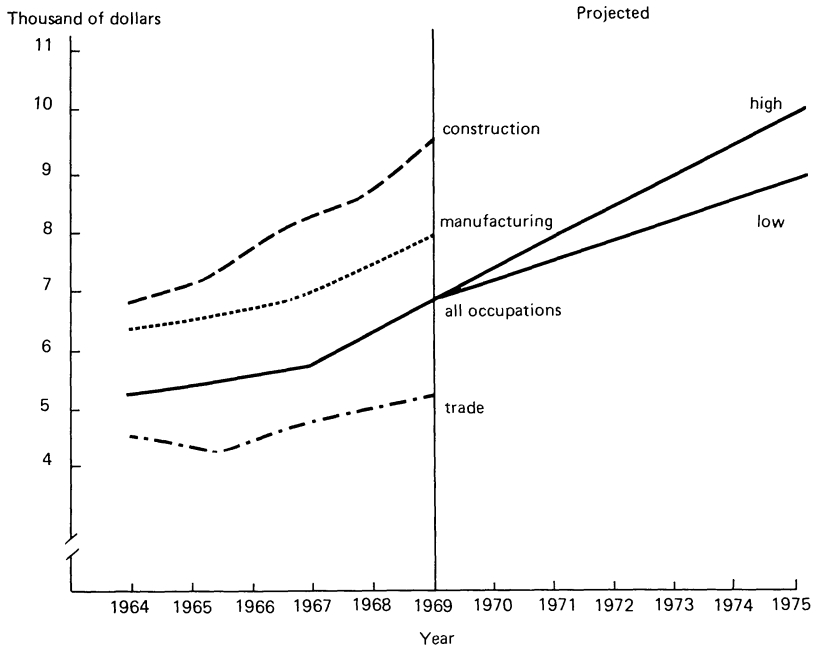

Figure 1. Trend and projected wage rates for selected nonfarm occupations—Minnesota

paid vacations.[5] Table 2 summarizes the number of vacation days per year based on length of service.

Only 73 percent of 332,614 employees receive paid sick leave averaging 10 to 12 days per year. Table 3 summarizes paid holidays for the same sample of nonfarmworkers, 98 percent of whom receive paid holidays. The number of holidays varies but averages 8 days per year. The number of days varies for about 15 percent of the employees depending on which day of the week the holiday came.

A number of employers pay all or part of the insurance coverage and retirement plans for employees. The annual median amount the employer pays for each employee is $240 for insurance and $336 for retirement. The figure varies by industry but represents all industries surveyed in 1970.

In summary, farm operators will need to recognize the employment alternatives available to prospective full-time hired men in order to compete with the nonfarm sector for available hired labor. Based on available information a farm operator will have to think in terms of a 40-hour week, an annual salary of about $10,000, at least 2 weeks paid vacation and six to nine paid holidays. Additional fringe benefits, such as insurance coverage and retirement plans, are included in the annual pay package. Extra wages are paid for working overtime.

[5] Provisions for paid vacations are not uniform for 9,794 of the 351,840 employees receiving paid vacations.

Table 2. Paid vacation and sick leave received by a sample of nonfarm employees, Minnesota, 1970

Years worked by employee	Median number of days: Paid vacation	Median number of days: Paid sick leave
1	10	10
5	10	12
10	15	12
25	20	12
Number of employees working for employers stating definite policy	361,887	332,614
Employees receiving	351,840	244,306
Percent	97	73

Source: *Minnesota Salary Survey 1970,* Minnesota Department of Manpower Services, unnumbered report, St. Paul, Minn. p. 42.

Results

Results are discussed in these sections: annual salary of full-time employee(s); utilization of full-time labor on modern dairy farms; vacations, time off, and hours.

Annual Salary of Full-time Employee(s)

A modern dairy farm's competitiveness for hired labor primarily depends on the farm size, milk price, and production per cow. The effect of these factors on the net return to operator and full-time labor is evaluated in the following sections:

Annual Salary and Size of Farm

Table 4 shows the organization needed to produce maximum profits for farms using one, two, three, and four full-time hired men. Net return to the operator and full-time labor is $38,034 for the farm operation with one full-time hired man and net return increases about $13,000 with each additional hired worker.[6]

With $5 per hundred weight (cwt.) milk price and 14,000 pounds of milk per cow, a farm operator could pay about $13,000 a year in wages to additional hired labor. This would leave the farmer's net income unchanged at about $25,000 per year.

The operator, paying $10,000 in total wages for an additional man, would increase the return to his labor and management by $3,000 per year per hired man. This would represent payment for additional management and risk associated with a larger investment. At that wage the farm operator could compete with the nonfarm occupations listed in the previous section (table 1).

[6] Any principal payments on land would have to be financed out of the net return to the operator's labor and management. The study does not include a return to equity.

Table 3. Paid holidays received by a sample of nonfarm employees in Minnesota, 1970

Total annual paid holidays	Number of employees	Percent receiving paid holidays
5 or less	6,096	2
6	47,782	14
7	58,322	17
8	87,593	25
9	112,005	32
10	18,527	5
More than 10	16,527	5
Total employees receiving paid holidays	346,852	100
Number of employees reported	355,300	

Source: *Minnesota Salary Survey, 1970,* Minnesota Department of Manpower Services, unnumbered report, St. Paul, Minn. p. 46.

Table 4. A maximum profit farm organization employing one, two, three, and four full-time hired men*

Item and unit	Full-time hired men			
	One	Two	Three	Four
Farm organization				
Dairy cows (number)	126	163	199	236
Corn grain fed (acres)	128	163	200	237
Corn grain sold (do.)	134	155	176	197
Corn silage (do.)	88	114	139	165
Oats (do.)	25	33	40	47
Alfalfa (do.)	76	98	120	141
Soybeans (do.)	108	162	217	271
Total (do.)	559	725	892	1,058
Investment				
Land (dollars)	195,650	253,750	312,200	370,300
Buildings and equipment (do.)	86,268	103,863	120,982	138,577
Machinery (do.)	69,408	79,644	79,644	79,644
Dairy herd (do.)	58,060	75,110	91,699	108,748
Total (do.)	409,386	512,367	604,525	697,269
Net return to operator and full-time labor (do.)†	$38,034	$50,832	$66,030	$81,445
Labor used				
Overtime (hours)	163	408	789	1,277
Operator and full-time (do.)	4,523	5,651	6,765	7,862
Family and seasonal (do.)	1,592	2,017	2,290	2,450
Total (do.)	6,278	8,076	9,844	11,589

* Assumes 14,000 pounds of milk production per cow and the following prices: milk, $5 per hundredweight (cwt); corn, $1.02 per bushel; soybeans, $2.60 per bushel.

† Includes $3 per hour for overtime.

Annual Salary and Varying Milk Prices

Milk price is a major factor in the wages which a dairy farm operator can pay full-time hired workers. Expansion to multi-men dairy farms, while paying hired men competitive wages, may prove disastrous if milk prices are falling. To evaluate the relationship between milk price and ability to pay employee wages, profit maximizing farm organizations are set up using $4.50, $5, and $5.50 per cwt. milk prices. The basic farm organization remains unchanged over the milk price range considered, that is, the relative profitability of dairy, corn for grain, and soybean enterprises is not affected. More soybean acreage is included with higher milk prices because nondairy enterprises (corn and soybeans) profitably contribute the maximum allowable 20 percent to total farm sales. Because of this maximum 20 percent nondairy gross sale, the higher milk price allowed soybeans to expand so that nondairy enterprises would still contribute just 20 percent of total farm sales.

At $5 per cwt. milk, net return to the operator and the one full-time employee is $38,034 (table 5). A 50-cent fall in milk price reduces this net return by $9,000—to $28,895. A 50-cent increase in price (to $5.50 per cwt.) increases this net return by $9,000—to $47,173. Assuming the return to the

Table 5. Effect of a change in milk price on maximum profit farm organization, net return to operator and full-time employee and labor used*

Item and unit	Milk price per cwt.		
	$4.50	$5.00	$5.50
Farm organization			
Dairy cows (number)	126	126	126
Corn grain fed (acres)	127	128	128
Corn grain sold (do.)	134	134	134
Corn silage (do.)	88	88	88
Oats (do.)	25	25	25
Alfalfa (do.)	76	76	76
Soybeans (do.)	80	108	136
Total (do.)	530	559	587
Investment			
Land (dollars)	$185,500	$195,650	$205,450
Buildings and equipment (do.)	86,268	86,268	86,268
Machinery (do.)	69,408	69,408	69,408
Dairy herd (do.)	58,060	58,060	58,060
Total (do.)	$399,236	$409,386	$419,186
Net return to operator and full-time labor (do.)†	$28,895	$38,034	$47,173
Labor used			
Overtime (hours)	163	163	163
Operator and full-time (do.)‡	4,523	4,523	4,523
Family and seasonal (do.)	1,545	1,592	1,640
Total (do.)	6,231	6,278	6,326

* Assumes one full-time hired man, 14,000 pounds of milk production per cow, and the following prices: corn, $1.02 per bushel; soybeans, $2.60 per bushel.

† Includes $3 per hour for overtime. Return to any equity is not included.

‡ Maximum labor available not used except in critical labor periods.

operator for his labor and management remains constant at $25,000, then the operator could pay $3,900, $13,000, and $22,100 to the full-time employee at $4.50, $5, and $5.50 milk prices, respectively.

To pay a competitive wage at a $4.50 milk price, the net return to the operator's labor and management must be reduced from $25,000 to about 16,000 pounds per cow per year. Assuming $5 cwt. milk and the operator's after paying help, when farm prices drop, however this study looks at how much can be paid a hired worker leaving operator return constant.

Annual Salary and Varying Production Levels

Varying milk production levels per cow also affect a farm operator's ability to pay a full-time employee. Table 6 shows the changes in net return to the operator and full-time labor for three production levels: 12,000, 14,000, and 16,000 pounds per cow per year. Assuming $5 cwt. milk and the operator's labor and management return constant at $25,000, the operator can pay $2,800, $13,000, and $23,200 to the full-time employee at 12,000, 14,000, and 16,000 pounds production, respectively, per cow.

Crop Yield Variability

Crop yields used in the farm analysis are projected averages for operators with above average management ability. The maximum profit farm plan is based on these expected yields as is the net return and ability to pay full-time hired labor.

Weather and other factors can cause expected yields to vary and can influence a farm operator's ability to pay competitive salaries to full-time help.

Yield variability for the 1960-69 period suggests that in about 84 percent of the years, per acre yields would not fall below 89 bushels of corn for grain, 14.25 tons of corn silage, 5.7 tons of alfalfa, and 26 bushels of soybeans.[7]

Because crop yields cannot be predicted, farm plans are based on the average expected yields. If realized yields were reduced to those listed here, net return would drop about $5,362—or from $38,034 to $32,672 (operator with one full-time hired man).[8]

Milk production level is assumed unchanged, but when corn grain yields drop, less corn grain is sold from the farm and the farm operator buys additional corn silage and alfalfa to feed the dairy herd the same ration.

Assuming a constant return to the operator (labor and management) of $25,000, the amount available to pay a full-time hired man would drop from $13,000 to about $7,500 with lower yields. In a relatively bad year the farm operator would be hard pressed to pay a competitive salary out of the year's income and still give himself a constant $25,000 return. In some years, yields would be greater than expected and, with proper management, the good years could offset the bad years.

Price variability for corn for grain and soybeans is not considered but would have an impact similar to yield variability. An earlier section considers the impact of various expected milk prices on net return and farm organization.

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[7] Reduced yields are obtained by subtracting one standard deviation from the projected 1975 expected yields. Oat yields are not corrected for this study.

[8] This is a partial analysis since crop prices are assumed unchanged. If farm yields are generally reduced, crops will be more scarce and prices are likely to rise. Milk price is $5 per cwt. and production per cow, 14,000 pounds (table 4).

Table 6. Effect of a change in milk production level on the maximum profit farm organization, net return to operator and full-time employee and labor used*

Item and unit	Annual milk production per cow		
	12,000 pounds	14,000 pounds	16,000 pounds
Farm organization			
Dairy cows (number)	126	126	126
Corn grain fed (acres)	109	128	146
Corn grain sold (do.)	153	134	116
Corn silage (do.)	88	88	88
Oats (do.)	25	25	25
Alfalfa (do.)	76	76	76
Soybeans (do.)	44	108	172
Total (do.)	495	559	623
Investment			
Land (dollars)	$173,250	$195,650	$218,050
Buildings and equipment (do.)	85,735	86,268	86,876
Machinery (do.)	69,408	69,408	69,408
Dairy herd (do.)	54,376	58,060	63,766
Total (do.)	$382,769	$409,386	$438,100
Net return to operator and full-time labor (do.)†	$27,844	$38,034	$48,224
Labor used			
Overtime (hours)	163	163	163
Operator and full-time (do.)	4,523	4,523	4,523
Family and seasonal (do.)	1,488	4,523	1,696
Total (do.)	6,174	6,278	6,382

* Assumes one full-time hired man and the following prices: milk, $5 per cwt.; corn, $1.02 per bushel; and soybeans, $2.60 per bushel.

† Includes $3 per hour of overtime.

Utilization of Full-time Labor on Modern Dairy Farms

Availability of Seasonal Labor

Labor use on dairy farms producing their own feedstuffs is highly seasonal. If a farmer uses only three full-time laborers during the busiest summer months (planting, cultivating, harvesting) he cannot keep them employed year around (during slack winter months) and there will be unused labor. However, if three full-time laborers can work on the farm year around and additional seasonal laborers can be employed during summer, the farm operator can manage a larger farm acreage and full-time labor will be nearly fully utilized year around. Hence availability of seasonal labor greatly influences the ability to fully utilize full-time employees.

Table 7 shows how farm size decreases as the amount of available seasonal labor is restricted first to family labor only and second to no seasonal labor. With both seasonal hired and family labor available, net return to operator and full-time labor is $38,034. For this farm, over 98 percent of the total annual operator and full-time hired labor available is used. When seasonal labor is

Table 7. Net return to operator and full-time labor with only family labor and with no seasonal labor available*

Item and unit	Labor available		
	Seasonal and family	Family only	No seasonal or family
Farm organization			
Dairy cows (number)	126	102	85
Corn grain fed (acres)	128	104	87
Corn grain sold (do.)	134	116	91
Corn silage (do.)	88	71	60
Oats (do.)	25	20	17
Alfalfa (do.)	76	61	51
Soybeans (do.)	108	78	73
Total	559	450	379
Investment			
Land (dollars)	$195,650	$157,500	$131,950
Buildings and equipment (do.)	86,268	74,856	66,772
Machinery (do.)	69,408	69,408	62,212
Dairy herd (do.)	58,060	47,001	39,168
Total (do.)	409,386	348,765	300,102
Net return to operator and full-time labor (do.)†	$38,034	$30,105	$25,122
Labor used			
Overtime (hours)	163	181	278
Operator and full-time (do.)	4,523	3,780	3,744
Family and seasonal (do.)	1,592	576	0
Total (do.)	6,278	4,537	4,022

* Assumes one full-time hired man, 14,000 pounds of milk production per cow, and the following prices: milk, $5 per cwt.; corn, $1.02 per bushel; and soybeans, $2.60 per bushel.
† Includes $3 per hour of overtime.

unavailable (family and hired), net return is reduced to $25,122 and only 80 percent of the total annual operator and full-time labor available is used.

Custom Hiring

Custom harvesting corn for grain, corn silage, oats, and soybeans releases regular farm labor for other tasks. This represents a net addition to the available labor.

Table 8 compares the increase in variable cost per acre, decrease in investment, and decrease in harvest labor when corn for grain, corn silage, oats, and soybeans are custom harvested rather than harvested with farm labor and machines. The farm operator needs less equipment investment and the associated depreciation, interest, taxes, and insurance when custom services are hired.

The net return to the operator and full-time labor is $38,034 when corn for grain, corn silage, oats, and soybeans are all custom harvested. When the farm operator uses available farm labor and his own equipment, his net return drops about $1,200—to $36,804. The farm organization is the same with and without custom harvesting. Also, 97 percent of total operator and full-time

Table 8. Net changes in variable cost, labor requirements, and machine investment from no custom harvesting to custom harvesting

Crop	Increase in cost per acre	Decrease in harvest labor per acre
Corn for grain	$4.73	0.490 hours
Corn silage	$8.37	1.018 hours
Oats	$3.24	0.262 hours
Soybeans	$3.36	0.245 hours

Decrease in machinery needed	Investment	Annual Cost
Combine	$17,840	$2,080
Forage wagon	2,220	244
Forage harvester	4,940	692
Total	$25,000	$3,016

labor available is used in both situations. The main difference is the utilization of available family and seasonal hired labor. Only 38 percent of available family and seasonal hired labor is used when the four crops are custom harvested. Without custom harvesting 44 percent is used.

Because the spring land preparation and crop planting in periods 2 and 3 are labor constraining, no changes in farm organization result from the labor saved by using custom harvesting in the fall. Hence, the labor employed with custom harvesting does not represent additional seasonal labor because surplus family and seasonal hired labor exist during the crop harvesting periods.

Marginal Productivity of Labor

Labor is the only effective constraint on farm size and net return in this study. Net return could be improved if additional labor were available in peak periods. When any labor is unused in a given period, additional labor would add nothing to net returns and would be of no value in augmenting farm income.

Table 9 shows that the farm operator could pay from about $42 to $79 for an additional hour of labor in the critical April 1-27 period depending on the milk price and production level. In the April 28-May 14 period he could pay up to $10.78 per hour.

Vacations, Time Off, and Hours

Annual labor, broken down to 14 periods, reflects hours available for critical crop production tasks (table 10). In determining the maximum hours available during each period from a full-time employee, the study makes the following assumptions. First, hours worked are computed on the basis of 40 hours per week minus 8 hours for each of six holidays.[9] The specific hours worked within each period are flexible but total hours worked could not exceed 40 hours per week. The maximum hours contributed by one full-time employee is 2,032 per year. Additional overtime hours are possible up to a maximum of 26 hours per week (assume 2 extra hours for 5 days a week plus 8 hours on each of the 2 days off). The employee is paid $3 for each hour of overtime.

[9] Holidays are as follows: period 1, New Year's and Washington's birthday; period 5, Memorial Day; period 6, July 4th; period 14, Thanksgiving and Christmas.

Table 9. Value of an additional hour of labor at various milk prices and production levels, operator and one full-time hired man

Production level of 14,000 pounds per cow per year		
Milk price dollar per cwt.	Value of an additional hour of labor	
	April 1-27	April 28-May 14
$4.25	$42.40	$10.78
4.50	49.48	10.78
4.75	56.56	10.78
5.00	63.63	10.78
5.25	70.71	10.78
5.50	77.79	10.78
Milk price of $5 per cwt. Production level, pounds		
12,000	$47.85	$10.78
14,000	63.63	10.78
16,000	79.42	10.78

On farms employing two or more full-time hired men, the operator's labor available is reduced about 938 hours for each full-time employee. This reflects additional supervisory and management responsibilities. Hours of family and seasonal labor available are average figures from a survey of large Minnesota dairy farms.[10] The fixed dairy and farm overhead labor is subtracted from total operator and full-time labor to obtain the labor available for alternative farm enterprises.

Scheduling to accomplish daily dairy chore labor is somewhat limited on a two-man farm. At one extreme the operator would work 7 days per week all year including holidays and the full-time employee would work a 40-hour week Monday through Friday, with six holidays. Other schedules might have the operator and full-time employee alternate weekends and holidays with the full-time employee staying within his 40-hour week by receiving compensating weekdays off. This schedule would probably be less acceptable to the employee but would relieve the operator of a very tiring schedule. Similar schedules could be worked out without changing the maximum profit farm plans or the total hours the full-time employee works.

Even though scheduling would still require either the operator or full-time employee to work a considerable number of weekends, the two-man farm provides more flexibility than the single operator farm. Family and hired seasonal labor could be available for chores when either the operator or full-time employee is off.

Time Off During Slack Labor Periods

Providing the employee vacation and time off during slack labor periods would be most advantageous to the farm operator. Yet, this makes it impossible for the employee and his family to select vacation time.

Table 11 shows the dates (labor periods) when labor is unused during the year and the hours that could be taken off without affecting the enterprise combination, size of operation, or net returns.

[10] *1964 Pesticides Uses Survey*, U.S. Department of Agriculture, Economic Research Service, FPED, 1965.

Table 10. Labor available, farm overhead labor and work days for 14 labor periods

Date	Labor period number	Total days in period	Mondays to Fridays in period	Saturdays and Sundays in period	Holidays in period	Maximum hours available					Fixed hours of dairy labor and farm overhead
						Full-time hired	Full-time overtime	Operator	Family	Seasonal	
		days				hours					
Jan.1-Mar. 31	1	90	64.3	25.7	2	498	334	810	315	499	284
Apr. 1-27	2	27	19.3	7.7	0	154	100	270	108	154	88
Apr. 28-May 14	3	17	12.2	4.8	0	97	63	187	77	97	57
May 15-24	4	10	7.2	2.8	0	58	37	110	45	57	26
May 25-June 19	5	26	18.6	7.4	1	141	97	286	237	141	67
June 20-July 4	6	15	9.7	4.3	1	70	56	165	150	78	39
July 5-15	7	11	7.9	3.1	0	63	40	121	110	63	28
July 16-Aug. 19	8	35	25.0	10.0	0	200	130	385	350	200	80
Aug. 20-31	9	12	8.6	3.4	0	69	45	132	120	69	31
Sept. 1-19	10	19	13.6	5.4	0	109	71	209	124	101	49
Sept. 20-30	11	11	7.9	3.1	0	63	40	121	72	63	28
Oct. 1-14	12	14	10.0	4.0	0	80	52	154	49	80	47
Oct. 15-Nov. 11	13	28	20.0	8.0	0	160	104	297	98	160	93
Nov. 12-Dec. 31	14	50	35.7	14.3	2	270	186	469	175	270	160
Total		365	260	104	6	2,032	1,355	3,716	2,030	2,032	1,077

Table 11. Slack labor available for vacations, dairy farms with operator and one, two, three, and four full-time hired men

Date	Labor period	Full-time hired men						
		One	Two		Three		Four	
		Total	Total	Per employee	Total	Per employee	Total	Per employee
		hours						
July 16-Aug. 19	8	55	33	16	10	3	0	0
Sept. 1-19	10	24	5	2	0	0	0	0
Nov. 12-Dec. 31	14	50	75	37	101	34	126	31
Total unused labor		129	113	55	111	37	126	31

For a two-man farm (one full-time hired employee), there are 129 hours of unused operator and full-time labor. This labor is distributed so that vacation could be arranged in 5-day blocks (40 hours) in either/or both periods 8 and 14; a 2-week vacation for the employee provides limited time off for the farm operator—a little more than 1 day in periods 8 and 14 and 3 days in period 10.

The larger the farm operation, the less unused labor per employee and the unused labor tends to concentrate in labor period 14 (Nov. 12-Dec. 31). For farms with two, three, and four full-time employees the unused labor is so limited that vacations are not possible in 5-day blocks (40 hours) for all employees. Assuming the operator takes no time off, only 55 hours, 37 hours, and 31 hours per employee are available for time off on farms with two, three, and four full-time employees, respectively.

To provide 1-week vacations, the farm operator would have to make alternative plans such as substituting hired seasonal and/or family labor to provide additional time off for the full-time employee or limiting the size of operation until 2-week vacations could be provided each full-time employee.

Additional hired seasonal labor and/or family labor, if available, would reduce net return by the amount of additional wages.

If labor is restricted so that each full-time employee on farms employing three and four men full-time could receive 1 week off in both labor periods 8 and 14, then the number of cows, acres of land, and net return must be reduced (table 12).

Time Off During Critical Labor Periods

Naturally, the employee would like to select his vacation times without regard to the critical labor periods. Yet, taking a vacation during a critical labor period could have a substantial impact on farm size and net return.

The most critical labor periods are (11—silage harvest and dairy), (2—land preparation, planting oats nurse crop, manure removal, and dairy), and (3—planting corn for grain, ground preparation, and dairy).

If an employee were given free choice and chose to take his vacation during a restrictive labor period, the operator would again have to substitute additional hired labor or plan his farming operation around the reduced labor then available.

Table 13 shows the effect of an employee taking his vacation during labor period 2 and how the operator restricts his total farm operation accordingly. Net return decreases $4,200 for the first week and $5,300 for the second week of vacation. Therefore, the operator could afford to pay up to $4,200 including overtime for the one week of replacement labor.

In the maximum profit farm plan, cows are reduced by 12 or 13 and crop acres by 50 to 80 for each week of vacation. However, an important impact is poorer year-round utilization of the operator's and full-time employee's labor. The idle or unused hours, in other than labor period 2, increase to 500 hours or about one-fourth of the hours available from the full-time employee.

The farm operator's best alternative is to employ additional hired labor for any time off taken by the full-time employee during period 2. Otherwise, the operator should try to negotiate a labor agreement restricting vacation time during critical labor periods. Similar net return decreases would occur if vacations were arranged in either period 3 or 11.

Table 12. A maximum profit farm organization and net returns for farms that do and do not provide 1-week vacations in labor periods 8 and 14; two, three, and four full-time hired men*

Item and unit	Full-time hired men					
	Two		Three		Four	
	With vacation	Without vacation	With vacation	Without vacation	With vacation	Without vacation
Farm Organization						
Dairy cows (number)	163	163	196	199	220	236
Corn grain (acres)	318	318	422	376	593	433
Corn silage (do.)	114	114	137	139	154	165
Oats (do.)	32	33	39	40	44	47
Alfalfa (do.)	98	98	117	120	132	141
Soybeans (do.)	162	162	143	217	7	271
Total	724	725	858	892	930	1,057
Net dollar return to operator and full-time labor	$50,466	$51,395	$65,212	$67,850	$77,337	$81,952

* Assumes 14,000 pounds of milk production per cow and the following prices: milk, $5 per cwt.; corn, $1.02 per bushel; and soybeans, $2.60 per bushel.

Table 13. Effect of full-time employee taking vacation during critical labor period 2 (April 1-27)

Five day blocks taken from labor period 2 Apr. 1-27*	Number of dairy cows	Total crop acres	Net return†	Unused labor all periods‡ (hours)	Percent of full-time labor utilized (annual)
0	126	559	$38,034	129	98
1	114	479	$33,751	283	95
2	101	424	$28,475	550	90

* This also eliminates the 26 hours of overtime available in these weeks which is normally used in critical labor periods.

† Net return to operator and full-time employee labor.

‡ Unused operator and full-time labor.

Summary

The most efficient use of modern dairy technology is achieved on larger than single operator dairy farms. These larger farms require more than one full-time worker. Unless families pool their labor, farm operators will have to compete for employees in the hired labor market.

A modern dairy farm was set up on paper from engineering and actual farm data to evaluate what the operator could pay a full-time hired man under varying milk prices and production levels, under what circumstances a dairy farm operator could utilize full-time labor on a year-round basis, and whether the operator could compete for labor in terms of hours worked and paid vacations.

Major findings follow:

To compete for available labor in 1975, dairy farm operators will have to consider 40-hour weeks, 2-week paid vacations, six to nine paid holidays, and a cash and noncash annual salary package of about $10,000.

Assuming a $5 per cwt. milk price, 14,000 pounds of milk per cow per year and a $25,000 return to the farm operator, he could pay about $13,000 per year for a full-time hired worker. Under the same conditions, except with a 50-cent per cwt. drop in milk prices (to $4.50), the farm operator could pay only $3,895 per year. With a 50-cent increase in milk prices (to $5.50) the farm operator could pay $22,100. The ability to pay full-time employees is very sensitive to changes in milk prices.

Management ability, reflected in production per cow per year, substantially influences what a farm operator can pay full-time hired help. Assuming $5 per cwt. milk prices and a $25,000 net return to the operator, a full-time employee could be paid $2,800, $13,000, and $23,000 at 12,000, 14,000, and 16,000 pounds milk production respectively, per cow per year.

Reduced crop yields due to weather or other noncontrolled variables restrict a farm operator's ability to pay competitive wages. Lower yields, expected only in 16 percent of the years, reduces from $13,000 to $7,500 (assume a constant $25,000 return to operator) the amount available to pay a full-time hired man.

Year-round utilization of full-time labor on a dairy farm depends on the availability of family and/or hired seasonal labor for peak labor periods. Net return to the operator's labor and management and to the full-time labor is

reduced from $38,034, with a normal amount of seasonal labor available, to $25,122 with no seasonal labor available. In addition, over 900 hours of full-time labor is idled in slack periods because the farm can not expand beyond the limit of full-time operator and hired labor availability during rush seasons.

Use of custom harvesting services (both machine and labor provided) has relatively little effect on the year-round utilization of full-time labor and on net farm returns.

The value of additional labor during critical rush seasons reaches about $64 per hour. The value of additional labor varies with milk price and production levels.

The year-round labor use is distributed on two-man dairy farms to arrange vacations in 5-day blocks (40 hours) in either/or both the July 16-August 19 and November 12-December 31 periods. For larger farms with two, three, and four full-time hired men, the unused or slack labor is distributed throughout the year so that vacations are not possible in 5-day blocks for all employees. Results show that the number of cows, acres of land, and net return are reduced when each full-time employee receives a week's vacation during these dates.

Vacations during critical rush labor periods greatly influence farm size and net return unless additional seasonal labor can be hired to replace full-time labor on vacation. Net return decreases $4,200 for the first week and $5,300 for the second week of vacation taken during the April 1-27 period. Similar results are obtained when vacations are taken during other rush seasons.

Conclusion

Modern dairy farms must be able to compete with nonfarm occupations for development of viable, efficient dairy production units. Farm operators will be faced with increased competitive and legislative pressure to increase returns to hired labor. Providing year-round employment, vacation, sick leave and 40-hour work weeks will all be factors affecting the dairy farmers' ability to compete effectively for hired labor. The larger, more efficient dairy operations will be producing an increasing share of all U.S. milk and must compete effectively for labor despite surplus labor of thousands of small producers who quit dairying each year.

With good management and at least $5 per cwt. milk prices, the operator of a modern dairy farm in 1975 should be able to compete for hired labor in terms of hours worked, paid vacations, paid holidays, and wage package.

Appendix A

Budgets for Dairy Enterprises

The dairy budget is constant in all trials except where the production level varies or the milk price changes. In these cases, there are minor changes in the variable cost of feeding facilities, interest on the cattle, and the hauling and marketing charges. The major change is caused by a change in milk receipts. Total costs for a given dairy size are calculated by adding the fixed costs to the total variable cost per cow times the number of cows (table A-1).

Budgets for Crop Enterprises

The operator's crop alternatives include corn, corn silage, oats, alfalfa, and soybeans. Table A-3 lists the field operations for the various crops. Included are labor requirements by labor period.

Table A-2 lists the budgets for various crop alternatives. The profits from the crops except soybeans and some corn for sale came indirectly (through the dairy enterprise) since they are all used for feed. Excess corn grain also could be sold for cash income.

The crop yields are estimates for high-level management in southeastern Minnesota and are projected toward a 1975 level. The seeding, fertilizer, and chemical rates are based on 1970 recommendations for the yield estimates.

Table A-1. Estimated gross income and production requirements per adult cow of various production levels

Item	Annual fixed cost	Milk per cow (variable cost) 12,000 lbs. production	14,000 lbs. production	16,000 lbs. production
		dollars		
Gross income				
Milk receipts (cwt. milk x $5)		600.00	700.00	800.00
Sale of calves*		29.36	29.36	29.36
Sale of cull cows†		67.00	67.00	67.00
Total		696.36	796.36	896.36
Variable costs				
Breeding fees‡		6.00	6.00	6.00
Veterinary and medicine§		18.00	18.00	18.00
Dairy Herd Improvement Association**		7.00	7.00	7.00
Interest on cattle#		34.52	36.86	40.48
Hauling and marketing‡‡		32.40	37.80	43.20
Minerals and salt‖		6.31	7.11	8.03
Subtotal		104.23	112.77	122.71
Housing facilities	1,159.54	39.31	39.31	39.31
Milking facilities	2,715.00	0	0	0
Feeding facilities	1.016.03	33.82	34.43	35.13
Machine cost—manure handling and grain grinding		9.58	9.58	9.58
Calf starter and milk replacer[a]		23.24	23.24	23.24
Total	4,890.57	210.18	219.33	229.97

* Assumes 0.45 2-week-old bull calf at $44, 0.12 heifer 1 month old at $50, and 0.02 heifer 12 months old at $178 are sold for each adult cow in the herd.

† Assumes a 5 percent death loss for calves and a 25 percent replacement rate for adult cows. Each cull cow was valued at $268.

‡ Standard rate for southeastern Minnesota. Source: Edmund F. Graham, professor, Animal Science, University of Minnesota.

§ Assumes a complete herd health program, including mastitis and fertility testing as well as emergency calls. Estimates obtained from three east central Minnesota veterinary clinics.

** Figures are estimates based on data for east central and southeastern Minnesota. Source: J. William Mudge, associate professor, Animal Science, University of Minnesota.

Table A-1. (continued). Estimated gross income and production requirements per adult cow of various production levels

♯ Assumes 8 percent interest on the value of one adult cow and her replacements ($431.56, $460.80 and $506.08 for cows producing 12,000, 14,000 and 16,000 pounds of milk, respectively).

‡‡ Estimates are from information obtained from Twin Cities Milk Producers Association, St. Paul, Minnesota. Based on 27 cents per cwt.

‖ Assumes 54.84, 61.83, and 69.83 pounds per cow of each trace mineralized salt at 3.5 cents per pound and bonemeal at 8 cents per pound for cows producing 12,000, 14,000 and 16,000 pounds of milk, respectively. Source: John Donker, professor, Animal Science, University of Minnesota and price data obtained from dealers.

a Based on 67 pounds of milk replacer at 19.44 cents per pound and 167 pounds of calf starter at 6.12 cents per pound for each adult cow in the herd. Source: John D. Donker, professor, Animal Science, University of Minnesota and price data obtained from dealers.

Table A-2. Estimated yield and variable costs per acre for crop alternatives on dairy farms

Item	Corn silage following corn, oats or soybeans*	Corn grain following corn, oats or soybeans*	Corn silage following alfalfa*	Corn grain following alfalfa*	Alfalfa	Oats	Soybeans
Yield	16 tons	100 bu.	16 tons	100 bu.	6 tons	100 bu.	30 bu.
				dollars			
Variable costs							
Working capital							
Seed	3.60	3.60	3.60	3.60	3.33	4.03	7.60
Fertilizer	6.20†	9.30†	8.75†	14.35‖	11.60[a]	10.50[b]	5:80[d]
Anhydrous ammonia	3.00‡	5.25‡			2.16		
Herbicide	2.15§	2.15§	2.15§	2.15§		.55[c]	4.00[e]
Insecticide	2.48**	2.48**	2.48**	2.48**			
Insurance#	2.10	2.10	2.10	2.10		1.00	2.00
Fuel, oil, lubricants & repairs	12.12	8.30	12.12	8.30	6.72	6.72	5.84
Custom work‡‡	1.50	1.50			.50	1.75	
Working capital charge	1.33	1.39	1.24	1.32	.96	.96	1.01
Total variable cost per acre	34.48	36.07	32.44	34.35	22.27	25.51	26.25

* Assumes 10 tons manure is added per acre. If no manure is added, variable cost must increase by $3.12. This included 60 pounds of anhydrous ammonia at 5 cents per pound – $3, and an increase in working capital charge of 12 cents per acre.

† Fertilizer is 5-20-20.

‡ Anhydrous ammonia is 82 percent nitrogen.

§ Herbicide is atrazine applied at planting.

** Insecticide is diazinon applied at planting.

Insurance is based on Federal Crop Insurance rates for southeastern Minnesota.

‡‡ Nodland, T. R. and C. H. Cuykendall, *Custom Rates for Farm Operations*, Extension pamphlet 134, University of Minnesota, 1969. Custom work for applying anhydrous ammonia.

‖ Fertilizer is 10-10-20.

a Fertilizer is 0-12-36.

b Fertilizer is 20-10-10.

c Herbicide is 2,4-D.

d Fertilizer is 0-15-15.

e Herbicide is amiben applied at planting.

f Fertilizer is 20-10-10.

Table A-3. Field tasks and labor requirements in the 14 labor periods

Field tasks	Hours per acre	Labor period in which tasks can be accomplished
		1 2 3 4 5 6 7 8 9 10 11 12 13 14
Disk, harrow oat land and plant oats	.400	
Disk, harrow corn ground	.191	
Plant corn grain and corn silage	.208	
Till, disk, and harrow soybean ground	.365	
Plant soybeans	.208	
Cultivate all corn and soybeans	.466	
Harvest first crop of hay	1.358	
Cultivate all corn	.174	
Cultivate soybeans	.174	
Harvest second crop of hay	1.358	
Harvest oats and bale straw	1.093	
Bale third crop of hay	1.358	
Plow hay land	.393	
Harvest corn silage	2.774	
Plow corn silage ground	.393	
Harvest soybeans	.325	
Harvest corn grain	.916	
Plow corn grain ground	.393