

## Financial Structure

As Federal programs to remove excess milk supplies are eliminated, dairy farm managers must more than ever have detailed, reliable financial information on which to base production decisions. Ratio analyses provide a basis for monitoring and comparing the financial strength of farm businesses (Harsh et al., 1981).

The financial performance of the farm business is evaluated by using financial ratios (see appendix A) that show various relationships between income and balance sheet statements in percentage terms (Farm Financial Standards Council, 1995). Income statements are for the responding farm operation prior to income taxes and exclude any nonfarm expenses and off-farm income attributable to household members associated with the farm business. The farm business balance sheets provide the basis for assessing financial position at a point in time.

### Liquidity

Liquidity is measured using information from a balance sheet and measures the ability of the farm to meet financial obligations at a given point in time. The current ratio (see appendix A) indicates the extent to which the sale of all current assets (including livestock and crop inventories, purchased inputs, cash invested in growing crops, and prepaid insurance) would be sufficient to cover current liabilities (notes payable within 1 year, current portion of term debt, accrued interest, and accounts payable). The value of this ratio will vary throughout the production cycle. Greater liquidity is indicated by higher ratio values.

In 1993, the current ratio for dairy farm businesses in the Northeast region was the highest among the production regions (table 1). Nevertheless, all six regions posted a current ratio value greater than 1, indicating that, on average, all dairy businesses were meeting short-term demands for cash from existing liquid assets—an important factor when obtaining credit from lending institutions—and were not facing serious financial problems. The same held true for 1996 (table 2).

The current ratio is limited by the balance sheet date; the actual assets that can be sold may vary considerably from the date of preparation. Some accounts receivable and inventories may not be very marketable. Therefore, four other liquidity ratios are presented in table 1 as measures of short-run solvency.

The quick ratio excludes inventories from the numerator of the current ratio because they are considered to be the

least liquid asset and most probably a source of losses (Fraser, p.131). The quick ratio also indicates that for the most part, dairy businesses in 1993 and 1996 were in a relatively good position to meet short-term debt.

The farm business debt service coverage ratio measures the farm business' ability to repay both interest and principal. In 1993 and 1996, dairy businesses in all six milk production regions were able to cover the farm's interest and principal strictly from net cash farm income.

The debt servicing ratio measures the share of the farm business' gross income needed to service debt. In 1993, dairy businesses in the Upper Midwest region needed 21 percent of gross cash farm income to service debt, while businesses in the Southeast region needed only 12 percent. The Upper Midwest region felt the effects of the 1993 midwestern flood and the corresponding higher input costs. In 1996, higher concentrate feed prices and continued high prices for dairy-quality hay contributed to dairy businesses' in the Pacific region using 27 percent of gross cash farm income to service debt.

The times interest ratio measures the farm business' ability to service debt out of net farm income earned. On average, dairy businesses in the Upper Midwest were not able to service their debt level in 1993. In 1996, businesses in the Corn Belt faced a similar situation.

**1993-96.** In general, the ability of dairy businesses to cover current liabilities from the sale of current assets changed little during the 1993-96 period (table 3). The current ratio declined significantly only between 1994 and 1995, as notes payable within 1 year increased (app. table 5). The 1995 returns over feed costs were the lowest since 1991, as milk prices decreased more than feed prices. Consequently, many businesses had to obtain extra cash to meet operating expenses.

The quick ratio declined significantly between 1994 and 1995 and between 1994 and 1996. Because of lower returns over feed costs, dairy businesses in 1995 and 1996 were in a less favorable position to meet short-term debt than in 1994.

The ability of farm businesses to repay interest and principal from net cash farm income was mostly unchanged during the 1993-96 period. The farm business debt service coverage ratio declined significantly between 1993 and 1995, as notes payable in 1995 increased (app. table 5). However, increases in net cash farm income were smaller (app. table 6).

The share of the dairy business' gross income needed to service debt increased significantly between 1993 and 1995 and between 1994 and 1995. Gross farm income in 1995 did not increase enough to service new debt (app. table 7).

The dairy business' ability to service debt out of net farm income was similar in each year from 1993 through 1996. The times interest ratios were not significantly different from one another. Large increases in feed costs in 1994, 1995, and 1996 eroded advances in gross cash income (app. table 6).

## Efficiency

Four ratios are calculated to measure a farm business' financial efficiency—gross ratio, interest to gross cash income ratio, asset turnover ratio, and debt-burden ratio. The gross ratio measures the extent to which the cash income generated by the farm business is absorbed by the annual costs of production. The lower the ratio, the more effective the farm operation is in generating returns.

Gross ratios in 1993 hovered around 77 percent for specialized dairy businesses (table 1). Dairy farms in the Southeast region had a gross ratio over 80 percent. Costs of production in this area were relatively high (<http://www.ers.usda.gov/briefing/farmincome/data.htm>). In 1996, gross ratios were still around 77 percent (table 2).

The interest to gross cash income ratio measures the share of gross cash farm income committed to interest payments. In 1993, this ratio ranged from 3 percent in the Southeast region to 7 percent in the Upper Midwest region. Lower values of the ratio indicate greater efficiency and flexibility in meeting interest payments. In 1996, this ratio ranged from 4 percent in the Pacific and Southern Plains regions to 7 percent in the Corn Belt and Northeast regions.

The asset turnover ratio measures the income generated per dollar of assets used in production. This ratio increases with farm size (*Financial Performance of U.S. Commercial Farms, 1991-94*, USDA, ERS, June 1977, p.16). In 1993, dairy businesses in the Pacific, Southeast, and Southern Plains regions had ratios about twice as large as businesses in the other three regions (table 1). Similar differences in ratios were posted in 1996 (table 2).

The debt-burden ratio measures the burden placed on net cash farm income to retire outstanding debt. As net cash farm income increases relative to the farm business debt,

the smaller the burden and visa versa. In 1993, dairy businesses in the Upper Midwest region found themselves in the least favorable position, in part because of adverse weather conditions that placed considerable stress on input costs (table 1). In 1996, dairy businesses in the Corn Belt region were in the least favorable position (table 2).

**1993-96.** Dairy businesses in 1993 were significantly more effective in generating returns than in 1994 (table 3). In 1994, increases in gross cash income were not enough to compensate for increases in cash expenses, especially feed costs (app. table 6).

The efficiency and flexibility of dairy businesses in meeting interest payments showed no change during the 1993-96 period. The interest to gross cash income ratio was the same in each year. In each year, dairy businesses committed similar shares of gross cash farm income to interest payments.

The income generated per dollar of assets used in production increased significantly between 1993 and 1994. Commercial milk-fat use reached a record in 1994 as economic growth continued, and retail prices of dairy products remained relatively favorable.

By 1996, the burden placed on net farm income to retire outstanding debt increased significantly from 1993. Reflecting 1995's reduced corn and soybean crops, higher concentrate feed prices squeezed returns for dairy businesses in 1996.

## Solvency

The debt/asset ratio is one measure of solvency. This ratio is defined as total liabilities divided by total assets, indicating the amount of risk embedded in an operation's financial structure. Associated with debt is an obligation to pay principal and interest. While debt increases a farm's financial risk, benefits may accrue to owners using the debt if debt service commitments are met by earnings.

In 1993, the Pacific region posted a debt/asset ratio of 0.31, suggesting greater use of debt capital than in the other regions, which likely was needed for the continuing expansion of dairy businesses in the region (table 1). In 1996, this ratio was also higher for the Pacific region than for the other regions (table 2).

The debt to equity ratio measures the relative proportion of funds invested by creditors and owners. As expected,

the Pacific region had the highest value for this ratio in both 1993 and 1996 (tables 1 and 2).

**1993-96.** On average, solvency ratios for a dairy farm business changed little during 1993-96 (table 3). None of the calculated U.S. debt/asset and debt/equity ratios were statistically different from one another. However, these results mask the fact that, on a regional basis, the use of debt capital has been a crucial factor affecting the expansion of dairy businesses (app. tables 7-12).

## Profitability

Two measures of returns (rate of return on assets and rate of return on equity), the profit margin ratio, and an economic profit margin ratio are used to assess profitability of the farm business (table 1). The rate of return on assets is defined as net farm income plus interest expenses minus estimated charges for operator labor and management, divided by total assets. This ratio measures the per-dollar return on farm assets from current income only. The rate of return on equity equals net farm income minus estimated charges for operator labor and management, divided by equity per farm. This ratio indicates the relationship between net profits and equity of the farm business. A negative return on equity is a relative measure of financial stress. The absolute size of the ratio roughly measures the rate at which a farm business is adding to, or consuming from, its own capital stock.

In 1993, dairy businesses in the Pacific, Southeast, and Southern Plains regions earned a rate of return on assets of 5 to 6 percent (table 1). On the other hand, the smaller businesses (in terms of dairy cow numbers) in the Corn Belt, Northeast, and Upper Midwest earned a rate of return of only 2 to 3 percent. In 1996, this rate of return dropped to 2 percent in the Pacific region as weather problems affected the availability of dairy-quality (e.g., top quality alfalfa hay) inputs (table 2).

In 1993, dairy businesses in the Pacific region had the highest rate of return on equity (6 percent) (table 1). This was not the case in 1996 (table 2), when the Southern Plains had the highest rate of return on equity (5 percent).

The profit margin indicates the farm operator's ability to control the level of farm business costs relative to the volume of revenues generated. All six regions posted average profit margins of 17 percent or greater in 1993 (table 1). Only the Pacific region failed to post an average profit margin of at least 14 percent in 1996 (table 2).

An economic profit margin ratio is calculated to provide a more precise measure of an operator's profitability.

Imputed values for non-operator unpaid labor and returns to owned assets are subtracted from net farm income. The result is then divided by the gross cash farm income. The imputed value for non-operator unpaid labor is calculated as the product of surveyed non-operator unpaid labor and reported wages. A return to owned assets is calculated as the product of surveyed net worth and long-term interest rate for investments. Table 1 shows that, with the exception of the Corn Belt region, dairy farm businesses throughout the United States posted positive economic profits in 1993. As expected, significant differences existed between the relative smaller farms of the Corn Belt, Northeast, and Upper Midwest regions and the relatively larger farms in the Pacific, Southeast, and Southern Plains regions. Smaller farms tend to be more dependent on unpaid labor. In 1996, the Corn Belt region once again failed to post an economic profit (table 2).

**1993-96.** Profitability ratios for U.S. dairy businesses, in general, did not change much during 1993-96 (table 3). Significant differences were posted in the Pacific region for the period 1993-95 (app. table 9), indicative of the farm size expansion that was taking place.

## Common Size Financial Statements

The common size income statement (app. tables 13 and 14) reveals the level of expenses and profits relative to sales. The common size balance sheet (app. tables 15 and 16) shows the distribution of farm assets (fixed relative to current); the capital structure of the business (debt relative to equity); and the business' debt structure (long-term relative to short-term). Common size financial statements are another form of financial ratio analysis (Fraser, p. 125).

As expected, non-current assets across milk production regions accounted for 75 percent or more of all farm assets owned by dairy businesses. Investment in land and buildings (such as milking parlors and animal housing), farm equipment, and breeding animals was by far the largest component of non-current assets of dairy producers. Changes in investment are attributable to changes in such factors as milk prices, input costs, market value of assets, interest rates, and government farm policy. Investments have been financed primarily by long-term debt.

The common size income statement shows the trends for expenses, net cash farm income, and net farm income for an average dairy business. Not surprisingly, the Upper Midwest region was the least profitable region in 1993. The floods of 1993 were to blame for rapidly rising input costs. However, in 1996, poor weather conditions affect-

**Table 1—Financial ratios for specialized dairy farms, by region, 1993**

Item	Corn Belt (1)	North-east (2)	Pacific (3)	South-east (4)	Southern Plains (5)	Upper Midwest (6)
<b>Liquidity ratios:</b>						
Current	2.67 (t12**)	4.04 (t23**) (t25**) (t26**)	2.43	3.37	1.49	2.33
Quick	1.25	1.43 (t26**)	0.83	1.51	0.62	0.95
Farm business debt service coverage	1.55 (t15**)	2.03 (t23**) (t25**) (t26**)	1.30 (t35*)	1.83 (t45**)	0.39 (t56**)	1.58
Debt servicing	0.18 (t14**) (t15*)	0.14 (t23*) (t25**) (t26**)	0.20 (t34**)	0.12 (t45**) (t46**)	0.26	0.21
Times interest	2.33	2.58 (t26*)	2.89 (t36*)	3.96 (t46**)	3.33	1.47
<b>Efficiency ratios:</b>						
Gross	0.76 (t14*) (t15**)	0.77 (t25**)	0.78 (t35**) (t36*)	0.81 (t45*) (t46**)	0.93 (t56**)	0.74
Interest to gross cash income	0.05 (t14**) (t15*) (t16**)	0.05 (t24**) (t26**)	0.04 (t34**) (t35**) (t36**)	0.03 (t46**)	0.04 (t56**)	0.07
Asset turnover	0.25 (t13**) (t14**)	0.23 (t23**) (t24**) (t24*)	0.60 (t34**) (t35**) (t36**)	0.46 (t46**)	0.35	0.26
Debt-burden	0.42 (t15*)	0.38 (t25*)	0.45 (t35**)	0.51 (t45**)	0.05	0.36
<b>Solvency ratios</b>						
Debt to assets	0.14 (t13**) (t15**) (t16**)	0.14 (t23**) (t25**) (t26**)	0.29 (t34**) (t35**) (t36**)	0.17 (t45**)	0.52 (t56**)	0.19
Debt to equity	0.16 (t13**) (t15**) (t16**)	0.16 (t23**) (t25**) (t26**)	0.41 (t34**) (t35**) (t36**)	0.20 (t45**)	1.09 (t56**)	0.24
<b>Profitability ratios:</b>						
Rate of return on assets—						
Current income	0.03 (t13*)	0.03 (t23*)	0.06	0.05	0.03	0.04
Rate of return on equity—						
Current income	0.02	0.03	0.05	0.04	0.04	0.02
Profit margin	0.18	0.21	0.18	0.18	0.17	0.20
Economic profit margin	-0.01 (t13**) (t14**) (t16**)	0.03 (t23**) (t24**)	0.15 (t36**)	0.13	0.12	0.05

Note: txy indicates t-statistic between two regions. \* Significantly different at the 10-percent level. \*\* Significantly different at the 5-percent level.

Source: Compiled by the Economic Research Service from the 1993 Farm Costs and Returns Survey, USDA.

**Table 2—Financial ratios for specialized dairy farms, by region, 1996**

Item	Corn Belt (1)	North-east (2)	Pacific (3)	South-east (4)	Southern Plains (5)	Upper Midwest (6)
<b>Liquidity ratios:</b>						
Current	2.03	3.86 (t23**) (t26**)	1.60	na	1.55	1.91
Quick	1.00	1.82	0.76	na	0.83	0.48
Farm business debt service coverage	1.06 (t12*) (t15*)	1.88 (t23**)	0.80 (t35*) (t36*)	na	1.25	1.42
Debt servicing	0.25 (t12**) (t15**)	0.16 (t25*)	0.27 (t35**)	na	0.21 (t56**)	0.23
Times interest	0.83 (t15*)	1.19 (t25*)	1.47 (t35*)	na	4.06	1.67
<b>Efficiency ratios:</b>						
Gross	0.81 (t16*)	0.77	0.83 (t36**)	na	0.77 (t56*)	0.73
Interest to gross cash income	0.07 (t13**) (t15**)	0.07	0.04 (t36*)	na	0.04 (t56**)	0.06
Asset turnover	0.30 (t13**)	0.30 (t23**)	0.55 (t36**)	na	0.48	0.31
Debt-burden	0.25 (t15**)	0.37	0.35	na	0.57	0.40
<b>Solvency ratios:</b>						
Debt to assets	0.23	0.18 (t23*)	0.27	na na	0.20	0.20
Debt to equity	0.29	0.22 (t23*)	0.37	na na	0.25	0.25
<b>Profitability ratios:</b>						
Rate of return on assets— Current income	0.02	0.03	0.02	na	0.05	0.04
Rate of return on equity— Current income	0.00	0.01	0.00	na	0.05	0.02
Profit margin	0.14	0.17	0.11	na	0.18	0.18
Economic profit margin	0.00	0.05	0.08	na	0.14	0.06

Note: txy indicates t-statistic between two regions. \* Significantly different at the 10-percent level. \*\*Significantly different at the 5-percent level. na = not available, legal disclosure edit required.

Source: Compiled by the Economic Research Service from the 1996 Agricultural Resource Management Study, USDA.

**Table 3—Financial ratios for specialized dairy farms, 1993-96**

Item	1993	1994	1995	1996	t-statistics					
					93-94	93-95	93-96	94-95	94-96	95-96
<b>Liquidity ratios:</b>										
Current	2.50	2.64	2.02	2.11	0.42	1.55	0.02	1.83*	1.62	0.30
Quick	1.02	1.24	0.76	0.79	1.07	1.55	0.02	3.15**	2.22**	0.21
Farm business debt service coverage	1.45	1.31	1.16	1.31	0.79	2.07**	0.01	0.91	0.03	1.17
Debt servicing	0.20	0.20	0.24	0.21	0.00	2.07**	0.00	1.95*	0.79	1.53
Times interest	2.20	1.57	1.41	1.78	1.26	1.53	0.03	0.28	0.35	0.61
<b>Efficiency ratios:</b>										
Gross	0.77	0.80	0.78	0.78	1.73*	0.62	0.00	0.85	0.61	0.05
Interest to gross cash income	0.05	0.05	0.06	0.05	0.11	0.90	0.00	0.83	1.32	1.61
Asset turnover	0.30	0.32	0.35	0.35	1.53	1.81*	0.01	0.87	1.20	0.02
Debt-burden	0.36	0.33	0.36	0.38	0.87	0.06	0.00	0.77	1.18	0.31
<b>Solvency ratios:</b>										
Debt to assets	0.19	0.20	0.21	0.20	0.80	1.41	0.00	0.50	0.15	0.55
Debt to equity	0.24	0.26	0.27	0.26	0.79	1.35	0.01	0.48	0.12	0.27
<b>Profitability ratios:</b>										
Rate of return on assets— Current income	0.04	0.03	0.03	0.03	1.05	0.50	0.00	0.23	0.12	0.09
Rate of return on equity— Current income	0.03	0.01	0.01	0.02	1.20	0.90	0.00	0.02	0.72	0.51
Profit margin	0.19	0.16	0.16	0.16	1.61	1.30	0.01	0.01	0.16	0.14
Economic profit margin	0.06	0.06	0.07	0.07	0.20	0.26	0.02	0.38	2.08**	2.09**

\* Significantly different at the 10-percent level.

\*\* Significantly different at the 5-percent level.

Source: Compiled by the Economic Research Service from 1993-95 Farm Costs and Returns Surveys, USDA, and the 1996 Agricultural Resource Management Study, USDA.

## Regional Comparative Analysis

Various factors that affect regional productivity were analyzed for 1993 (table 4). Specialized dairy businesses across six milk production regions and the United States were used to make the comparisons more meaningful.

Dairy businesses in the Pacific, Southeast, and Southern Plains regions are larger in terms of herd size, and they have higher variable costs, but they generate larger net farm incomes. These businesses are more efficient and productive in terms of feed fed, milk produced, labor employed, and capital invested than farms in the Corn Belt, Northeast, and Upper Midwest regions. Short and McBride (1993, p.21) have shown that milk producers have some control over several variables that affect the dairy business' productivity and efficiency. This suggests that measures to improve smaller farm operators' management skills in the Corn Belt, Northeast, and Upper Midwest regions should be explored.

Another factor of importance in a comparative analysis is the relative balance between operating expenses and fixed expenses (Harsh et al., p.145). The Pacific, Southeast, and Southern Plains regions once again appear to be in a better position than the other three regions. While their operating ratios were somewhat higher than dairy farms in other regions, their fixed ratios were lower. This

implies that dairy business operators in the Pacific, Southeast, and Southern Plains regions are able to expand their operations more quickly.

## Trend Analysis

The income statement shows a steady upward movement in gross farm income generated by an average dairy business in the United States between 1993 and 1996 (table 5). Operating and fixed expenses also increased. However, the overall trend in net farm income was in a positive direction, and the fixed ratio did not trend upward (app. tables 7 and 8). Farm businesses with relatively small fixed ratios and large operating ratios are generally less vulnerable to cash-flow problems since fixed expenses must be paid regardless of the gross farm income generated.

The balance sheet indicates that, on average, over the period 1991-96, total assets owned by a dairy business posted a steady upward movement. Even though total liabilities also increased, the net effect is improved business net worth. The rate of growth in assets was greater than that of debt. The movement in the current ratio and the capital ratio (which show the relative balance among current and non-current assets in relation to current and non-current liabilities) supports this conclusion (app. tables 9 and 10).

**Table 4—Determinants of regional profitability of specialized dairy farms, 1993**

Item	Unit	Corn Belt	North-east	Pacific	South-east	Southern Plains	Upper Midwest	U.S.
Number of farms		17,259	26,702	5,536	856	2,018	45,351	97,721
Size indicators								
Total acres operated		275	335	153	684	378	356	328
Cow numbers		52	61	348	411	183	58	80
Total labor used	hours	4,437	4,847	8,138	16,677	8,249	4,402	4,928
Profit measure								
Net farm income	dollars	21,078	30,538	141,442	185,119	61,725	19,715	32,126
Income statement factors								
Operating ratio		0.61	0.60	0.68	0.70	0.70	0.60	0.63
Fixed ratio		0.11	0.11	0.08	0.06	0.06	0.16	0.12
Efficiency and productivity								
Per cow								
Milk production	cwt	14,876	16,085	17,462	14,531	14,452	15,570	15,964
Milk sales value	dollars	1,824	2,056	2,020	2,134	1,905	1,960	1,984
Feed fed	pounds	26,877	32,065	27,247	24,561	19,730	33,204	29,740
Labor hours		85	80	23	41	45	76	62
Average machinery investment	dollars	1,673	1,400	266	538	702	1,880	1,242
Average total investment	dollars	8,250	9,307	2,944	4,437	3,609	8,590	6,882
Per cwt of milk sold								
Value	dollars	12.87	13.33	11.74	14.98	13.30	12.89	12.77
Feed fed	pounds	189.65	207.90	158.29	172.45	137.74	218.47	191.38
Labor hours		0.60	0.52	0.14	0.29	0.31	0.50	0.40
Average machinery investment	dollars	11.80	9.08	1.55	3.78	4.90	12.37	7.99
Average total investment	dollars	58.22	60.34	17.11	31.15	25.19	56.52	44.29
Per labor hour								
Average machinery investment	dollars	19.60	17.49	11.36	13.25	15.59	24.82	20.10
Average total investment	dollars	96.64	116.28	125.78	109.22	80.16	113.40	111.40
Milk sold	dollars per cwt	1.66	1.93	7.35	3.51	3.18	2.01	2.52

Source: Compiled by the Economic Research Service from the 1993 Farm Costs and Returns Survey, USDA.



**Table 5—Trend analysis for specialized dairy farms, 1993-96**

Item	1993	1994	1995	1996
<i>Dollars per farm</i>				
Balance sheet				
Current assets	79,689	92,952	96,900	97,814
Non-current assets	528,342	528,392	549,318	620,515
Total assets	608,031	621,344	646,218	718,329
Current liabilities	31,924	35,236	47,939	46,310
Non-current liabilities	83,954	91,214	89,410	99,871
Total liabilities	115,878	126,449	137,349	146,181
Net worth	492,153	494,895	508,870	572,148
Current ratio	2.50	2.64	2.02	2.11
Net capital ratio	5.25	4.91	4.70	4.91
Income statement				
Gross farm income	181,464	201,310	226,630	249,376
Operating expenses	117,918	136,310	150,014	166,271
Fixed expenses	21,556	23,833	26,492	27,233
Net farm income	34,047	31,304	35,200	40,698
Gross ratio	0.65	0.68	0.66	0.67
Fixed ratio	0.12	0.12	0.12	0.11

Source: Compiled by the Economic Research Service from 1993-95 Farm Costs and Returns Surveys, USDA, and the 1996 Agricultural Resource Management Study, USDA.