

Business Analysis: Which Financial Tools Should I Use?

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As a dairy business manager, when you need tax management advice you likely would not turn to your nutritionist for that information. Likewise, it is doubtful that you would turn to your accountant or farm management consultant to help you resolve reproduction problems the dairy may be facing. The point is that as a dairy manager one of your tasks is to make sure you identify the person(s) best suited to answer the question at hand. Similarly, when analyzing the financial status/condition of your business, it is important to have the right tool for the job at hand. When analyzing the financial condition of businesses, we typically think of using the three basic financial statements – balance sheet, income statement, and cash flow statement. These statements are very useful for analyzing the well-being of operations from several different perspectives and thus are very important. However, these financial statements have some limitations for some financial analyses and thus may not always be the appropriate financial tool to use. The objective of this paper is to list some of the different financial tools that are commonly used and discuss their relative strengths and weaknesses for analyzing your businesses.

It is important to note that there are many production-related reports and measures that are essential when analyzing your business (e.g., production/cow, cull rate). While this information is extremely critical to successfully managing your operations, for the most part it will be ignored in this discussion as financial statements and analysis methods are the focus of this paper. The following is a list of the different financial statements and analysis tools that will be discussed individually.

Financial statements/tools for business analysis

- Balance sheet
- Income statement
- Cash flow statement
- Sources and uses of funds statement
- Financial ratios
- Partial budget
- Net present value
- Enterprise/whole-farm budget

While the above list is not all inclusive of every possible financial statement and tool available for analyzing one's business, it does include those that are most commonly used in the industry. All of these financial tools can be used with actual data (*ex post* analysis) or with projected data (*ex ante* analysis), but the particular question at hand will often dictate which is the appropriate tool to use. For example, the balance sheet, income statement, cash flow statement, and sources and uses of funds statement are typically used with actual data, whereas partial budgets and enterprise budgets are generally constructed with projected data. Many times cash flow statements are developed with both types of data – projected data for business planning, and actual data for business evaluation. While this

may sound like a trivial issue, the type of analysis you want to conduct will often dictate which tool is more appropriate to use. Likewise, the data available may also influence which type of analysis is appropriate given the question at hand. The following is a brief description and discussion of each of the different financial statements/tools listed above with regards to their use in analyzing a business.

Balance Sheet

The balance sheet, also known as the net worth statement, represents a financial snapshot of a business at a particular point in time and is one of the principal financial reports of a business. Balance sheets can take on different “looks,” but they all basically convey three critical pieces of information – assets, liabilities, and equity. Assets reflect the overall magnitude of the business in terms of dollars of investment (i.e., what is owned in the business), liabilities reflect what is owed (i.e., assets that are owned by creditors), and equity or net worth reflects the owner’s share of the business. Defined in this manner, equity is simply calculated as the difference between assets and liabilities. Assets and liabilities are often classified as being current or non-current. Current assets are those that can be quickly converted into cash in the normal business processes within a year – e.g., cash, milk, feed, calves. Non-current assets are those resources used to support production that are not typically expected to be sold in the normal business process – e.g., cows, equipment, buildings, land. Current liabilities are those debts that are due within a year – e.g., accounts payable, accrued interest, principal due on term loans. Non-current liabilities are the longer-term portion of notes payable, i.e., that portion that is not due within the next year. Examples of non-current liabilities are things such as land mortgages and building and equipment loans.

The value of assets in a balance sheet can be either *market based* or *cost based*. Market based means the value of the asset reflects what it would be worth if it were sold at the time the balance sheet is constructed (i.e., its current market value). Cost based means the value of the asset reflects its cost (i.e., what was paid for it when it was purchased) less any accumulated tax depreciation. Depending on the asset, these two valuation methods can result in similar or significantly different values for an asset. For example, the market- and cost-based values would basically be the same for purchased feed that is kept in inventory for short time periods. On the other hand, these two approaches will often result in significantly different values for assets such as land and buildings that were purchased many years prior. Because liabilities reflect dollars owed, valuing liabilities on the balance sheet is not an issue. When valuing assets on the balance sheet, the important thing to keep in mind is that it is done consistently over time (it is often wise to value long-term assets using both valuation methods – cost basis for tax purposes and market value for lenders).

Because a balance sheet represents the assets and liabilities of a business at a specific point in time (e.g., January 1, 2005), a single balance sheet has little value in terms of conveying the financial success of the dairy business. Rather, the balance sheet provides useful information to lenders and others as to the size of the business (i.e., assets) as well as how leveraged the business is (i.e., liabilities) which provides an indication of risk-bearing ability. Table 1 is an example of a market-based balance sheet for dairy farms that are members of the Kansas Farm Management Association (KFMA).¹ This balance sheet actually is two balance sheets as it reflects values at the beginning of the year (1/1/2003) and the ending of the year (12/31/2003) – i.e., two points in time implies two balance sheets. At the end of 2003, the average dairy farm in the KFMA had assets of approximately \$1.2 million and debts of \$328,554 for a leverage position of 28.0%. By looking at the beginning and ending of year values, the change can be calculated which provides some indication as to what kind of year the business had. For example, assets increased \$24,216, due primarily to an increase in the value of crop and feed inventory and an increase in land. Current liabilities decreased by over \$14,000, however, total liabilities increased by \$4,431 leading to an

increase in net worth (equity) of \$19,785 (\$24,216 – \$4,431). Given the change in equity, an after-tax return on equity (ROE) can be calculated by dividing the change in equity by the beginning equity. The after-tax ROE for the average dairy in the KFMA in 2004 was 2.40% (\$19,785 ÷ \$825,225).

As was just shown, by having two balance sheets (i.e., beginning of the year and ending of the year) a measure of financial success can be measured with the balance sheet. However, balance sheets have much more value for measuring the success, or lack of success, of a business when past balance sheets can be compared to identify trends or changes in the business with regards to assets, liabilities, and net worth. Table 2 shows the balance sheets over the previous five years for dairy farms in the KFMA. It can be seen that the size of the business, as measured by total assets, has been growing slightly over this time period and liabilities have increased at a slightly faster rate (i.e., leverage position has been trending up slightly). ROE has been positive three of the years and negative two of the years indicating the variability in income dairy producers have been faced with over this time period. Figure 1 shows the liabilities, equity, and assets (total of liabilities and equity) for these dairy farms over the last 10 years. This type of information provides a visual depiction of what the business has been doing over time (i.e., growing, shrinking, etc). Given historical information such as that depicted in figure 1, it is often useful to calculate what the annualized growth rate has been in some measure of interest (e.g., ROE, assets, etc). This can be done using the following formula

$$g = \left(\frac{V_n}{V_m} \right)^{\left(\frac{1}{n-m} \right)} - 1 ,$$

where g = the annualized growth rate, V_n is the value of interest in year n , and V_m is the value of interest in year m . Given an equity values of \$595,018 in 1994 and \$845,012 in 2004, the annualized ROE can be calculated as

$$0.0357 = \left(\frac{845,012_{2004}}{595,018_{1994}} \right)^{\left(\frac{1}{2004-1994} \right)} - 1 .$$

Thus, the dairies in the KFMA have had an annual after-tax ROE of 3.57% from 1994 to 2004. This calculated value can then be compared to what a manager may feel is acceptable given their level of risk and alternative business opportunities. It should be noted that in cases where capital has been pulled out of the dairy business (reflected in a personal balance sheet) this type of calculation has much less meaning unless the transferred capital is taken into account. This growth rate formula might also be useful when applied to production measures to identify production benchmarks. For example, applying the above formula to USDA data reveals that average production per cow in the U.S. has been increasing 2.2% annually over the last 40 years.

The balance sheet is an important financial statement that needs to be part of your business analysis. However, it is important to remember that a single balance sheet only conveys information at a single point in time. Even when a beginning and ending balance sheet exist allowing you to calculate change in net worth, the balance sheet does not convey enough information to know why net worth increased or decreased and thus it can lead to wrong conclusions. For example, net worth may have increased in a particular year due to an infusion of outside capital as opposed to the business being profitable. This potential problem of reaching inappropriate conclusions is significantly reduced the more years of balance sheets that are available for analysis. Thus, it is important to recognize that the balance sheet as

a financial analysis tool has limitations and is most valuable when multiple years of balance sheet information exists so it can be used to identify important business trends. For more information about balance sheets, see Langemeier (2004a).

Income Statement

The income statement is the key financial statement for measuring the success of a business over a certain period of time in terms of net income or profit. The most common time period for most farms is a calendar year, but larger businesses will often construct income statements on a quarterly or even monthly basis. The income statement is also often referred to as a profit and loss statement, operating statement, or income and expense statement. As with the balance sheet, income statements can take on many different “looks” with regards to how they are organized, but as a general rule they are fairly straight forward in that they contain an income section and an expense section with the difference between the two being net income (or loss).

Income statements can be constructed on a *cash basis* or an *accrual basis*. Understanding the difference between cash and accrual income statements is extremely important when analyzing your business. A cash income statement includes only the income received and expenses paid during the time period being analyzed, whereas, the accrual income statement includes the income earned and the expenses incurred in the time period, regardless of whether or not they were actually received or paid. The key difference between cash and accrual income statements is that accrual income statements include inventory adjustments to reflect the income earned and expenses incurred for the time period. Because of these inventory adjustments, accrual income statements are typically harder to construct (and understand) compared to a cash income statement.

Most farm businesses report their income on the cash basis for tax purposes because of the great flexibility this provides them for income tax management. However, producers need to recognize that the cash-based income statement may, or may not, paint an accurate picture as to the profitability of their business. For example, it is possible for a profitable business that is growing to go a long time period (e.g., 10 years or more) and routinely show a loss for tax purposes. The opposite scenario is also true, i.e., a business may have to pay income taxes in a year when it was unprofitable. The key point to remember is that cash-based income statements may, or may not, accurately depict the profitability of your business and thus it is important to construct an accrual income statement.²

Table 3 is an example income statement for the dairy farms in the KFMA for the year 2003. Because the crop and livestock revenue sections include inventory adjustments, this income statement is an accrual income statement and thus should give an accurate depiction as to the actual profitability of the dairy farms in 2003. As stated previously, income statements often take on slightly different looks and formats depending on who is constructing them. For example, the approach used at Kansas State University is to subtract livestock and feed purchases from gross revenue and calculate a value referred to as Value of Production. This Value of Production figure more accurately depicts the income that was produced on the farm as opposed to simply purchased. On the other hand, total cash expenses will look low using this approach because feed is not included in this category. Other income statements will simply treat purchased feed as an expense and list it in that section. Using this approach, the total expense category will be more accurate, but the income category will be inflated potentially due to large feed inventories. The important thing to keep in mind is that this difference is not relevant with regards to the “bottom line” – i.e., net farm income, but it does affect category totals and thus it is important to be aware of how the income statement treats these different items when benchmarking.

The dairy farms in the KFMA had a value of production of \$340,883 in 2003 compared to a total expense of \$283,061 (including depreciation and all inventory adjustments) resulting in a net farm income from operations (NFIFO) of \$57,822. In this income statement, the \$31,324 of depreciation reflects the amount machinery and buildings dropped in value and thus this is the expense of using those assets. In other words, the depreciation included on the income statement is a market-based value as opposed to a tax-based value (i.e., the amount allowable by the IRS for tax deduction purposes). While knowing, understanding, and tracking tax depreciation is important, it typically does not accurately reflect the true expense of the asset and thus is not used in the income statement. Somewhat related to the fact that depreciation (a non-cash expense) is included in the income statement, is the fact that principal payments on loans are *not* included on the income statement. Principal payments are not a business expense and thus they do not belong on an income statement, however, they are a cash flow and thus they do belong in the cash flow statement (see next section).³

The gain or loss on the sale of capital assets is added to the net farm income from operations to give the total net farm income (NFI) for the year (\$58,021). The difference between these last two lines (i.e., NFIFO and NFI) is subtle, but important to understand. NFIFO helps answer how well your business did during the year based on the normal production of the business (i.e., did I make money producing milk?). NFI measures the same thing but also includes gains or losses on assets you might have sold (i.e., did I make money producing milk and selling assets?). As can be seen in this example, these two measures are essentially equal for businesses that do not do a lot of buying and selling of capital assets throughout the year.

The income statement is an important financial statement that needs to be part of your business analysis. The accrual income statement provides a good measure as to the financial success of your business over some time period (e.g., previous year). Furthermore, by looking at income and expense categories the income statement can shed some light as to why your business was, or was not, successful. However, as with balance sheets, this is best accomplished when income statements from multiple years exist so that trends and benchmarking can be done (e.g., How did income this year compare to my 5-year average? Which costs were higher than average? Which costs were lower than average?). For additional information about income statements readers are encouraged to see Langemeier, 2004b.

Cash Flow Statement

The cash flow statement is the third financial statement that should be part of any business financial reporting. The cash flow statement is a recording of the dollars coming in and going out of a business over some time period (e.g., year, quarter, month) and thus it measures how well a business is doing at meeting its cash commitments. Cash inflows refer to money coming into the business (e.g., sales, loans) and cash outflows refers to money leaving the business (e.g., expenses, principal and interest payments, cash withdrawals). Cash flow statements can be either historical (actual data) or projected for a future time period. Projected cash flow statements are often developed for lenders as a means of showing how and when borrowed money will be repaid. This paper focuses on the historical cash flow statement.

Table 4 is an example cash flow statement for the dairy farms in the KFMA for the year 2003. Total farm cash inflow was \$471,363 which will be the same as the gross revenue (line 7) on the income statement if there are no inventory adjustments. Total farm cash outflow for these dairy farms averaged \$444,491 which includes the same cash expenses as on the income statement plus livestock and capital asset purchases. The net farm cash flow is the value that is often mistakenly thought of as net farm income and was \$26,872 for these dairies. In this example, net farm cash flow is less than half of net farm income (\$58,021). It is important to recognize that net cash flow can be greater than, equal to, or

less than net farm income regardless of whether a farm is profitable or not (i.e., net farm income > \$0). The key point is that you cannot draw any conclusions about the profitability of a farm based on the net farm cash flow.

After accounting for all farm cash inflows and outflows (line 28), the rest of the cash flow statement accounts for all dollars coming into and leaving the business. Outside capital invested in the business and non-farm income are added to the net farm cash flow while capital withdrawals and taxes paid are deducted. After these adjustments, you are left with the net cash flow (note – we no longer say “farm”) which is -\$7,561 in the example. This negative amount indicates that more money went out of the business than came in and thus this amount should be reflected in changing balances of cash, receivables, payables, or loan accounts. In this example, the \$7,561 shortfall came partly out of cash balances (\$1,701), partly out of a reduction in receivables and coop investment (\$484 and \$945, respectively), and the rest from an increase in loan balances (\$4,431) -- these changes can be seen from the beginning and ending year balance sheets shown in Table 1. Line 38 in the cash flow statement is simply a “check” to see if any dollars are unaccounted for. If all dollars coming into the business as well as those leaving the business have been accounted for, this value should be \$0. With a projected cash flow statement this value is often forced to zero by allowing Line 37 to change – that is, after accounting for cash inflows and all cash outflows how much will the loan balance increase or decrease? Used in this manner, a lender can get an idea about the credit needs of a borrower and thus the cash flow statement can be a very helpful planning tool. However, having said that, it very important for producers and those making business management decisions to recognize that cash flow statements are not the same as income statements (i.e., positive cash flow does not imply profitability or vice versa). For more information about cash flow statements, see Langemeier (2004c).

Sources and Uses of Funds Statement

A sources and uses of funds statement is similar to a historical cash flow statement in that it lists all the funds that come into a business (sources) and the funds that leave the business (uses). Because the historical cash flow statement and sources and uses of funds both account for all dollars coming into and leaving the business, they are based on the exact same data. One difference between the two statements has to do with organization of how information is presented. In the cash flow statement shown in Table 4 increasing loan balances are shown at the bottom of the statement even though they are technically an “inflow” to the business. This is in contrast to the sources and uses of funds statement where increases in liabilities (i.e., increasing loan balances) shows up as a source of funds and likewise decreases in liabilities (i.e., paying down loan balances) shows up as a use of funds. Another difference between the two statements is that the sources and uses of funds statement typically do not show as much detail as the cash flow statement. For example, expenses and receipts are aggregated rather than showing individual categories. Table 5 shows an example of a sources and uses of funds statements for the dairy farms in the KFMA for 2003. Like the historical cash flow statement, if all funds have been properly accounted for in the business, the sources (inflows) should exactly equal the uses (outflows).

Financial Ratios

The previous sections have discussed the key financial statements (balance sheet, income statement, and cash flow statement) used to analyze the financial position and success of a business. Financial ratios are a means of using the information that is reported in one or more of the financial statements and interpreting it another way. By definition, the word ratio implies some value relative to some other value and thus most financial ratios are independent of the size of the business allowing different sized business to be compared to each other more easily. Table 6 includes 15 financial ratios that can be

constructed from the information contained in the balance sheet, income statement, and cash flow statement.

As with the financial statements, financial ratios are most valuable for both internal and external benchmarking of your business when multiple years of data exist. Internal benchmarking simply refers to examining how your business is doing over time when compared to itself. Thus, by definition, internal benchmarking requires multiple time periods (years, quarter, etc.) of data. External benchmarking refers to how your operation compares with other operations. The ratios and measures reported in Table 6 fall into various categories – *liquidity* and *solvency* consider the debt level and debt structure of the business; *profitability* ratios measure the extent to which the business generates a profit from the use of its resources; *financial efficiency* ratios measure the intensity to which a business uses its assets to generate value of production and the effectiveness of production, purchasing, pricing, financing, and marketing decisions; and *repayment capacity* measures the ability of the business to cover its principal and interest payments and evaluate the potential to acquire and service additional debt.

When examining financial ratios and comparing them to reported guidelines or other dairies, it is important to recognize that farm type and other factors can influence some of these measures. For example, the guidelines for asset turnover will be different for a beef cow-calf operation than for a dairy operation. Likewise, a free-stall dairy likely will have slightly different depreciation expense ratio values than a pasture dairy. For a more detailed discussion of the various financial ratios, see Langemeier (2004e).

Financial statements for business analysis

The three primary financial statements – balance sheet, income statement, and cash flow statement – are not only important, they are critical for analyzing the financial condition of a dairy and for making broad comparisons across dairies. A strength of these statements is that they rely upon information that has happened as opposed to what is expected (i.e., they are based on actual data rather than projected data). However, a weakness of these financial statements is that seldom can they be used to identify specifically why one operation is more (less) profitable than another. A temptation when benchmarking data from the financial statements is to focus on a particular measure without accounting for other factors in the operation. For example, labor-saving technologies often require larger investments and thus represent substituting one expense (depreciation and interest) for another (labor) and if the manager is focusing on one ratio (e.g., depreciation expense ratio), he or she may be missing the bigger picture. This does not mean that benchmarking information should not be done, but it does point to the importance of making sure the comparison being made is appropriate. Put another way, it is very difficult to identify the profitability associated with a particular management style or strategy using financial statements by focusing on one particular measure (uni-variate analysis) due to the many confounding effects. To accurately measure the profitability associated with a particular management strategy (e.g., facility type, milking frequency, bST use) using data from the income statement requires a large amount of data (i.e., information from many herds) and an analysis methodology that takes into account the variability across herds (i.e., a multi-variate analysis).

Partial Budget

A partial budget analysis is generally a fairly straightforward analysis, but depending on the question at hand, it can become more complex. Typically, a partial budget is used to examine the *expected* economic returns associated with a particular management intervention. The word *expected* is used because partial budgets are almost always based on projected data. Ideally, we would use the income

statement with historical data to measure the actual observed returns associated with a particular management intervention. However, often insufficient data exist with regards to both the number of observations (operations and/or years) and information about the characteristics of the different operations (e.g., facility type, static vs. expanding herd size, milking frequency, etc.). In this case, a partial budget analysis based on sound assumptions about expected impacts is often the best indicator as to the expected returns of a particular management intervention.

This type of analysis simply examines the impact a change in the operation has on net returns in a three step process. The first step is to identify the *benefits* of the intervention. Second is identification of the *costs* associated with the intervention. Finally, we need to compare the benefits (gains) made in the first step to the costs (losses) identified in the second step. Figure 2 shows a schematic of what a partial budgeting analysis entails. To construct a partial budget, four values need to be identified: (1) increased revenue, (2) decreased costs, (3) increased costs, and (4) decreased revenue. It is important to note that not all four of these values will always be relevant and in some cases some of them cannot be quantified.

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Figure 2. Partial Budget Analysis Approach.

It can be seen that by identifying the four factors identified in figure 2 the profitability of a particular management intervention can be calculated. A positive economic return points us in the direction of a good decision, while a negative outcome tells us that moving forward with the decision will be detrimental to overall business performance. In addition to calculating the profitability as benefits less costs (as depicted in the figure), a benefit-cost ratio can also be calculated (i.e., B / C). This ratio simply indicates the dollars of return generated for every dollar of cost. Once the partial budget has been constructed, it is often useful to do a breakeven analysis and/or a sensitivity analysis around some of the projected values to determine the impact they have on the profitability.

Tables 7 and 8 are examples of using a partial budget to analyze the profitability of adding sprinklers and fans (i.e., a cooling system) in a free stall barn (Table 7) and using bST (Table 8). It is important to note that this same type of analysis could be done for almost any management decision made on the farm, e.g., 2X vs. 3X milking, synchronized reproduction programs, etc. However, because the partial budget analysis relies upon projections, it is important to remember that this type of analysis is only as good as the assumptions that go into the budget. As the complexity of the intervention being considered increases, the number of assumptions required also increases which may lead you to having less confidence in your expected value. This is the reason it is often useful to do the sensitivity analysis – i.e., we recognize that some of our assumptions may be incorrect.

While profitable decisions ultimately contribute to improvements in balance sheets, income statements and cash flow statements, accurately assessing the profitability of individual decisions or the performance of individual enterprises can't be done solely with these reports. Partial budgeting gives us the required process to accurately assess those changes in income and expenses that are specifically associated with a particular management decision, without the problem of having the profitability of that decision clouded by other activities on the dairy that are irrelevant to the question at hand. Thus, the partial budget is a very powerful tool for analyzing different interventions management might be considering. Weaknesses of the partial budget are that it requires projections (not particularly a serious issue) and the fact that some income or cost impacts are overlooked (potentially a serious issue). Another weakness of the partial budget is it only shows the "marginal" impact on the business and there are times you will want to know what this does to the bottom line (e.g., the breakeven milk price in Tables 7 and 8) is only somewhat useful information for a manager – the total breakeven for the dairy would likely be more meaningful).

Net Present Value

Net present value (NPV) analysis is a means of taking into account the fact that a time value of money exists (i.e., a dollar tomorrow is worth less than a dollar today). Generally a NPV analysis is nothing more than a partial budget (i.e., changes in income and costs) that takes into account the timing of the income and cost changes. There is no question that a properly done NPV that also takes into account taxes is the best type of analysis to use, however, the increased complexity of this method is often not warranted. For example, the data in Table 7 could be analyzed in a NPV framework because the costs of the fans represent a multi-year investment and thus the time value of money is somewhat relevant. However, given the magnitude of the investment, the increased complexity of discounting future income streams is not that critical and thus the simpler approach is appropriate (time value of money has somewhat been accounted for by using an amortization factor to proxy depreciation and interest costs of fans). Because NPV analysis likely is not needed to answer many of the questions dairy managers face, no example is provided here. If readers are interested in finding out additional information as to how to do a NPV analysis, they are encouraged to contact the authors.

Enterprise/whole-farm budget

An enterprise or whole-farm budget is similar to the partial budget except that as its name implies it is for the entire operation. This tool is very useful for looking at alternative scenarios with regards to facilities, milking frequency, or any other management intervention. For a dairy operation that also has a cropping enterprise, it is suggested that the crop income and costs be examined separately and thus we are referring to a dairy enterprise budget. For dairy operations that do not have other enterprises, the enterprise and whole-farm budget are the same thing. The advantage of the enterprise budget is that all factors have been accounted for and thus it could be argued that it is more difficult to "overlook" some impacts (a potential weakness of the partial budget). Thus, an enterprise budget subsumes a partial budget, i.e., anything you can look at in a partial budgeting framework can be duplicated in an enterprise budgeting framework. The difference being that many income and cost categories might not change across the scenarios being analyzed. A weakness of the enterprise budget is that, like the partial budget, it relies upon projections. However, as previously stated, this is not a serious issue for those producers that have good historical data to use in making projections. Additionally, by conducting a sensitivity analysis, the enterprise budget can be very useful for examining and quantifying the potential risk associated with a particular scenario or management intervention.

Tables 9 and 10 are examples of whole-farm budgets reflecting the expected costs and returns of a 2,400 head lactating cow dairy at two levels of production for freestall barns and drylots, respectively. The

advantage of these enterprise-level budgets over partial budgets is that the total cost of producing milk (breakeven price) can be calculated (Line E) as well as the expected rate of return (Line G). Similar to the partial budget, once a baseline budget is constructed sensitivity analyses can be conducted to examine how various factors impact returns (see Dhuyvetter et al. (2004a and 2004b) for examples). The strength of developing projected budgets such as those depicted in Tables 9 and 10 is that the question at hand can be focused on without all the confounding effects. For example, what are the expected returns of higher production levels after increasing those costs that are expected to increase? Or, what are the expected returns of one facility type versus another? These types of questions are much more difficult to answer by analyzing historical data from the various financial statements unless sufficient data are available and a multi-variable analysis is used.

Summary and Conclusions

There are numerous different financial tools and analysis methods that can be used when analyzing the profitability of a dairy business. However, as with many other aspects of the dairy business, using the right tool for the job at hand is important. The key financial statements – balance sheets, income statements, and cash flow statements – are very useful and critically important for identifying and measuring the success of your dairy. Likewise, these same statements can provide some useful benchmarking information. However, it is important to remember that when benchmarking individual measures there may be confounding issues that need to be accounted for. If there are confounding effects, an analysis based upon one factor (i.e., a uni-variate analysis) can lead to misleading results. Because of these confounding factors, using financial statements based on historical data to identify *why* a business is or is not successful can be difficult. That is, financial statements are very useful for identifying if a business is successful, but they are less useful at identifying specific management styles and strategies that led to that success. The exception to this is when financial statement information, specifically income statement information, can be analyzed from a large numbers of operations using a multi-variate analysis methodology that accounts for the many varying characteristics of the dairies.

When insufficient information is available (either numbers of operations or information pertaining to the characteristics of the dairies), it is very difficult to identify cause and effect issues using financial statements. In this case, it is often more useful, and likely more accurate, to use either partial or enterprise/whole-farm budgets. While partial and whole-farm budgets require projections of the various cost and return variables, it is easy to see what assumptions have been made and conduct sensitivity analysis around those where uncertainty exists. This is a preferred case to using actual data when information about confounding effects are unknown meaning you can only guess at what might have been going on.

A key point to keep in mind as a dairy manager when analyzing your business is that basically *all* decisions you make are based on what you expect will happen in the future and thus the most important thing is having confidence in your expectations. Thus, you need to ask yourself, do I have more faith in an analysis of financial statements using actual data or in a budget that is based on historical data and my best projections. We believe that both types of analyses have their place, but it is important to use the right tool and method of analysis for the job at hand.

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Table 1. Balance Sheet for Dairy Farms in Kansas Farm Management Association

<u>ASSETS:</u>		<u>1/1/2003</u>	<u>12/31/2003</u>	<u>Change</u>
Cash	(1)	28,200	26,499	-1,701
Marketable Securities	(2)	0	0	0
Accounts Receivable	(3)	3,937	3,453	-484
Fertilizer and Supplies	(4)	7,148	7,532	384
Investment in Growing Crops	(5)	0	0	0
Crops Held for Sale and Feed	(6)	70,120	80,503	10,383
Market Livestock	(7)	3,431	2,561	-870
TOTAL CURRENT ASSETS	(8)	112,836	120,548	7,712
(Add Lines 1 through 7)				
Breeding Livestock	(9)	199,025	198,577	-448
Machinery and Equipment	(10)	209,806	214,148	4,342
Buildings	(11)	80,288	75,674	-4,614
Investments in Cooperatives	(12)	51,468	50,523	-945
Land	(13)	495,925	514,094	18,169
TOTAL NONCURRENT ASSETS	(14)	1,036,512	1,053,016	16,504
(Add Lines 9 through 13)				
TOTAL ASSETS	(15)	1,149,348	1,173,564	24,216
(Add Lines 8 and 14)				
<u>LIABILITIES AND OWNER EQUITY:</u>				
Accounts Payable	(16)	0	0	0
Taxes Payable	(17)	0	0	0
Accrued Expenses	(18)	2,725	2,451	-274
Current Portion: Deferred Taxes	(19)	0	0	0
Notes Due Within One Year	(20)	87,180	73,069	-14,111
Current Portion of Term Debt	(21)	0	0	0
Accrued Interest	(22)	0	0	0
TOTAL CURRENT LIABILITIES	(23)	89,905	75,520	-14,385
(Add Lines 16 through 22)				
Noncurrent Portion: Deferred Taxes	(24)	0	0	0
Noncurrent Portion: Notes Payable	(25)	234,218	253,034	18,816
Noncurrent Portion: Real Estate Debt	(26)	0	0	0
TOTAL NONCURRENT LIABILITIES	(27)	234,218	253,034	18,816
(Add Lines 24 through 26)				
TOTAL LIABILITIES	(28)	324,123	328,554	4,431
(Add Lines 23 and 27)				
OWNER EQUITY	(29)	825,225	845,010	19,785
(Subtract Line 28 from Line 15)				
TOTAL LIABILITIES AND OWNER EQUITY	(30)	1,149,348	1,173,564	24,216
(Add Lines 28 and 29)				

Table 2. Balance Sheets for Dairy Farms in Kansas Farm Management Association

<u>ASSETS:</u>	<u>1/1/2000</u>	<u>1/1/2001</u>	<u>1/1/2002</u>	<u>1/1/2003</u>	<u>1/1/2004</u>
Cash	26,019	36,609	35,289	28,200	26,499
Marketable Securities	0	0	0	0	0
Accounts Receivable	6,732	2,898	3,789	3,937	3,453
Fertilizer and Supplies	3,927	4,967	6,931	7,148	7,532
Investment in Growing Crops	0	0	0	0	0
Crops Held for Sale and Feed	74,360	71,422	75,465	70,119	80,503
Market Livestock	1,027	1,360	9,699	3,431	2,561
TOTAL CURRENT ASSETS	112,066	117,255	131,172	112,835	120,549
Breeding Livestock	187,745	188,416	194,511	199,025	198,577
Machinery and Equipment	197,073	191,863	202,928	209,806	214,148
Buildings	77,198	74,634	80,940	80,288	75,674
Investments in Cooperatives	43,668	41,748	44,808	51,468	50,523
Land	461,406	478,710	501,672	495,925	514,094
TOTAL NONCURRENT ASSETS	967,091	975,371	1,024,860	1,036,511	1,053,016
TOTAL ASSETS	1,079,157	1,092,626	1,156,032	1,149,346	1,173,565
Accounts Payable	0	0	0	0	0
Taxes Payable	0	0	0	0	0
Accrued Expenses	1,266	1,337	1,359	2,725	2,451
Current Portion: Deferred Taxes	0	0	0	0	0
Notes Due Within One Year	65,549	75,227	81,827	87,180	73,069
Current Portion of Term Debt	0	0	0	0	0
Accrued Interest	0	0	0	0	0
TOTAL CURRENT LIABILITIES	66,815	76,564	83,185	89,904	75,520
Noncurrent Portion: Deferred Taxes	0	0	0	0	0
Noncurrent Portion: Notes Payable	194,669	200,562	218,508	234,218	253,034
Noncurrent Portion: Real Estate Debt	0	0	0	0	0
TOTAL NONCURRENT LIABILITIES	194,669	200,562	218,508	234,218	253,034
TOTAL LIABILITIES	261,484	277,126	301,694	324,122	328,553
OWNER EQUITY	817,673	815,501	854,338	825,224	845,012
TOTAL LIABILITIES AND OWNER EQUITY	1,079,157	1,092,626	1,156,032	1,149,346	1,173,565
Net worth change, \$	32,305	-2,173	38,838	-29,114	19,788
Net worth change (ROE), %	4.11%	-0.27%	4.76%	-3.41%	2.40%

Figure 1. Assets, Liability, and Equity of Dairy Farms in Kansas Farm Management Association

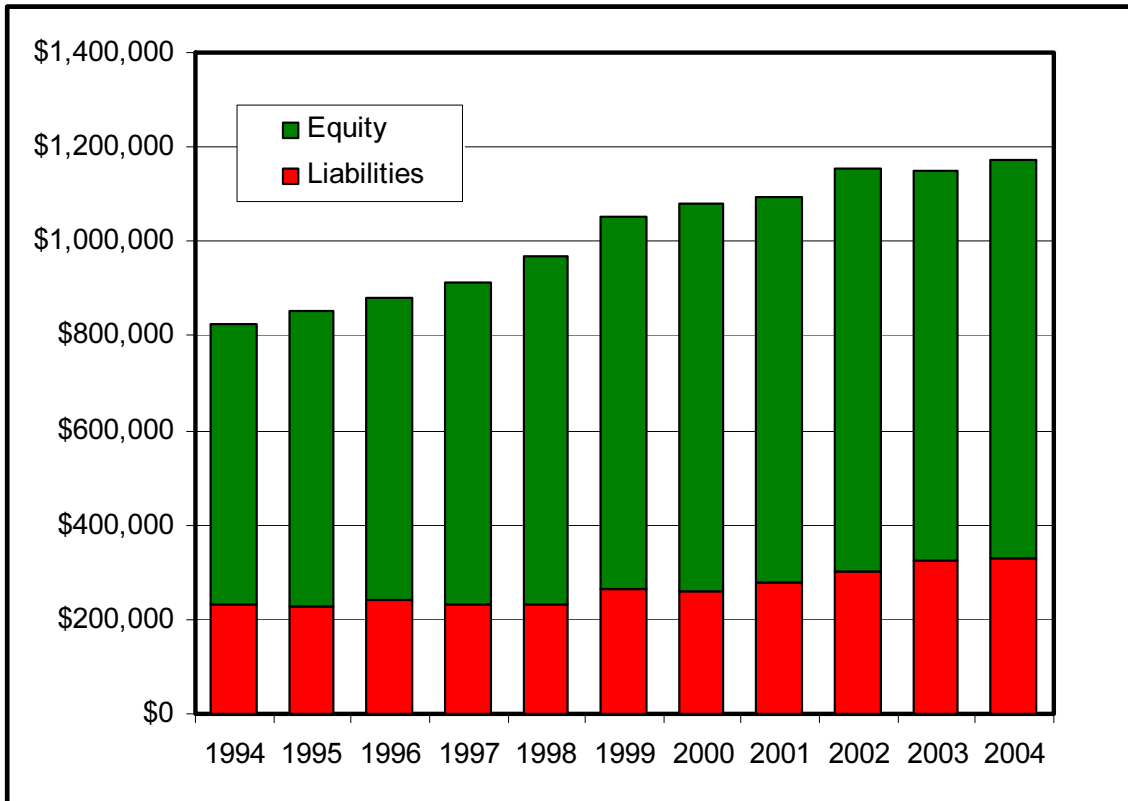


Table 3. 2003 Income Statement for Dairy Farms in Kansas Farm Management Association

Farm Business Receipts:		<u>Amount</u>
Crop Cash Sales	(1A)	56,317
Ending Crop Inventory	(1B)	80,503
Beginning Crop Inventory	(1C)	70,120
Accrual Gross Revenue from Crops (1A+1B-1C)	(1)	66,700
Livestock and Milk Cash Sales	(2A)	351,545
Ending Livestock Inventory	(2B)	201,138
Beginning Livestock Inventory	(2C)	202,456
Accrual Gross Revenue from Livestock and Milk (2A+2B-2C)	(2)	350,227
Gain/Loss on Sale of Breeding Livestock	(3)	0
Government Payments	(4)	40,799
Crop Insurance Proceeds	(5)	7,150
Other Farm Income	(6)	15,068
GROSS REVENUE (Add Lines 1 through 6)	(7)	479,944
- Livestock Purchases	(8)	34,994
- Cost of Purchased Feed/Grain	(9)	104,067
VALUE OF FARM PRODUCTION (Line 7 - Line 8 - Line 9)	(10)	340,883
Farm Business Expenses:		
Labor Hired	(11)	33,786
Repairs	(12)	29,158
Seed	(13)	12,240
Fertilizer	(14)	19,720
Machine Hire	(15)	7,737
Veterinarian Expense	(16)	12,234
Marketing	(17)	10,102
Fuel and Utilities	(18)	23,949
Property Tax	(19)	6,564
General Farm Insurance	(20)	10,170
Cash Rent	(21)	12,622
Herbicide and Insecticide	(22)	11,256
Miscellaneous	(23)	42,093
TOTAL CASH OPERATING EXPENSES (Add lines 11 through 23)	(24)	231,631
+ Expense Inventory Adjustment	(25)	-658
+ Depreciation	(26)	31,324
TOTAL OPERATING EXPENSES (Line 24 + Line 25 + Line 26)	(27)	262,297
+ Interest	(28)	20,764
TOTAL EXPENSES (Line 27 + Line 28)	(29)	283,061
NET FARM INCOME FROM OPERATIONS (Line 10 - Line 29)	(30)	57,822
+ Gain/Loss on Sale of Capital Assets	(31)	199
NET FARM INCOME (Line 30 + Line 31)	(32)	58,021

Table 4. 2003 Cash Flow Statement for Dairy Farms in Kansas Farm Management Association

FARM CASH INFLOW		Amount
Crops and Livestock		
Grains (including crop insurance proceeds)	(1)	60,201
Hay and Forage	(2)	3,266
Dairy	(3)	345,950
Other Livestock	(4)	5,595
Government Payments	(5)	40,799
Miscellaneous Income	(6)	15,552
Capital Asset Sales	(7)	0
Total (Add lines 1 through 7)	(8)	471,363
FARM CASH OUTFLOW		
Feed	(9)	104,067
Hired Labor	(10)	33,786
Repairs	(11)	29,158
Seed	(12)	12,240
Fertilizer	(13)	19,720
Machine Hire	(14)	7,737
Veterinarian Expense	(15)	12,234
Marketing	(16)	10,102
Fuel and Utilities	(17)	23,949
Property Tax	(18)	6,564
General Farm Insurance	(19)	10,170
Cash Rent	(20)	12,622
Herbicide and Insecticide	(21)	11,256
Miscellaneous Expense	(22)	42,093
Interest	(23)	20,764
Dairy Purchases	(24)	32,454
Other Livestock Purchases	(25)	2,540
Capital Asset Purchases	(26)	53,035
Total (Add Lines 11 through 26)	(27)	444,491
NET FARM CASH FLOW (Line 9 - Line 28)	(28)	26,872
NON-FARM CASH FLOW		
Outside Equity Capital / Non-Farm Income	(29)	23,951
Capital Withdrawals	(30)	-52,888
Income and Self-Employment Taxes	(31)	-5,496
Total (Add Lines 29 through 31)	(32)	-34,433
NET CASH FLOW (Line 28 + Line 32)	(33)	-7,561
Change in Cash Balance (Ending - Beginning)	(34)	-1,701
Change in Accounts Receivable (Ending - Beginning)	(35)	-484
Change in Investment in Coops (Ending - Beginning)	(36)	-945
Change in Total Loans (Ending - Beginning)	(37)	4,431
Unaccounted for Funds (Line 33 - Lines 34 through 37)	(38)	0

Table 5. 2003 Sources and Uses of Funds Statement of Dairy Farms in KFMA

SOURCES OF FUNDS:		
Beginning Cash	(1)	28,200
Cash Farm Receipts	(2)	471,363
Decrease in Accounts Receivable	(3)	484
Decrease in Investment in Cooperatives	(4)	945
Capital Asset Sales	(5)	0
Increase in Total Liabilities	(6)	4,431
Outside Equity Capital	(7)	12,296
Net Non-Farm Cash Income	(8)	11,655
Total Sources of Funds (Add Lines 1 through 8)	(9)	529,374
USES OF FUNDS:		
Farm Cash Operating Expenses	(10)	391,456
Increase in Accounts Receivable	(11)	0
Increase in Investment in Cooperatives	(12)	0
Capital Asset Purchases	(13)	53,035
Decrease in Total Liabilities	(14)	0
Equity Capital Withdrawals	(15)	0
Family Living Withdrawals	(16)	52,888
Income and Self-Employment Taxes	(17)	5,496
Ending Cash	(18)	26,499
Total Uses of Funds (Add Lines 10 through 18)	(19)	529,374
UNACCOUNTED FOR FUNDS: (Line 9 - Line 10)	(20)	0

Table 6. Financial Ratios for Dairy Farms in Kansas Farm Management Association

Liquidity	<u>1/1/2003</u>	<u>12/31/2003</u>
Current Ratio	1.26	1.60
Working Capital	\$22,931	\$45,028
Solvency		
Debt/Asset Ratio	0.28	0.28
Profitability		<u>2003</u>
Operating Profit Margin Ratio		0.0754
Rate of Return on Farm Assets		0.0221
Rate of Return on Farm Equity		0.0059
Financial Efficiency		
Asset Turnover Ratio		0.2935
Net Farm Income Ratio		0.1696
Operating Expense Ratio		0.6776
Depreciation Expense Ratio		0.0919
Interest Expense Ratio		0.0609
Total Expense Ratio		0.8304
Adjusted Total Expense Ratio		0.9855
Economic Total Expense Ratio		1.1815
Repayment Capacity		
Income Available for Capital Replacement and Term Debt Replacement		\$42,417

Table 7. Partial Budget Analysis for Adding Fans and Sprinklers to a Dairy

Intervention Benefits:		
(1)	Increased Revenue	
	– Increased milk	10 lb/day x 85 days x \$12/cwt
		\$102.00 per cow
(2)	Decreased Costs	
	– None	
		\$ 0.00
	Total Benefits (B)	\$102.00
Intervention Costs:		
(3)	Decreased Revenue	
	– None	
		\$ 0.00
(4)	Increased Costs	
	– Fans/sprinklers ¹	\$85/cow x 0.2505
		\$ 21.29
	– Electricity	\$10.65/kW (demand) \$0.06/kWh (energy)
		\$ 8.98
	– Water	1,360 gallons x \$1.60/1000 gallons
		\$ 2.18
	– Feed	4 lb/day x 85 days x \$0.07/lb
		\$ 23.80
	Total Costs (C)	\$ 56.25 per cow
Profitability of Intervention		
	Benefits minus Costs	\$102.00 – \$56.25
		\$ 45.75 per cow
	Benefit-Cost (B/C) ratio	\$102.00 / \$56.25
		1.81
Breakeven Analysis:		
	Breakeven milk price ²	\$56.25 / (10 lb x 85 days) x 100
		\$ 6.62 per cwt
Sensitivity Analysis:		
	B/C ratio @ \$9/cwt milk	\$76.50 / \$56.25
		1.36
	B/C ratio @ 8# milk response	\$81.60 / \$56.25
		1.45
	B/C ratio @ \$0.09/lb feed	\$102.00 / (21.29 + 8.98 + 2.18 + 30.60)
		1.62
	B/C ratio @ +20% utilities	\$102.00 / (21.29 + 10.78 + 2.62 + 23.80)
		1.74

¹ The \$85/cow represents the amount required to purchase and install fans and sprinklers and the 0.2505 is an amortization factor to reflect the annual depreciation and interest cost (based on 5-year life and 8% interest).

² This is the breakeven milk price to cover the costs associated with the cooling system (i.e., breakeven price on the incremental milk production). Thus, so long as milk prices are at this level or greater it is economically advantageous to install the cooling system even though the dairy may not be covering total costs.

Table 8. Partial Budget Analysis for POSILAC® on a 1,000 cow dairy

Intervention Benefits:		
(1)	Increased Revenue	
	– Increased milk	10 lb/day x \$12/cwt x 1000 cows
		\$1200 per day
(2)	Decreased Costs	
	– None	
		<u>\$0.00</u>
	Total Benefits (B)	\$1200
Intervention Costs:		
(3)	Decreased Revenue	
	– None	
		\$0.00
(4)	Increased Costs	
	– POSILAC	\$5.85 / 14 days x 1000 cows
		\$418
	– Feed costs	4 lb feed (DM) @ \$0.07/lb x 1000
		\$280
	– Labor costs	\$0.01/cow/day x 1000 cows
		<u>\$ 10</u>
	Total Costs (C)	\$708 per day

Profitability of Intervention		
	Benefits minus Costs	\$1200 – \$708
		\$492 per day
	Benefit-Cost (B/C) ratio	\$1200 / \$708
		1.70
Breakeven Analysis:		
	Breakeven milk price ¹	\$708 / (10 lbs x 1000 cows) x 100
		\$7.08 per cwt
Sensitivity Analysis:		
	B/C ratio @ \$9/cwt milk	\$900 / \$708
		1.27
	B/C ratio @ 8# milk response	\$960 / \$708
		1.36
	B/C ratio @ \$0.09/lb feed	\$1200 / (\$418 + \$360 + \$10)
		1.52
	B/C ratio @ \$25/day labor	\$1200 / (\$418 + \$280 + \$25)
		1.66

¹ This is the breakeven milk price to cover the cost of the POSILAC® (i.e., breakeven price on the marginal milk production). Thus, so long as milk prices are at this level or greater it is economically advantageous to use POSILAC® even though the dairy may not be covering total costs.

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Table 9. Cost-Return Projection --- 2,400 Lactating Cow Freestall Dairy (replacements purchased)

	Production level (lbs milk sold)			
	19,000		24,000	
	per cow	per cwt	per cow	per cwt
RETURNS PER COW				
1. Milk sales @ \$13.23/cwt.	\$2,513.38	\$13.23	\$3,174.80	\$13.23
2. Volume premium	95.00	0.50	120.00	0.50
3. Government payment (MILC)	10.86	0.06	10.86	0.05
4. Calves sold: 95% x \$200/head	190.00	1.00	190.00	0.79
5. Cull cows sold: 1,400 lbs x 28% x \$58.41/cwt.	228.97	1.21	228.97	0.95
A. GROSS RETURNS	\$3,038.21	\$15.99	\$3,724.63	\$15.52
VARIABLE COSTS PER COW:				
6. Feed (from Table 3)	\$1,056.01	\$5.56	\$1,307.58	\$5.45
7. Labor	307.02	1.62	307.02	1.28
8. Veterinary, drugs, and supplies	182.78	0.96	245.56	1.02
9. Utilities and water	162.75	0.86	179.03	0.75
10. Fuel, oil, and auto expense	54.68	0.29	54.68	0.23
11. Milk hauling and promotion costs	152.00	0.80	192.00	0.80
12. Building and equipment repairs	63.93	0.34	63.93	0.27
13. Breeding/genetic charge:				
a. Capital replacement: 34% x \$1600/head	544.00	2.86	544.00	2.27
b. Semen, A.I. services, and supplies	40.00	0.21	45.00	0.19
c. Interest	112.00	0.59	112.00	0.47
d. Insurance	16.00	0.08	16.00	0.07
14. Professional fees (legal, accounting, etc.)	22.00	0.12	22.00	0.09
15. Miscellaneous	20.00	0.11	25.00	0.10
16. Depreciation on buildings and equipment	166.04	0.87	166.04	0.69
17. Interest on land, buildings, and equipment	98.79	0.52	98.79	0.41
18. Insurance and taxes on land, buildings, and equip.	41.53	0.22	41.53	0.17
B. SUB TOTAL	\$3,039.52	\$16.00	\$3,420.14	\$14.25
19. Interest on 1/2 operating costs @ 7.0%	67.38	0.35	79.30	0.33
C. TOTAL COSTS PER COW	\$3,106.90	\$16.35	\$3,499.45	\$14.58
D. RETURNS OVER TOTAL COSTS (A - C)	-\$68.69	-\$0.36	\$225.18	\$0.94
E. BREAKEVEN MILK PRICE, \$/cwt:		\$13.59		\$12.29
20. Lactating cow feed cost, \$/head/day	\$3.18		\$3.92	
21. Dry cow feed cost, \$/head/day	\$1.11		\$1.46	
F. ASSET TURNOVER (A/Assets) /1	73.09%		89.60%	
G. NET RETURN ON ASSETS				
((D + 13c + 17 + 19)/Assets) /1	5.04%		12.40%	

/1 Assets equal total value of breeding herd and land, buildings, and equipment.

Table 10. Cost-Return Projection --- 2,400 Lactating Cow Drylot Dairy (replacements purchased)

	Production level (lbs milk sold)			
	18,000		22,000	
	per cow	per cwt	per cow	per cwt
RETURNS PER COW				
1. Milk sales @ \$13.23/cwt.	\$2,381.14	\$13.23	\$2,910.23	\$13.23
2. Volume premium	90.00	0.50	110.00	0.50
3. Government payment (MILC)	10.86	0.06	10.86	0.05
4. Calves sold: 95% x \$200/head	190.00	1.06	190.00	0.86
5. Cull cows sold: 1,400 lbs x 28% x \$58.41/cwt.	228.97	1.27	228.97	1.04
A. GROSS RETURNS	\$2,900.97	\$16.12	\$3,450.06	\$15.68
VARIABLE COSTS PER COW:				
6. Feed (from Table 3)	\$1,002.44	\$5.57	\$1,192.92	\$5.42
7. Labor	243.06	1.35	243.06	1.10
8. Veterinary, drugs, and supplies	182.78	1.02	245.56	1.12
9. Utilities and water	217.50	1.21	233.78	1.06
10. Fuel, oil, and auto expense	54.68	0.30	54.68	0.25
11. Milk hauling and promotion costs	144.00	0.80	176.00	0.80
12. Building and equipment repairs	44.47	0.25	44.47	0.20
13. Breeding/genetic charge:				
a. Capital replacement: 34% x \$1600/head	544.00	3.02	544.00	2.47
b. Semen, A.I. services, and supplies	40.00	0.22	45.00	0.20
c. Interest	112.00	0.62	112.00	0.51
d. Insurance	16.00	0.09	16.00	0.07
14. Professional fees (legal, accounting, etc.)	22.00	0.12	22.00	0.10
15. Miscellaneous	20.00	0.11	25.00	0.11
16. Depreciation on buildings and equipment	120.01	0.67	120.01	0.55
17. Interest on land, buildings, and equipment	69.06	0.38	69.06	0.31
18. Insurance and taxes on land, buildings, and equip.	27.47	0.15	27.47	0.12
B. SUB TOTAL	\$2,859.46	\$15.89	\$3,170.99	\$14.41
19. Interest on 1/2 operating costs @ 7.0%	64.50	0.36	74.29	0.34
C. TOTAL COSTS PER COW	\$2,923.96	\$16.24	\$3,245.28	\$14.75
D. RETURNS OVER TOTAL COSTS (A - C)	-\$23.00	-\$0.13	\$204.78	\$0.93
E. BREAKEVEN MILK PRICE, \$/cwt:		\$13.36		\$12.30
20. Lactating cow feed cost, \$/head/day	\$2.96		\$3.53	
21. Dry cow feed cost, \$/head/day	\$1.43		\$1.64	
F. ASSET TURNOVER (A/Assets) /1	85.85%		102.10%	
G. NET RETURN ON ASSETS				
((D + 13c + 17 + 19)/Assets) /1	6.59%		13.62%	

/1 Assets equal total value of breeding herd and land, buildings, and equipment.

¹ The example financial statements used in this paper (Tables 1-6) reflect fairly small dairies (roughly 110 cows) that have multiple enterprises (e.g., dairy, crops, beef, swine) and thus they are not reflective of the modern dairy operation that tends to be much larger and more specialized. These examples were used because of the desire to use actual data (as opposed to made up examples) and also because the concepts of the information conveyed in the financial statements and how it is used is the same regardless of size and type of operation. The authors would like to thank Michael Langemeier for providing the KFMA historical data.

² Net income values calculated for businesses that maintain similar year-end inventory levels over time and that remain at a constant size (i.e., business is not growing or shrinking) will be similar whether based on a cash or accrual income statement.

³ Income statements and cash flow statements are often mistaken for each other. That is, people assume they measure the same thing which is inappropriate. However, it is possible that in some cases the two distinctly different financial statements proxy each other quite well. For example, an accrual income statement and a cash flow statement might look very similar for a business that is not growing (or shrinking) that has similar inventories from year to year and a debt level such that principal payments are approximately equal to depreciation.