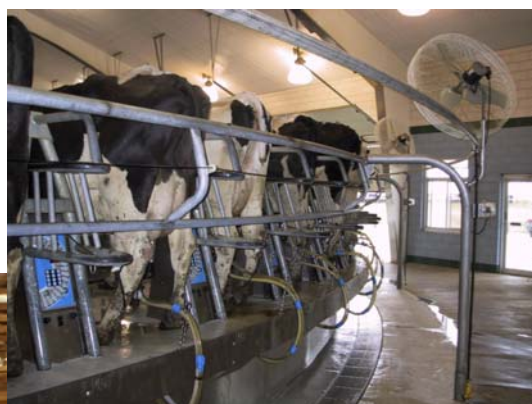


Analyzing Your Dairy Business:

A Systematic Approach to Using Benchmarks



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Notes:

In 2007 and 2008 producers saw a major shift in milk price and cost of production. As a result we have made adjustments to several of the benchmarks focusing on cost control and costs of production. We have left the old benchmarks in this manual as a reference, but have added new figures to reflect the current economic environment. These new recommendations are listed in parentheses and in bold print.

Table 1 on page 30 contains key performance indicators achieved by a group of Pennsylvania dairy farms that participated in a grant (*Evaluating Diverse Dairy Business Models*) sponsored by the Pennsylvania Department of Agriculture. We have included data from 2005 (above average milk prices) and 2006 (below average milk prices) to reflect the differences in business performance under various milk prices. The authors would like to thank Erica Cowan, a project associate in the Department of Dairy and Animal Science, for her outstanding efforts in managing this grant.

In addition, Table 1 on page 30 contains data for 2007 from a group of 63 farms in the Cornell Dairy Farm Business Summary. This data is provided annually as a preliminary report to provide an overview of the business performance of New York dairies. We have included this data to reflect the changes in business performance that producers experienced in 2007. The authors would like to thank Wayne Knoblauch, Jason Karszes and Linda Putnam of Cornell University for their cooperation in providing this data.

Introduction

One key to operating a successful and competitive dairy business is to monitor business performance and make the necessary adjustments to correct any bottlenecks that may adversely affect profitability. Benchmarks can be useful tools in helping dairy producers evaluate their business. Producers should always have a “**Big Picture**” view of how their business is performing. Dairy producers can accomplish this by knowing **ten key performance indicators** for their businesses; **five financial ratios and five herd performance indicators**. These indicators are comparable to the warning lights on the dashboard of a car. They can signal that something is wrong, but will provide little detail as to what the specific cause of the problems might be. However, if any of these ten indicators are significantly different, from a negative perspective, than recommendations outlined in this manual or the goals established by the business owners, other indicators should be examined to determine the cause of substandard performance.

Conducting an annual business performance analysis is an essential process for all business owners. Although dairy producers are no exception, many fail to address this important matter. An annual business analysis provides the owner with a comprehensive view of how the business has performed in a number of key areas over the past year. The analysis will answer some important questions every business owner must answer and can help determine the strengths and weaknesses of the business. If properly conducted, an annual business performance can pinpoint the bottlenecks that are reducing profits.

Many producers avoid this task because they lack the records needed to complete the process. Others have adequate records but are overwhelmed with the data their records contain. They lack a systematic approach to organizing and analyzing the information they have. The purpose of this workbook is to help dairy producers organize the key pieces of information needed to conduct an annual analysis and provide them with a systematic approach for examining and analyzing that information.

A Systematic Approach to Integrated Business Analysis

Integrated business analysis is a process in which business performance is evaluated from various viewpoints. We start by evaluating the financial performance of the business and work our way down through more detailed information to determine what management practices or other factors may be adversely affecting business performance. We can use a set of benchmarks to accomplish this task.

A benchmark is simply a point of reference. This point of reference can relate to a previous point in time in the operation of a business, a goal or an industry standard. Averages should not be confused with benchmarks, although they often are. In conducting a business analysis, we should always compare our operations to the top performers within an industry. By participating in an annual business analysis program, such as the Penn State Dairy Farm Business Summary, dairy producers can compare the performance of their businesses to that of the top performers within the group of farms participating in the analysis. Producers can also compare the performance of their business over time to evaluate the progress they are making toward achieving their goals.

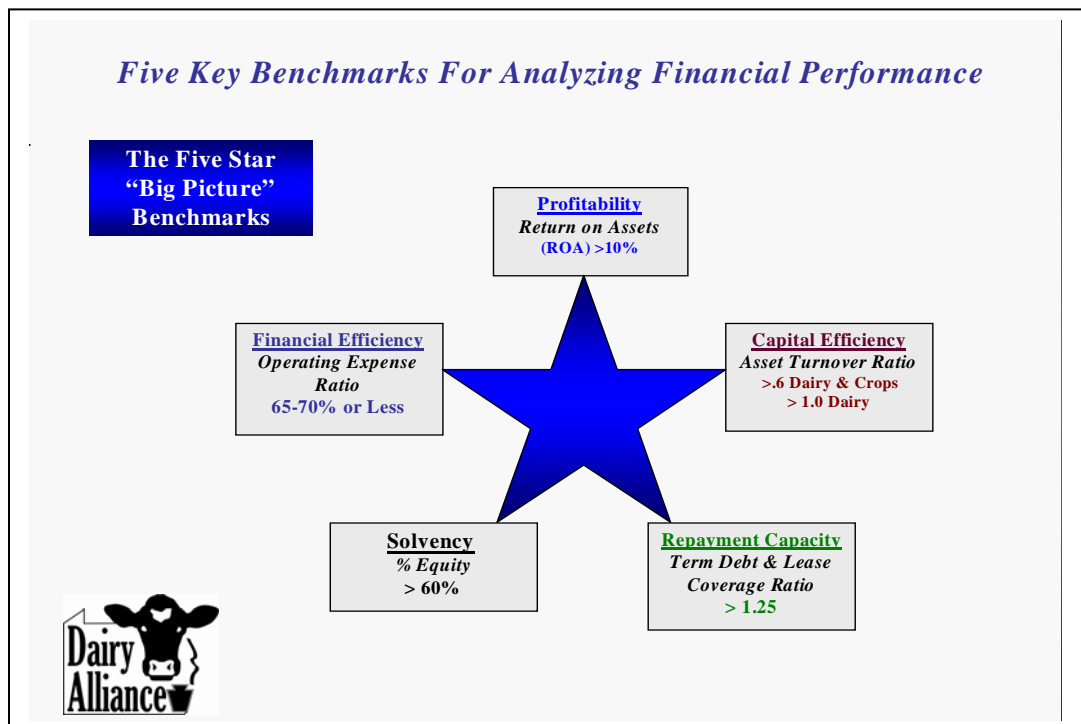
In conducting a comprehensive business analysis dairy producers must be able to evaluate the financial performance of their business as well as production system performance. Producers must first evaluate the “Big Picture” view of both aspects of their business. This can be done with a set of ten key performance indicators, five addressing the financial criteria of the business and five assessing the production system or herd performance measures.

To begin the analysis producers must answer five basic questions that provide the “Big Picture” view of the financial performance of their dairy business. This is accomplished by examining five critical financial criteria. These five questions are:

- 1) Is the business profitable? (Does it generate adequate returns to its resources?)
 - **Criteria - Profitability**
- 2) Is the business able to meet its financial obligations? Does it cash flow?
 - **Criteria - Liquidity & debt repayment**
- 3) How financially secure is the business?
 - **Criteria - Solvency**
- 4) Is the business efficient in spending money to make money?
 - **Criteria - Financial efficiency**
- 5) Is the business utilizing capital efficiently?
 - **Criteria - Capital efficiency**

The five key financial ratios that provide the answers to these questions, and some recommended benchmarks for each indicator are illustrated in Figure 1. Business owners should calculate these five ratios for their business annually and should be able to recall them from memory at any time.

Figure 1. Five Key Financial Benchmarks



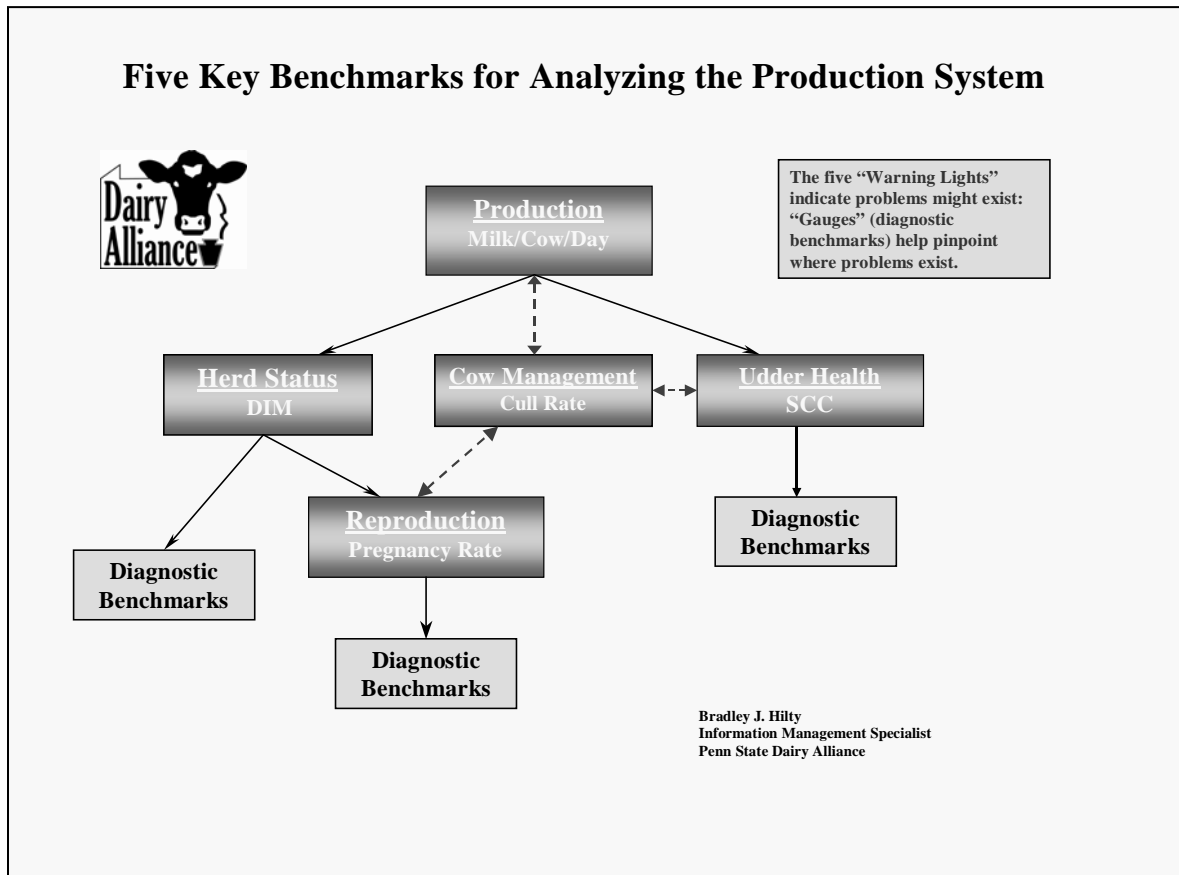
Because these indicators are big picture measures of business performance they are insufficient to provide producers with the detailed information needed to determine the causes of sub-par performance. However, they can help to focus our efforts to analyze the appropriate aspects of the business. By starting with these Five Star Indicators and progressively working down through the systematic approach later in this publication, business owners can pinpoint the bottlenecks in the business that are causing sub-standard performance.

Financial performance is directly impacted by the production system efficiency of a dairy business. Therefore, producers should have a set of indicators that examine the key areas of the production system or their dairy herd. To get the “Big Picture” evaluation of the production system’s performance producers must monitor five keys area of herd performance. These areas include:

- **Production**
- **Herd lactation and reproductive status**
- **Reproductive performance**
- **Udder health**
- **Overall cow management**

The indicators for examining these areas are listed in Figure 2.

Figure 2. Production System Benchmarks

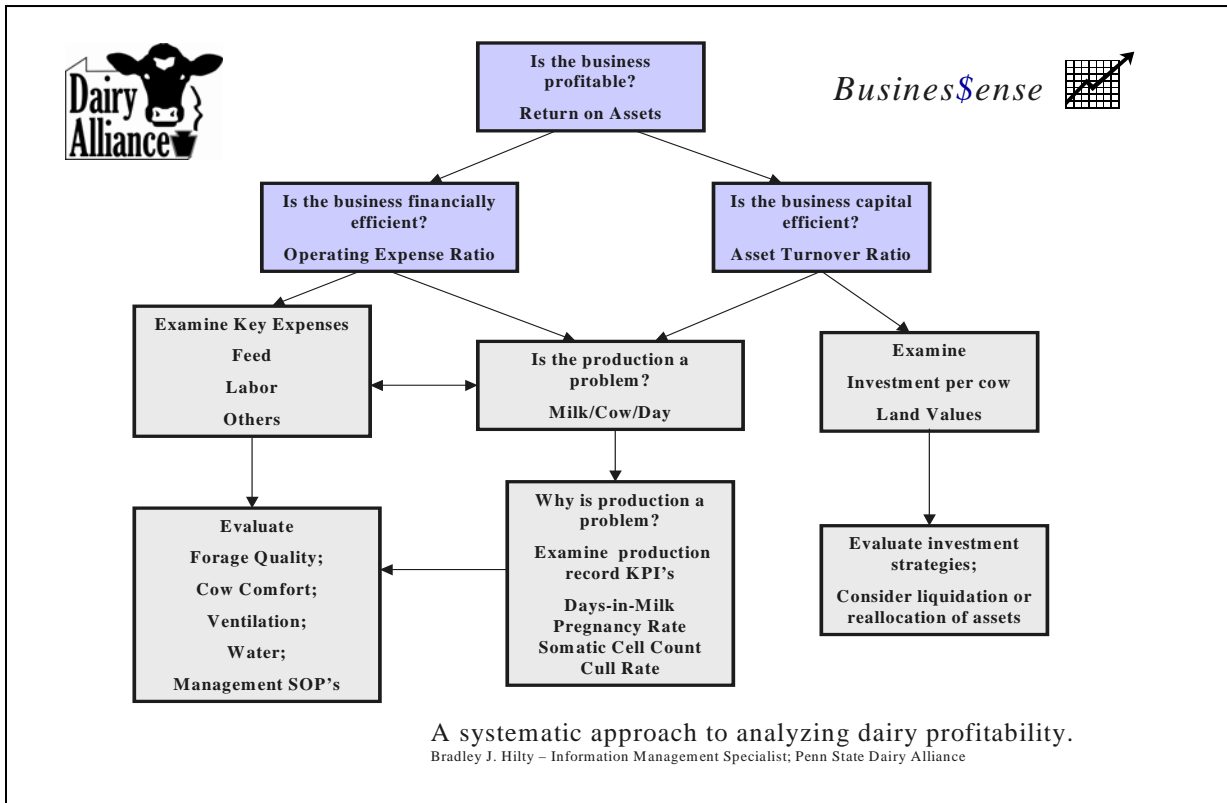


Once again the five indicators of production efficiency only provide a “Big Picture” view of herd performance. They tell us little about specific problems with herd performance, but can help focus the analysis in the right direction. However, under each management area, there are a number of more detailed indicators that can help pinpoint where the bottlenecks in the production system might exist. These indicators are similar to the gauges on the dash board of a car. They will provide more specific information as to where problems might exist and the specific management areas that should be examined.

Understanding the relationship between each of these indicators and how they impact the profitability of the dairy business is important in conducting an integrated business analysis. We will define and examine the five financial benchmarks and the five production benchmarks in this publication, as well as others for evaluating key management areas that impact the profitability of dairy businesses, such as feed, labor, investment management, debt management and cost of production. These benchmarks can be used as guidelines in conducting an integrated business analysis to help you identify the areas you need address to improve the profitability of you dairy business.

Having a systematic approach to integrating this data will make the analysis process easier to complete and increases the probability that the correct bottlenecks are detected and fixed. A model for this systematic approach to conducting an integrated business analysis, addressing profitability, is presented in Figure 3. A similar model can be used for evaluating cash flow problems.

Figure 3. A systematic approach to integrated business analysis



We begin by examining the farm's level of profitability (return on assets). If that is not up to standards, we examine two measures of financial performance that directly affect profitability, financial efficiency (operating expense ratio) and capital efficiency (asset turnover ratio). If either or both of those indicators are below standards or the goals of the business, we look at a production to determine if it is contributing to the problem. If production is a problem, we can examine other herd performance indicators to help us determine what management factors may be contributing to sub-standard production. If production is not a problem, we proceed down each side of the analysis model, evaluating financial efficiency on the left and capital efficiency on the right. As we work our way down through the process, the management factors that are contributing to sub-standard profitability begin to surface. We will provide step by step instructions on how the model can be used to analyze business performance later in this publication after the key indicators used in the analysis have been defined.

Conducting any analysis is meaningless, unless strategies to address the problem areas are developed and corrective measures implemented to ensure that the bottlenecks will be removed, thus improving profitability. Once the corrective measures have been implemented, the business must be monitored to determine if adjustments are working. There are other indicators and benchmarks that can be monitored to determine if progress is being made in specific management areas. These are addressed later in this manual.

Integrated Business Analysis Template

We have included a template to help you conduct an integrated business profitability analysis at the end of this publication. You can use data from a dairy farm business summary printout, or another benchmarking program. However, you must be sure that the calculations match those outlined in this manual. If you do not participate in a dairy business analysis program, simply calculate your ratios by hand and enter them in the template. You can determine where your business performance falls within a distribution of similar farms, by using the Farm Business Analysis Charts included in Cornell's Dairy Farm Business Summary reports or a similar profile system. If you have any questions regarding the use of this template, you may contact the primary author at 717-948-6612 or by email at bhilty@psu.edu.

Conducting an annual business performance analysis can help the owners spot the bottlenecks in their business that are reducing profits. Comparing the key indicators for your business to the top performers will enable you to set goals for your operation and establish strategies for achieving those goals.



Key Measure of Profitability

Return On Assets

ROA evaluates how well the business generates returns to its resources.

Formula

$$\frac{\text{NFI}^1 \text{ (from operations)} + \text{Interest} - \text{Return to Owner \& Unpaid family labor \& management}}{\text{Average Total Farm Assets}}$$

Benchmarks

Average – 2-4%

Leaders – 12-15% or higher

Goal – 8-10%

Factors affecting ROA

- Financial efficiency
- Capital efficiency
- Production levels
- Milk Price
- Value of operator labor and management & unpaid family labor

Keys to generating a high ROA

- Increasing Production
- Careful investment in capital assets
- Controlling expenses

If ROA is less than desired goal, examine:

- Operating Expense Ratio
- Asset Turnover Ratio
- Production per Cow
- Number Operators drawing money from business

*** Key Point**

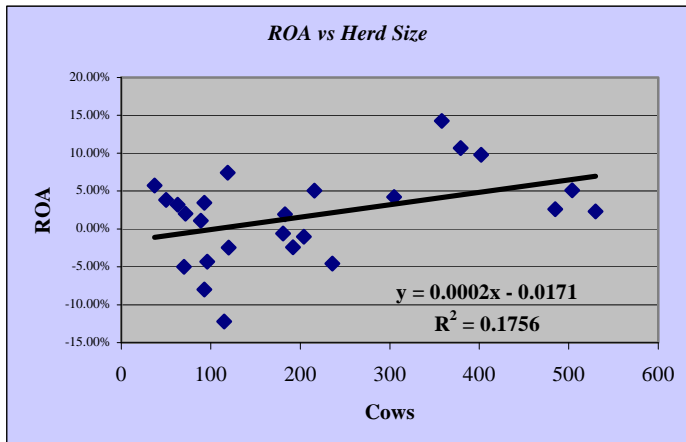
Owner withdrawals can significantly impact ROA. It is important to use a number that represents fair compensation for the labor and management contributed by the principals (owners) involved in the business. This may or may not be equivalent to owner draws. If owner draws are less than an amount that would be considered fair compensation for labor and management, ROA will be overstated. Likewise, if an owner of a business is drawing out funds for extraordinary expenses, such as college tuition, using owner draws to calculate ROA, will result in ROA being understated. It is also important to compensate unpaid family labor to generate an accurate ROA.

Pro's & Cons

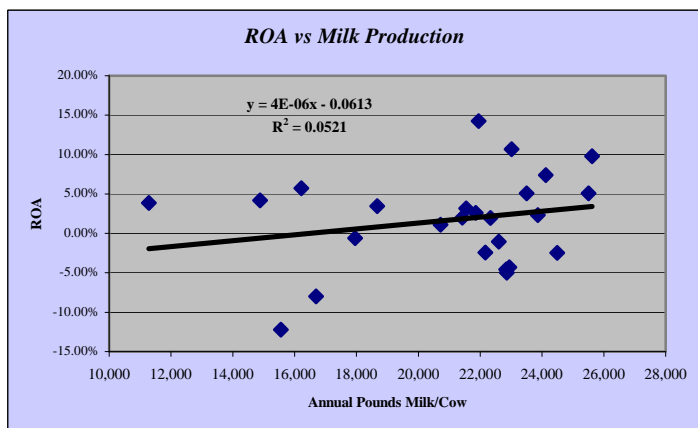
Pro – Because ROA expresses profitability as a percent of asset value it is a more relative measure of farm profitability than another measure of profitability, net farm income. It is relative across all herd sizes and management systems and can be easily compared to ROA generated by other businesses.

Con – Dairies with high asset values (on a market basis) will find it difficult to generate a ROA at the recommended levels. Smaller farms may also find it difficult to reach the recommended levels due to the amount that must be pulled from the business to fairly compensate the owner and his or her family for their labor and management efforts.

Relationship between Herd Size and Return on Assets²



Relationship between Production/Cow and Return on Assets²



Correcting Poor Profitability

- **Detect and correct bottlenecks that are limiting production, such as:**
 - * Poor cow comfort
 - * Poor forage quality
 - * Transition Cow Management
- **Analyze each investment and focus on investments that generate high returns, such as:**
 - * Cows
 - * Investments in cow comfort
- **Avoid over investing in land & machinery**
 - * Consider alternatives such as custom hiring fieldwork or purchasing all feed. (especially for smaller dairies)
- **Consider liquidation or reallocation of low returning assets**
- **Control Expenses**
 - * Know the difference between productive and non-productive expenses and know when productive expenses become non productive.
- **Consider Expansion –**
 - * For dairies with multiple owners

¹ NFI = Net Farm Income (income-expenses, including interest and depreciation)

²Data Source –“BusinesSense” Participants-2000 Data

Key Measure of Cash Flow/Repayment Capacity

Term Debt and Lease Coverage Ratio

Examines the amount of money available to pay required term debt payments as a percent of total debt payments.

Formula:

$$\frac{\text{Net Farm Income} + \text{Depreciation} + \text{Interest} + \text{Non-Farm Income} - \text{Owner Draws}^1}{\text{Principal and Interest Payments on Term Debt (plus Capital Lease Payments)}}$$

Benchmarks

Average – 1.0 – 1.15

Leaders – >1.5

Goal – >1.25

Factors affecting TDLCR

- Poor Profitability
- Financial efficiency
- Debt levels & Debt structure
- Production levels
- Milk Price
- Owner Draws

Keys to generating an acceptable TDLCR

- Controlled debt management
- Increasing production
- Controlling expenses
- Wise investment practices

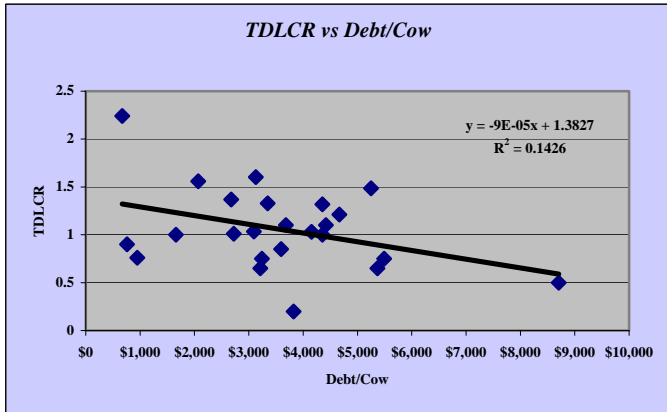
If TDLCR is less than Goals, Examine:

- Debt per Cow
- Investment per Cow
- Operating Expense Ratio
- Owner Draws
- Production per Cow

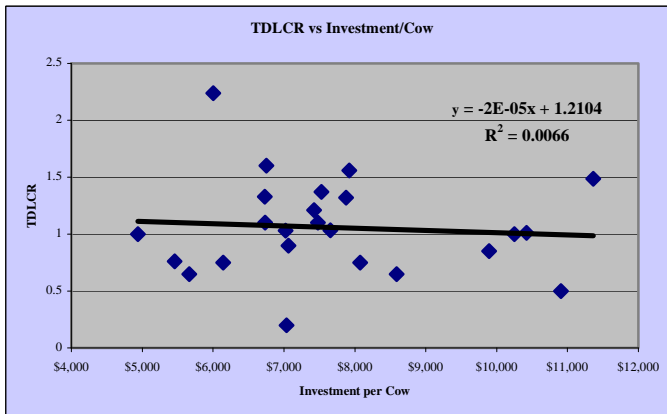
*** Key Point**

To illustrate this measure consider a dairy operation with annual principal and interest payments of \$100,000. If the business has \$110,000, after owner draws have been deducted, to make those payments, the TDLCR would be 1.10. If \$130,000 were available the TDLCR would be 1.30. The excess funds are money that is available to invest back into the business, pay down debt at an accelerated rate, put aside for additional risk protection, invest in a retirement account or it could be used for extraordinary family expenses, like college tuition. We recommend evaluating the debt repayment capacity of the dairy business only by excluding non-farm income and including only those owner draws that are taken from the dairy business.

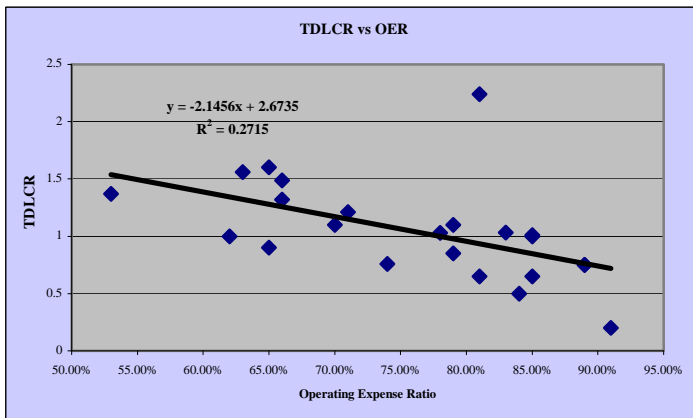
Relationship between Debt per Cow and TDLCR²



Relationship between Investment/Cow and TDLCR²



Relationship between OER and TDLCR²



Management Factors affecting TDLCR

The graphs on this page illustrate the relationship between several management areas that are within producers' control and the term debt and lease coverage ratio. Debt per cow is the most significant factor that affects TDLCR, but controlling expenses and investment are not far behind.

Correcting Cash Flow Problems

- **Reduce Debt per Cow**
 - * Consider liquidation of low or non-earning assets to pay off debt.
 - * Examine expansion if facilities are under capacity
- **Make wise investment**
 - * Invest only in items that have a rapid payback (1-2 years)
- **Improve profitability**
 - * See Return on Assets
 - * Evaluate Spending
- **Examine debt structure**
 - * Avoid trying to pay debt off too rapidly.
 - * Structure debt to match asset life
 - * Consider debt restructure (mostly as a last resort)
- **Consider expansion of a profitable dairy to accommodate additional operators**
 - * if owner draws is the major cause of cash flow problems

²Data Source –“Businessense” Participants-2000 data

Key Measure of Solvency

Percent (%) Equity

Expresses the share of the business assets owned by the business owners.

Formula:

$$\frac{\text{Assets} - \text{Liabilities}}{\text{Total Assets}}$$

Benchmarks

Average – 50-55%

Leaders – 50-55%

Goal – 50-60% *

Factors affecting % Equity

- Debt Levels
- Profitability
- Financial Efficiency

Keys to increasing % Equity

- Sound Investment Management
- Careful Debt Management
- Operating a Profitable Business
- Expense Control

If %Equity is less than Goals, Examine:

- Asset Turnover Ratio
- Return on Assets
- Debt per cow

*** Key Point**

The percent equity of a business should be calculated using the market value of assets. Although a goal of 50-60 percent is listed for this indicator, it is more important to evaluate businesses on an individual basis over time, as it will vary during the life of a business. A mature business with 50-60 percent equity should probably own more of the business (70-80 percent equity). The percent equity of a business will decrease during periods of growth and should increase as debt is paid off. Tragedies, such as drought or disease, usually cause a drop in this ratio. Percent equity is driven by the profitability of a business. A highly profitable business with 30-35 percent equity may actually be performing better than a business with 65-70 percent equity. Managers of highly profitable businesses tend to leverage their business by borrowing money at a lower rate than the business generates.

Solvency measures the ability of a business to cover all of its financial obligations if liquidated at a given point in time. It is important to include deferred taxes on the balance sheet or percent equity could be grossly overstated, giving the owners a false sense of security. A business with \$1,000,000 in assets and 50 percent equity appears to have a net worth of \$500,000. However, if upon liquidation the business owes \$200,000 in capital gains taxes, after the sale of assets, the owners would only have \$300,000 left to reinvest after liquidating the business. Therefore, it is extremely important to include deferred taxes in liabilities.



An upward trend in percent equity is imperative for a business that is not in a growth phase. However, even growing businesses must see upward trends in this ratio if they want to continue growing.

To Increase Percent Equity

- **Improve profitability**
* See Return on Assets
- **Reduce Debt**
* Consider liquidation of low or non-earning assets to pay off debt. But be sure to consider tax consequences.
- **Make wise investments**
* Invest only in items that have a rapid payback (1-2 or 3-5 years)

Key Measure of Financial Efficiency

Operating Expense Ratio

Evaluates how efficient a business spends money to make money. Evaluates only operating expenses, not capital expenses (interest and depreciation). An expression of how much a business spends to make a dollar.

Formula:

$$\frac{\text{Total Expenses (minus interest and depreciation)}}{\text{Total Income}}$$

Benchmarks

Average – 74-78%

Leaders – < 65%

Goal – < 70%

Factors affecting OER

- Low production
- Poor Cost Control
- Poor Forage Quality
- Poor Cow Comfort levels
- Low Milk Price
- Poor Labor Management

Keys to Controlling the OER

- Increasing Production
- Producing high quality forages
- Careful attention to cow comfort levels
- Differentiating between productive and non-productive expenses
- Controlling Feed Costs

If OER is higher than the Goal, Examine:

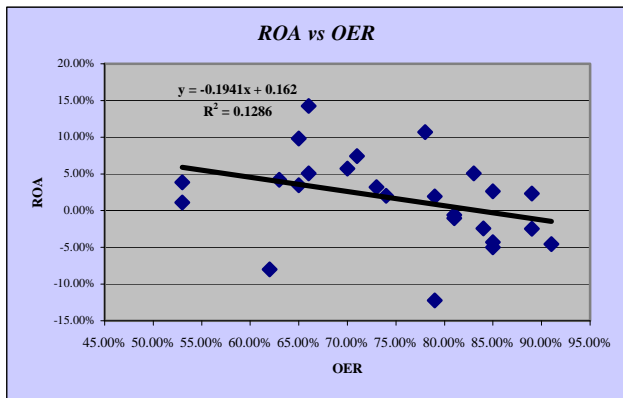
- Production per cow
- Cost per cwt. for key expenses
 - Feed
 - Labor
 - Replacements

** Key Point*

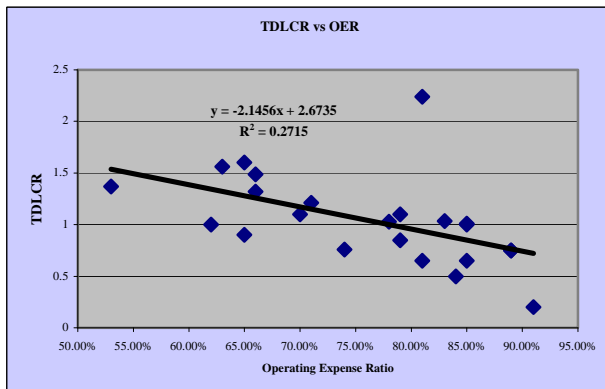
Accrual adjustments should be made to income and expenses prior to calculating this ratio. Income should include cull cow income, if replacements are raised on the farm or custom raised. Cutting costs is not the only remedy to a poor OER. Increasing production can improve the OER, by reducing the net cost of production of a single unit. In many instances, tightening up management can improve the OER. Improving forage quality, cow comfort, milk quality and reproductive performance can be as effective, if not more so, than cutting costs in reducing the OER of an operation.

Can cash flow be improved, in an environment where resources are limited (i.e. cow numbers), by spending a little more to push for higher production? An analysis of this scenario indicates that a producer must realize a 10-12 pound increase in production to offset a 5% increase in OER. In other words, a producer with 74 pounds of production at \$14.00/cwt. milk, and an OER of 65%, would have the same EBITD (earnings before interest, taxes and depreciation) as a producer with 86 pounds of production at \$14.00/cwt. milk, and an OER of 70%. Both producers would have the same amount of money to make debt payments and pay owner draws, including income and self-employment taxes.

Relationship of Return on Assets to OER²



Relationship of OER to Debt Repayment Ability²



As operating expense ratio increases the ability of a business to be profitable and cash flow decreases.

Reducing a High OER

- **Increasing production if it is below the recommended goals**
 - * But first evaluate systems to ensure bottlenecks to higher production have been removed
- **Evaluate and Monitor Feed Costs**
 - * Improve forage quality
 - * Improve cow comfort levels
 - * Price feed ingredients from different vendors
 - * Monitor feed usage to reduce waste
- **Evaluate and Monitor Labor Costs**
 - * Develop an organizational structure for your business with well-defined job description and standard operating procedures
 - * Train employees to do their job correctly and efficiently
- **Evaluate Replacement Program & Cull Rate**
 - * Heifers calving at 24 months or older increase the fixed costs of a dairy business.
 - * High cull rates lead to higher costs through the additional replacements needed to maintain herd size. The cost of raising the extra animals increases operating expenses.

²Data Source – “BusinesSense” Participants – 2000 data

Key Measure of Capital Efficiency

Asset Turnover Ratio

Asset turnover ratio (ATR) measures how efficiently the business uses its assets to generate income.

Formula:

$$\frac{\text{Gross Income (Revenues)*}}{\text{Average Total Assets**}}$$

* Finpack uses Value of Farm Production, (Gross Income-cost of goods sold)

**Business assets only

Benchmarks

Average – .40-.45

Leaders – >.65

Goal – >.60

> 1.0 For dairy operations that raise crops

For dairy operations only

Factors affecting ATR

- Over investment in low earning assets
- Low production
- High Land Values
- Milk Price

Keys to generating a high ATR

- Maximizing Production
- Sound investment strategies
- Limiting investments in land & machinery

If ROA is less than Goals, Examine:

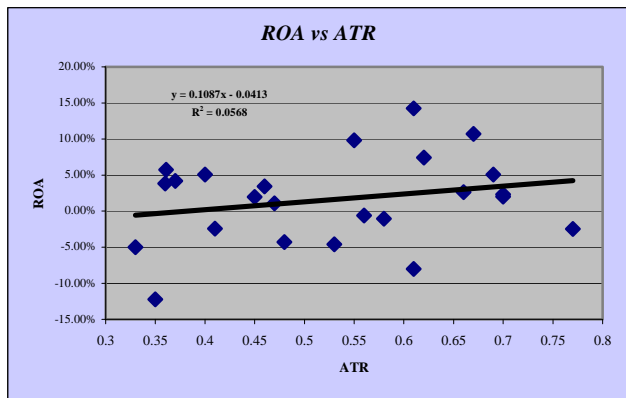
- Investment per cow
- Land Values
- Machinery Investment per cow
- Production per cow
- Herd size

* **Key Point**

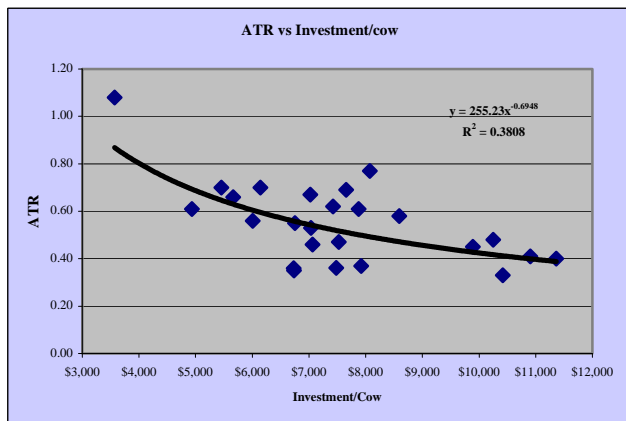
This ratio is a function of volume, price and investment values. Practicing wise investment strategies and maximizing production will help ensure that the business generates an acceptable asset turnover ratio. Milking 3 times per day; the use of BST; over-crowding, within reason, are all practices that can help improve the ATR of an operation. The high investment requirements in land and machinery will reduce this ratio for operations that raise crops verses those that do not. Highly fertile land will help improve the ATR. This indicator will be higher in operations that rent land and facilities. However, the operating expense ratio will be somewhat higher for renters. The ATR will drop in years of low milk prices. The values placed on assets will have a major impact on ATR.

Western dairies, and the large dairies being built in the Midwest, have a goal of **\$4,500-\$5,000 investment per cow**. Considering dairies will have another \$500-\$1,000 per cow in receivables and inventory, total assets per cow on western and mid-western dairies will equal \$5,000-\$6,000 per cow. Data from the Pennsylvania Dairy Business Summary indicates the range for PA dairies is \$3,500-\$12,000 per cow. That gives western dairies a considerable competitive advantage in this area. Some of that competitive advantage is offset by the higher milk prices received by northeast dairies.

Relationship of Return on Assets to ATR²



Relationship of ATR to Investment/cow²



Increasing a Low ATR

- **Increase Total Production**
 - * Increase Production/Cow by:
 - improved management
 - 3x milking
 - using BST
 - * Expand herd
 - more fully utilize facilities
 - with minimum investment

- **Analyze each investment**
 - Make investments that generate high returns a priority
 - Limit investments in Land and machinery until size of operation justifies

- **Liquidate assets with limited earning potential**

²Data Source –“BusinesSense” Participants - 2000 data

Key Production Benchmarks

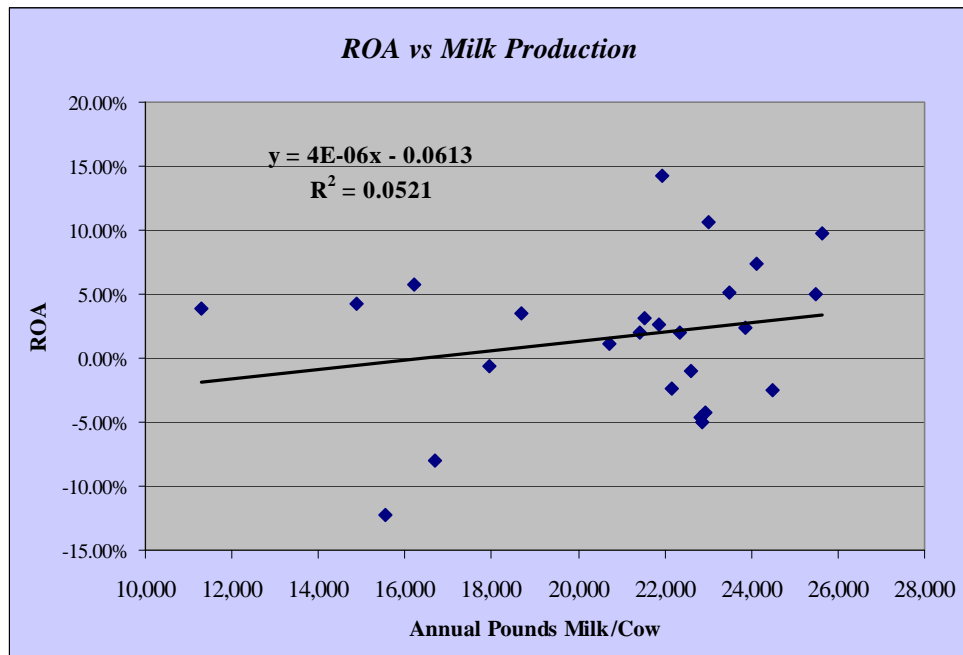
The five benchmarks presented on the previous pages provide the “Big Picture” view of the financial performance of a dairy business. Likewise a similar view of the production efficiencies of a dairy can be obtained by examining the five key performance indicators listed below.

Milk/cow/day

Milk pays the bills of a dairy business. Most businesses strive to maximize production efficiency in an effort to maximize long-term profitability. Maximizing production, *within the limitations of the production system*, is a key to maximizing profitability of a dairy business. In most cases profitability increases as production increases. The cheapest milk that a producer can make is the next five to ten pounds of milk each cow produces. Since fixed costs are already covered, the only costs associated with the increased production are the marginal costs, which in most instances, is feed. Considering that a cow will produce 2.5 to 3 pounds of milk per extra pound of dry matter and most rations cost 6-7 cents per pound of dry matter, the cost of producing this marginal milk is approximately \$2.50 per hundred pounds. This is significantly cheaper than the \$12.00-\$13.00 cost of producing the current milk.

Goal:
Holsteins – 80-85 pounds/cow/day

Relationship of Return on Assets to Milk per Cow



Days-in-milk

Days-in-milk provides a quick assessment of the lactation and reproductive status of the herd. If an operation is not achieving the level of production the owners' desire, one must determine where, in the production system, the herd is falling short. If days in milk are within reason (**170-185 days**), we must do more in-depth diagnoses of possible production problems revolving around milk start up, peak milk and/or persistency. Days-in-milk higher than the goal mentioned above result in lost production and decreased profitability. Production decreases from .15-.20 pounds of milk for every day past 150 days in lactation. Herds with average days in milk greater than 200 days are losing five to ten pounds of milk (or more) per cow per day. That translates into a considerable loss of income. In such cases, we would look at the reproductive management program of the herd, as there are usually some reproductive problems that must be addressed.

Goal: 170-185 days-in-milk

Pregnancy Rate

To assess the reproductive performance of a herd, we examine **pregnancy rate**. Pregnancy rate is used rather loosely and can have different meanings. In this case we are looking for the *percent of eligible estrous cycles that resulted in a pregnancy over a given period of time*. To calculate this from DHIA records, we multiply the heat detection rate by the conception rate (% successful). Over the years producers have been told, in theory, we should be shooting for a 35% conception rate. The national average is about 14 percent. In order to maintain a 13-13.5 month calving interval, which by most experts' standards is acceptable, a herd must achieve a **pregnancy rate of 22-24%**. This is probably a more realistic goal than the 35% we have traditionally considered. A pregnancy rate of 24% equates to a 60% heat detection rate and a 40% conception rate.

Goal: > 20%

Somatic Cell Count

Somatic cell count (SCC) is the most common indicator of udder health. Counts higher than the recommended benchmark indicate various levels of udder infection within a certain percentage of the herd. Udder infections adversely affect the profitability of a dairy business through lost income, higher cull rates and increased veterinary expenses. Other indicators must be examined to determine where, in the production system, the infection is occurring and what the possible causes may be.

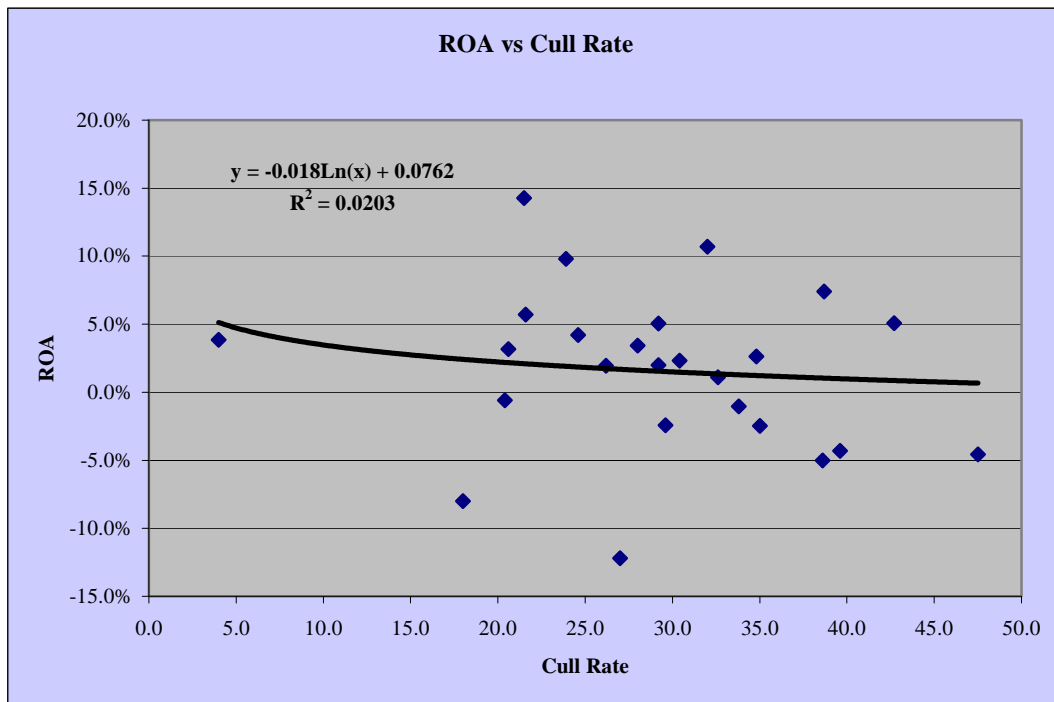
SCC Goal: < 200,000

Cull Rate

Finally, we need to evaluate the overall cow management of a dairy operation. **Cull rate** summarizes this quite nicely. All of the above factors can contribute to high cull rates. In many instances, problems in the previously mentioned areas are a secondary result of poor cow comfort. High cull rates can decrease the profitability of a dairy business through increased overhead expenses, as the costs of raising (or acquiring) replacements are spread over fewer years. Herds with high cull rates require larger replacement herds, which can decrease profitability. **Cull rate should be 25-25% or less.** Even at this level cows are only in the herd an average of 3.3 years. Complete and accurate records on *why and when* cows are leaving the herd are needed to troubleshoot high cull rates.

Cull Rate Goal: 25-35%

The Relationship to ROA to Cull Rate



By examining and monitoring these five key production indicators, one can get a broad overview of how a dairy herd is performing. They can also provide some hints as to what management areas of herd performance we should more closely examine. To examine a specific management area, we need a set of diagnostic indicators. We can compare these

diagnostic indicators to the gauges on the dashboard of a car. They can provide more detailed information as to where the problem may exist and what the possible causes of the problem may be. For example, if milk production is lower than a recommended benchmark or a farm goal, we would look at the days-in-milk of the herd to determine if substandard production is due to production management issues or reproduction management issues. If days-in-milk are within the recommended guidelines, we would examine a set of ***production diagnostic indicators***, such as peak or summit milk, milk starts (production 1-40 DIM), peak phase milk (production 41-100 DIM), 305-day mature equivalent production persistency score and component data to determine where in the production system a problem may exist. These numbers can be especially helpful in evaluating problems with dry and transition cow management, cow comfort, ration formulation and bunk management and other problems that may be contributing to substandard production levels.

If days-in-milk are greater than the recommended benchmark, we would begin to examine the repro management program. First we would examine pregnancy rate. If pregnancy rate is within the guidelines mentioned above, we would assume things are getting better and that production should improve in the future as cows calve and days-in-milk return to the recommended benchmarks. If pregnancy rate is lower than the recommended benchmark, we would need to examine a set of diagnostic benchmarks to determine if poor performance is due to poor heat detection (often a people problem) or poor conception rates (usually a cow problem). Diagnostic indicators include heat detection rates, conception rates (across various parameters), percent of animals not service by 70 days in milk, services per conception and others.

We can evaluate our udder health management program by examining the distribution of linear somatic cell scores by parity and stage of lactation. Is high SCC a result of just a few high cows or is it a herd problem? Is the problem confined to a certain stage of lactation such as early lactation animals or a specific parity group, such as heifers? Using diagnostic indicators we can get a clearer picture of where problems may exist and what the possible causes might be.

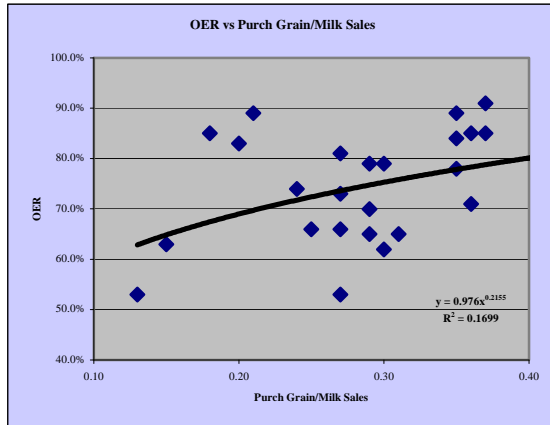


Efficiency Indicators For Key Management Areas

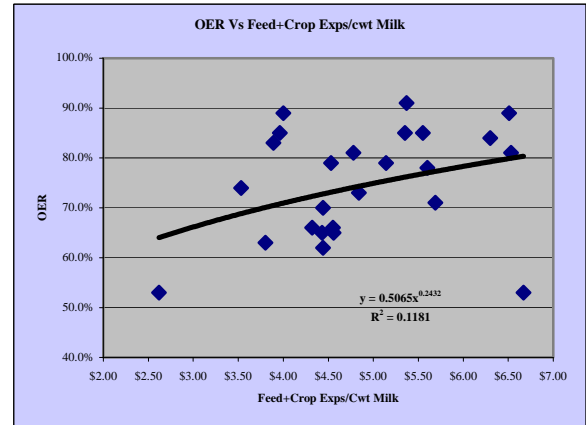
Feed

Feed is the largest expense of a dairy business. Managing feed expenses is absolutely critical to operating a profitable dairy business. It is the major factor that affects the operational efficiency (operating expense ratio) of a dairy business, as illustrated in the graphs below. It is a critical control point in managing a profitable dairy business. Several indicators for evaluating and monitoring feed costs are listed below.

OER vs. Purchased Grain/Milk Sales



OER vs. Feed +Crop Expenses/Cwt Milk



- **Income Over Feed Costs (IOFC)**

Affected by feed expenses, production and milk price, IOFC is the most important measure of the economics of feeding a dairy herd. The goal should be to maximize IOFC. Focusing on reducing feed costs only can lead to lower production and reduce IOFC. Maximizing this measure will call for different feed strategies under the varying milk price cycles. It should be monitored and evaluated monthly; more frequently (daily) on larger dairies. The benchmarks below are based on \$13.50 gross milk price.

Benchmarks

- Average - \$5.00-\$5.50
- Leaders - > \$7.00
- Goal - \$6.00 or higher

- **Feed Efficiency (Lbs. Milk/ Lb. Dry Matter)**

Feed efficiency is monitored closely in livestock operations, yet it has not received that much attention in the dairy industry. Dry matter intake and milk production should be monitored daily, which would allow producers to monitor this indicator also. Monitoring it daily enables producers to evaluate the possible reasons for declining performance and make adjustments to the ration or feeding management practices on a timely basis.

Benchmarks

- Average – 1.35-1.4
- Leaders - > 1.5
- Goal - 1.45 or higher

Efficiency Indicators For Key Management Areas

Feed – (Continued)

- Feed Cost per cwt. milk (milking herd only)**

Although income over feed costs is the primary indicator of the economics of feeding the dairy herd, it is also important to have a measure of cost control for the feeding program. Monitoring feed costs per hundred pounds of milk standardizes milk yield and is useful in monitoring the effectiveness of cost control measures. It should not be used as the sole measure to evaluate the feeding program as it can lead to making wrong decisions, as the following example illustrates. **Benchmarks for current commodity Prices are reflected below.**

	<u>Herd A</u>	<u>Herd B</u>
Daily Milk Production	85 lbs.	75 lbs.
Feed Cost/Cow/Day	\$ 4.15	\$ 3.25
Feed Cost/Cwt. Milk	\$ 4.88	\$ 4.33
Income over Feed Costs	\$ 7.33	\$ 6.88
Gross Milk Price	\$13.50	\$13.50

Although Herd B has a lower feed cost/cwt. milk, the owners are realizing \$0.45 less IOFC per cow per day than Herd A. That represents more than \$40,000 in annual income to a 300-cow dairy.

Benchmarks (at 2007/08 Prices)*

Average - \$5.00 - \$5.25	(\$8.50-\$9.00)
Leaders - \$4.50 - \$4.80	(<\$ 8.50)
Goal - < \$5.00	(<\$ 8.50)

- Purchased Concentrates As a % of Milk Income**

Another indicator of the economics of the feeding program is to compare Purchased grain and concentrates to milk sales. Milk price, production levels, commodity prices and the amount of grain raised by the farming operation impact this number, so it's usefulness is somewhat limited. However, it can be used on an annual basis compare herds within a region.

Benchmarks

Average - 27 %
Leaders - 27%
Goal - < 22% (if purchasing mainly protein & minerals) < 30% (if purchasing energy, protein & minerals)

Keys to Controlling Feed Costs

- | | |
|--|---|
| <ul style="list-style-type: none"> * Produce and feed high quality forages * Maintain high cow comfort levels * Provide plenty of fresh clean water * Provide adequate water space * Monitor dry matter intake, refusals, feed efficiency, feed cost/cwt & IOFC | <ul style="list-style-type: none"> * Feed a balanced ration * Balance Ration based on production * Sound feeding management practices * Develop Standard Operating Procedures * Evaluate the cost effectiveness of each ingredient |
|--|---|

Efficiency Indicators For Key Management Areas

Labor

Labor represents the second largest expense on most dairies. Labor efficiency impacts the profitability of dairy businesses. Several indicators of labor efficiency are listed below.

*** Milk sold per worker**

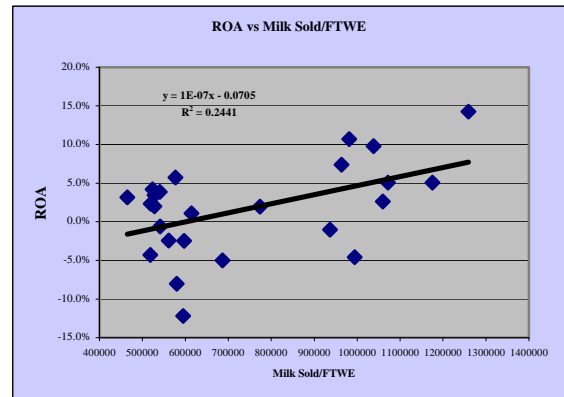
Goals: >600,000 for Stanchion Barns
> 1,000,000 for Free Stalls with Parlors

*** Cows per worker**

Goals: > 45-50 (dairy & crop operations)
> 90-100 (dairy only operation)

*** Milking Labor /Cwt. (labor for milking cows only)**

Goal: < \$0.60-\$0.70/cwt



Investment

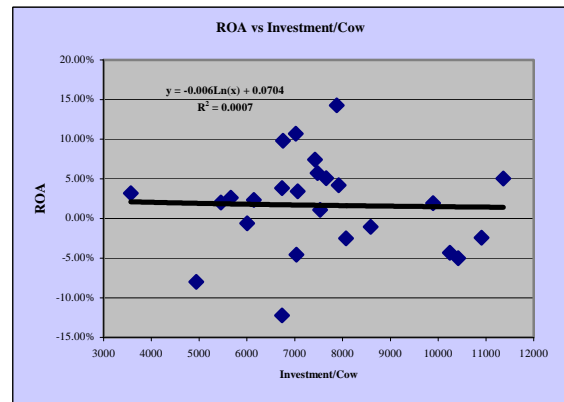
Managing investments wisely is a key to operating a highly profitable business. Some indicators for evaluating investment management are listed below.

*** Investment/cow**

Goal: < \$6,500-\$7,500 per cow
For Northeast Dairies: Other areas may be lower

*** Machinery Investment/cow**

Goal: <\$1,200 per cow



Debt Management

Sound debt management impacts the ability of the business to cash flow. Some indicators of debt management are listed below.

*** Debt per Cow**

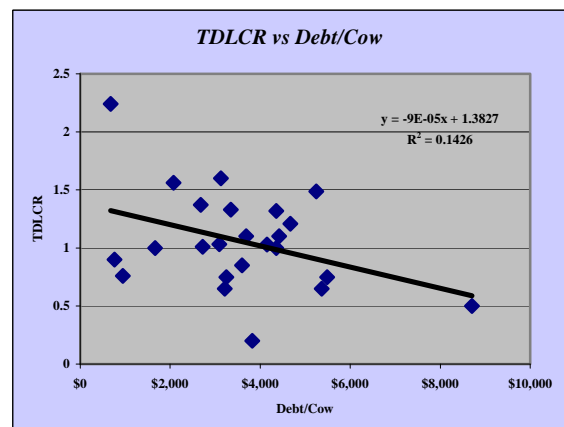
Goal: < \$2,500 (if not expanding)
<\$4,000-\$4,500 (if expanding)

*** Debt payments per cwt.**

Goal: \$2.50-\$2.85 or less

*** Debt Payments as a % of Income**

Goal: < 17-20% gross farm receipts



Cost of Production

One of the problems in evaluating this measure is the inconsistency in how it is calculated. Over the years there have been a number of different models developed for calculating this measure. Questions often arise concerning the numbers that should be included in calculating this benchmark. Is *cost of production* be calculated on a “cash flow” basis or a “profitability” basis? This is just one of the questions one must consider when analyzing this indicator. One must also address the issue of whether *cost of production* is calculated on a “whole-farm” basis or an “enterprise-specific” basis. Many accounting systems are inadequate to provide accurate data to calculate an enterprise specific cost of production. Therefore, most models calculate a whole-farm cost of producing 100 pounds (cwt) of milk. This is accomplished by adding all the accrual adjusted expenses and dividing the sum by the total (accrual) cwt’s. of milk shipped. An adjustment must then be made for the other sources of income the farm receives. All non-milk income is totaled and divided by the total cwt’s. of milk shipped. This number is subtracted from the total expenses/cwt. and the result is the next cost of producing 100 pounds of milk. There is an assumption made in this calculation that every dollar of non-milk income costs \$1.00 to generate. Of course this is not always true, and this is an inherent weakness in conducting a whole farm cost of production analysis of a specific commodity. However, as many dairy businesses generate 85-90 percent of their income from milk sales, this type of analysis provides a fairly accurate measure of the cost of producing 100 pounds of milk.

For the purpose of this analysis we will examine the cost of production figures calculated by the Cornell Dairy Farm Business Summary (DFBS), with one slight modification, as noted below.

Operating cost per cwt. milk

This figure examines all the costs of operating a dairy business. *Although DFBS includes interest expense in this measure, it is our recommendation to exclude it, as we consider interest a capital expense. Therefore, our formula will differ slightly from the formula used by DFBS.* This slight adjustment will also help this measure more closely conform operating expenses as defined by the “operating expense ratio”. Interest and depreciation are removed from expenses to calculate the OER of a business.

Formula: (**Bold numbers reflect the current increase in feed and energy prices**)

$$\frac{\text{Total Expenses (excluding interest and depreciation) – non-milk income}}{\text{Total volume of milk shipped}}$$

Benchmarks

Average: - \$10.30 (**\$13.00-\$13.50**)

Leaders: - \$ 8.80 (**\$ 13.00**)

Goal: - \$ 9.50 (< **\$13.50**)

The keys to achieving the goal are increased production and sound cost control measures. Focusing on forage quality, cow comfort, sound animal husbandry practices and good labor management practices will help lower the operating cost of production of a dairy.

Purchased Input cost per cwt. milk

This measure includes capital costs (interest and depreciation) with the operating costs calculated above. As we have previously stated, sound investment management is a key to operating a profitable dairy business. This measure allows us to evaluate production costs from a complete business management perspective.

Formula: (**Bold numbers reflect the current increase in feed and energy prices**)

$$\frac{\text{Total Expenses (including interest and depreciation) – non-milk income}}{\text{Total volume of milk shipped (in cwt.)}}$$

Benchmarks

Average: - \$ 12.60 (**\$15.50-\$16.00**)
Leaders: - \$ 10.85 (**\$15.00**)
Goal: - \$ 11.70 (< **\$ 15.50**)

The keys to controlling this measure and achieving the stated goal include sound investment management in addition to the items mentioned under the previous cost of production indicator. Obtaining the stated goal will enable business owners to be fairly compensated for their labor and management efforts and to reinvest money back into the business to ensure it continues to operate efficiently in the future.

Total Cost per cwt. milk

This measure examines all the costs of producing 100 pounds of milk, including compensation for unpaid family labor, fair compensation to owner/operator labor and management and a reasonable return on owner equity. DFBS compensates unpaid family labor at a rate of \$2,000 to \$2,500 per full time month and has been using a five percent return on owner equity. Return to owner/operator labor and management is determined by the owner and is somewhat subjective. However, it is usually recommended that this figure should be comparable to what the owner would have to pay a person to provide a comparable level of labor and management to his or a similar sized operation.

Formula:

$$\left\{ \begin{array}{l} \text{Total Expenses (including interest and depreciation)} \\ + \text{Compensation for unpaid family labor} \\ + \text{Return to owner/operator labor \& management} \\ + \text{5\% return on owner equity} \\ - \text{Non-milk income} \\ \hline \text{Total Volume of Milk shipped} \end{array} \right.$$

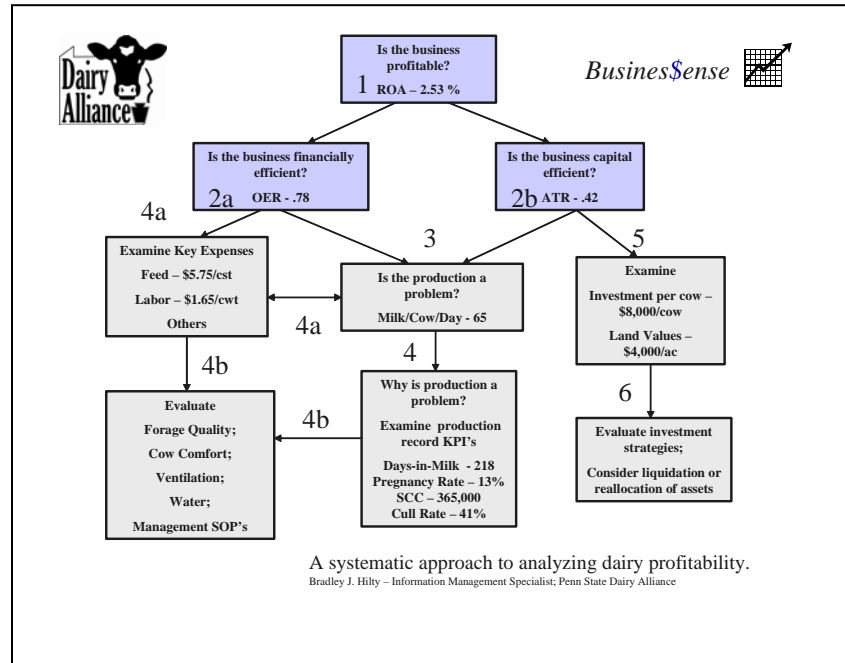
Benchmarks

Average: - \$ 14.25 (**\$17.50-\$18.50**)
Leaders: - \$ 12.35 (**\$ 17.00**)
Goal: - \$ 13.50* (< **\$17.50**)

The goal for this measure should be lower than the long term average (5-10 years) milk price the business has received. This will help ensure the long term viability of the business. A key to achieving the goal is to match the business size with the income goal of the owner(s) and their families, as well as the other items previously mentioned.

A Systematic Approach to Integrated Business Analysis *Putting It All Together*

Now that we have defined a number of key performance indicators and benchmarks for dairy operations, we must organize them in the Integrated Business Analysis Model we discussed earlier. The six steps in this process are illustrated below.



Step 1. Examine the ROA the business has generated. If it is below our recommended goal, or the goal of the individual business, we would proceed to Step 2.

Step 2. Determine if poor profitability is caused by poor financial efficiency (2a) or poor capital efficiency (2b), by examining the OER and the ATR, respectively. If either, or both, of these measures are less than recommended goals, we proceed to Step 3.

Step 3. Examine production levels. Determine if the herd is achieving adequate production per cow. Also if poor capital efficiency is noted, check to see if total production matches the asset base of the operation. Is herd size adequate to ensure efficient utilization of assets? If production per cow is less than the recommended goal, proceed to Step 4.

Step 4. This step actually consists of several phases. First we would want to examine several of our other key herd performance indicators to see if poor reproduction or udder infections may be adversely affecting production. If either of these factors are reducing milk output, evaluating various herd management practices to determine what bottlenecks must be addressed to improve production will be necessary. There are a number of different diagnostic indicators we can examine to evaluate milk production, reproduction, udder health and overall cow management practices. If indicators illustrate there are problems in any area of cow management, we will proceed to Steps 4a and 4b.

In **Step 4a**, we examine several key expense items to ensure the business is providing sufficient inputs to achieve acceptable production levels. For instance, a dairy may experience low production, because the owner is trying to keep feed expenses low. In this instance we may see low feed expenses per cow, but higher than normal feed expenses per cwt. of milk. Inadequate labor can also lead to reduced production. Low vet cost may also be an indicator that the operation is trying to control costs to the point that it is reducing production. If production does not seem to be a problem, but the operation has a higher OER, we would also conduct Step 4a. In this case we would be looking for expenses that are *higher* than normal. If the operation is trying to push for high production in a system that is not capable of supporting it, we might see high feed and vet costs. If sound labor management practices are not employed, we may see high labor expenses. Ultimately, in Step 4a we are looking for individual expense items that are out of line. If found we proceed to Step 4b.

If some herd performance indicators are not up to recommended standards or if some of the expense items are out of line, we must evaluate management areas that could affect these areas. Therefore in Step 4b, we would evaluate forage quality, cow comfort, transition cow management, ventilation and other items. We must also evaluate labor management issues such as labor organization and the implementation of standard operating procedures. Each of these items can significantly impact individual farm profitability, both negatively and positively. Once we have identified the major bottlenecks that are adversely affecting farm profitability, we must develop strategies to correct them.

If in Step 2b, we find that the operation is not capital efficient, we would conduct **Step 5 and Step 6**. We must determine if the asset base of the operation matches the size of the operation. In Step 5 we evaluate items like total investment per cow, machinery investment per cow and others. We must also consider land values, especially in the Northeast. Land values can have a significant negative impact on ATR and thus ROA and thus this must be considered in the evaluation process. **Step 6** involves evaluation of investment management practices and development of some possible solutions to address this issue.

A similar process can be used to evaluate cash flow problems starting with the Term Debt and lease coverage ratio and substituting equity and debt measures in place of the investment measures on the right side of the model.

As you can see, using a systematic approach to organizing and analyzing dairy business performance can simplify the process and help ensure it is done on an annual basis. The most difficult part of improving farm profitability is implementing the strategies developed as a result of the analysis. This is often where managers fall short in their quest for improved profitability. By implementing the strategies that are developed as a result of this process, dairy business owners can operate competitive and viable businesses. We have included a template for conducting an integrated business profitability analysis and for documenting the strategies you will use to address the bottlenecks in your dairy business in this manual. We hope the information presented in this manual will help you better analyze your dairy business and help start you on the road to higher profits.

Notes & Calculations

My Key Performance Measures

ROA	_____			
OER	_____			
ATR	_____	Invstmnt/Cow	_____	
TDLCR	_____	Debt Pmnt/cwt	_____	Debt Pmnt/Inc (%) _____
% Equity	_____	Debt/Cow	_____	
Milk/Cow/Day	_____	DIM	_____	PG Rate _____ SCC _____
		Cull Rate	_____	
Income/Feed \$	_____	Feed \$/Cwt	_____	Concentrate/Milk Inc (%) _____
Cows/FTWE	_____	Milk Sold/FTE	_____	Hired Labor \$/Cwt _____
Operating\$/Cwt	_____	Purchased \$/Cwt	_____	Total Cost/Cwt _____



BusinessSense

Business Analysis Worksheet

For Analyzing Profitability Problems

BusinessSense



ROA

Goal Yours % Rank
10%

OER

Goal Yours % Rank
65%

ATR

Goal Yours % Rank
0.65

Key Expenses/Cwt.

Goal Yours % Rank

Purchsd Feed Expense/cwt < \$3.60
Feed+Crop Exp/cwt < \$5.00
Hired Labor/cwt \$2.25
Repairs Exp/cow \$185
Supplies Exp/cow \$100
Operating Exps/cwt < \$9.50
Machinery Exp/Cow <\$500
Machinery Exp/Ac \$220
Total Production Exp/cwt < \$17.50

Milk/Cow

Goal Yours % Rank
70-85

Key Production Data

KPI Yours Goal
DIM 180
PG Rate 22%
SCC <200K
Cull % 30%

Investment BM

Goal Yours % Rank

\$ 5,000 Total Invest/Cow
<\$1,200 Machine Inv/Cow
Land Value/Acre
2.2 Acres/Cow

Investment Evaluation

Goal Yours % Rank

Corn Silage/Acre
Hay Crop DM/Acre
Facilities \$ / Cow

Management Practices

	Yours	Goal
Forage Quality		135-140
Free Stall Usage		90-95%
Milk Sold/FTWE		750K-1M
Cows/Waterer		25
Labor Organization	Y/N	
Written SOP's	Y/N	
Transition Cow Area	Y/N	

Investments Analysis

List 3 investments you have made w/i the past 1-3 years that have provided a sound ROI

2a)

2b)

2c)

List 3 investments you have made w/i the past that have NOT provided a sound ROI.

3a)

3b)

3c)



Is there a production problem in this business? Y / N

Does your business own any assets that are non-productive or provide a low ROI? List

If yes, check the Key Performance Indicators that are out of line.

Days-In-Milk _____ Preg Rate _____

SCC _____ Cull Rate _____

Forage Quality _____

List three (3) Strategies for addressing these weaknesses & who is responsible for addressing implementing these strategies?

- 1a
- 1b
- 1c

4a)

4b)

4c)

List three (3) strategies for improving your investment management practices.

5a)

5b)

5c)

Who is responsible for making the changes on this sheet.

Is there a cost control problem in this business? Y / N

If yes, List your three largest productive expenses.

Is each expense high? Per Cow Possible Causes?

- | | | |
|----|-------|-------|
| 1) | _____ | _____ |
| 2) | _____ | _____ |
| 3) | _____ | _____ |

List 1-2 strategies for controlling the expenses listed above.

If yes, List your three largest non-productive expenses.

List a strategy for controlling each non productive expense.

- 1)
- 2)
- 3)

Table 1. Key Performance Measures

<i>Indicator</i>	<i>2005</i>	<i>Top 25% 2005</i>	<i>2006</i>	<i>Top 25% 2006</i>	<i>NY Data 2007</i>
Herd Size	206	238	205	352	443
Milk/Cow	20,385	22,119	19,789	22,789	23,808
Cull Rate (%)	27.9	27.4	30.5	29.3	NA
Acres/Cow	2.55	1.87	2.88	2.06	2.05
Milk Price	\$ 16.36	\$ 16.51	\$13.80	\$ 14.32	\$ 20.48
Hauling & Marketing	\$ 0.87	\$ 0.71	\$ 0.88	\$ 0.87	\$ 0.82
Net Milk Income	\$ 15.49	\$ 15.80	\$ 12.93	\$ 13.45	\$ 19.66
5 Key Indicators					
Return on Assets (%)	1.61	9.75	-1.56	6.29	15.3
Operating Expense Ratio (%)	77.5	68.3	81.5	74.5	.67
Asset Turnover Ratio	0.49	0.65	.44	.55	.70
Percent Equity (%)	70.1	67.8	73.1	70.0	68.0
TDLCR ¹	1.36	1.66	.85	1.39	3.11
Feed Cost Efficiency					
Purchased Feed Cost/Cwt.	\$ 4.39	\$ 3.85	\$ 3.87	\$ 3.63	\$ 4.92
Feed + Crop \$/Cwt	\$ 5.60	\$ 4.86	\$ 4.98	\$ 4.37	\$ 6.20
Concentrate/Milk Income (%)	25.7	21.8	26.7	24.8	24.0
Labor Efficiency					
Cows/FTWE	36.2	45.6	34.0	41.9	47.0
Milk/FTWE	750,798	1,004,026	703,231	959,202	1,059,056
Hired Labor \$/ Cwt	\$ 1.82	\$ 1.99	\$ 1.76	\$ 2.36	\$ 2.49
Investment & Debt					
Investment per Cow	\$ 10,336	\$ 7,972	\$ 10,009	\$ 7,923	\$ 8,281
Debt per Cow	\$ 2,984	\$ 2,769	\$ 2,603	\$ 2,484	\$ 2,817
Machinery Efficiency					
Machinery Expenses/Acre	\$ 312	\$ 341	\$ 299	\$ 355	\$ 305
Production Costs					
Operating Expense/CWT	\$ 11.71	\$ 10.14	\$ 11.28	\$ 10.65	\$ 13.06
Purchased Input/Cwt	\$ 14.43	\$ 11.90	\$ 13.31	\$ 11.52	\$ 15.16
Total Expense/Cwt	\$ 17.95	\$ 14.32	\$ 17.53	\$14.97	\$ 17.05

¹Term Debt and Lease Coverage Ratio

²Data Source – Penn State / PDA Dairy Business Model Grant Participants; NY data from preliminary report of 63 farms participating in the 2007 Cornell DFBS program

Statistical Analysis

The data from which all graphs in this publication have been generated is summarized in Table 1. [Although the slopes of some of the lines generated by regression analysis may seem to indicate a relationship between the indicators examined, in several instances, the R-squared values indicate that many other factors affect the relationship between the two variables.](#) This may be due in part to the small sample size and the large standard deviations that exist for many of the indicators. The authors realize the limitations of such statistical analysis and have included the graphs for illustration purposes only.

Benchmark figures were compiled from a review of data from several dairy benchmarking programs, including, but not limited to Cornell's Dairy Farm Business Summary, University of Florida's Southeast Dairy Business Summary and University of Wisconsin's Dairy Benchmarks. Goals were developed through consultation with ag lenders, accountants and consultants throughout Pennsylvania and the Northeast. Some benchmarks have been adjusted to reflect the current dairy business environment.

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