

DAIRY ECONOMICS



BASICS

OVERVIEW

- There have been two fundamental trends in the dairy industry over time: 1) dramatic increases in milk yield/animal/year and 2) increases in herd size. These trends have resulted in a continued increase in total production for the country and shaped the industry. They are expected to continue into the future.
- Influencing both of these trends is the underlying economic principle of spreading fixed cost over more units of production.
- The dairy industry is largely a commodity market where prices are determined based on the demand/supply characteristics of dairy products. Dairymen typically have little control over the price received aside from improving milk quality, components and or using some forward contracting or hedging tools.
- In the dairy production system, the primary means of increasing profit is by controlling cost (lowering it) and or increasing production in a manner where the marginal value of production increases exceed the associated marginal costs.

GEOGRAPHIC DISTRIBUTION

Note: the concepts in this chapter are applicable across the various global dairy production systems; however, economics are presented in USD and production compensation referred to per volume of liquid milk. For increasing wealth on the dairy, unique application is necessary based on end-product compensation (i.e., milk solids vs. liquid volume) and global markets (i.e., domestic vs. export market, niche markets), yet the economic concepts presented here hold true.

ACCUMULATING WEALTH

- The overall goal of virtually all dairies is to improve their overall wealth. Financially, wealth can be defined as the accumulation of valuable assets that are owned by the producer.
- To build a dairy requires the investment in a number of assets such as cows, land, building, facilities, feeds etc. The sum value of these assets can vary from region to region reflecting the underlying local economic values for the assets, but typically range from \$4,000 to \$16,000 per cow.
- Many producers will take on debt (liabilities) as a tool to expand the asset base (larger dairy) of their operations. Typical values for debt often are in the range of \$2,000 to \$3,000 per cow. When the dairy is sold, this debt must be paid first before any economic value is passed to the owner (equity). On the balance sheet of an operation one will see the total farm asset value/cow listed as well as the total liabilities (debt)/cow listed with the difference between the two being the equity/cow. The fundamental balance sheet equation is:

$$\text{Total Assets} = \text{Liabilities} + \text{Equity}$$

- With these assets, the dairy producer and his consultants will make decisions on how they are to be used in the operation of the dairy with a goal to accumulate more assets and to pay down debt. Dairy profitability, measured by net income, measures how well the dairy producer can generate additional revenues above and beyond the costs associated with the use of labor, management, and capital (depreciation of assets).
- *Revenue*: Cash flow generated by the dairy is dominated by fluid milk sales (includes quota and non-quota sales and quality premiums). It is a function of milk yield/cow and the size of the herd. In the US it is typically 80-85% of revenues. Culls cows, calves and excess heifers will also generate revenues for the herd.

FIXED AND VARIABLE COSTS

Costs for the operation can be divided into fixed and variable categories and can facilitate marginal analysis (partial budgeting).

- *Fixed costs* are the costs that do not change appreciably in the short-term planning horizon and are not directly related to output production levels. Examples of fixed costs include facilities (i.e., milking parlor, barns) and equipment, land and cattle, pens or pastures, and intermediate to long-term debt service. Many of these costs will not change over a given year or as production increases or decreases. At the tactical level, for a given decision, if a cost does not change, irrespective of making the decision or not making the decision, it can generally be considered “fixed”.
- *Variable costs* are those that tend to change as the level of output changes. Costs that are proportional to herd size and to the level of production will be considered variable. Examples include feed (single largest cost of production), labor (typically the second largest cost of production), veterinary/medical expenses, bedding, and utilities.
- *Profit* is revenue minus the fixed and variable costs and is thus influenced by the price/unit volume of milk, volume of milk shipped, price/pound for market (beef) animals, variable costs/cwt, and fixed costs/cwt (including debt). The profit and loss statement of the dairy identifies these revenues and cost for a given period of time and expresses their difference as a net income.

ECONOMIC CONCEPTS – FARM LEVEL

From the balance sheet ($\text{Assets} = \text{Liabilities} + \text{Equity}$) and the profit and loss statement of a dairy ($\text{Net Income} = \text{Revenues} - \text{Costs}$), a series of metrics can be calculated to assess the overall financial viability of the operation.

- *Return on assets* ($\text{ROA} = (\text{net income} + \text{interest}) / \text{total assets}$) and return on equity ($\text{ROE} = \text{net income} / \text{equity}$) are metrics that can evaluate how effectively assets are being used for productive purposes. Often dairies will be under continual expansion and thus purchase assets of varying scale (land, barn or parlor expansion) creating inefficiencies in use. For example, excess capacity might exist in situations where a recent parlor expansion could exceed cow numbers in terms of milking capacity.
- *Return on equity* ($\text{ROE} = \text{Net Income} / \text{Equity}$). The ROE reflects how fast the overall wealth of the owner is growing.

DuPont Analysis

- DuPont Analysis is a useful equation to evaluate the nature of inefficiency of an overall operation. It fundamentally dissects the return on equity into its essential elements that can be evaluated

$$R o E = \frac{N I n}{T S} \times \frac{T S}{A} \times \frac{A}{E}$$

- Net Income/Total Sales is sometimes called the profit as percent of sales. Generally one would like this value to be above 14%. This ratio will increase as the operational efficiency of the dairy improves and thus influence the ROE.
- Total Sales/Assets is called the asset turnover and is an index of how well the assets can generate sales (milk, calves, cows). Greater sales per unit of asset will also grow the equity of the operation. Generally one would like this value to be above 40%.
- Assets/Equity is called the leverage factor. Note that the leverage factor cannot be below 1 since Assets = Liabilities + Equity. When the leverage factor equals 1, then total equity = total assets (operation has no debt (liabilities)). As the value increases, the operation is growing the ROE by increasing debt and thus the operation is in a more risky, less solvent situation.

Other Overall Metrics

- *Liquidity*: The ability of the farm business to pay current bills as they come due without disrupting the normal operations of the dairy. Cash as well as assets that can easily be converted into cash can be used to meet these obligations.
- *Solvency* is an index of how much of the assets are actually owned verses how much of asset value is owned by others (liabilities). The debt to asset ratio gives the percent of asset value that is owned by others.

ECONOMIC CONCEPTS – TACTICAL DECISION LEVEL

Most decisions occur on a tactical level of operations on the dairy where many costs are fixed. For example: what feeds to feed, should the cows be challenge fed to increase production, which breeding program to implement, should the herd be milked 3 times per day, or will treatment A be effective are examples of tactical decisions. For these types of decisions, it is important to ignore fixed costs and only focus on marginal costs (costs associated with the decision). This type of analysis is called partial budgeting or marginal analysis where one considers the marginal changes in revenues and the marginal changes in costs.

- *Marginal costs*: These costs are those associated with the decision at hand. For example, if a herd is going from 2x to 3x milking to realize a 10% increase in milk yield/cow, the marginal costs associated with the decision include those associated with the additional operation of the parlor and the additional feed consumed to meet increased production. The costs of the parlor as well as feed fed for the maintenance of the cow are considered “fixed” and not included in the analysis.
- As long as the marginal revenues (increases in revenue) are greater than the marginal costs, the decision is lucrative and will improve the overall economic status of the herd.
- *Opportunity cost*: Foregone value of an alternative decision that was not selected, or in other words, the value of a product, opportunity, or activity not realized.

- Dairymen (and advisors) must carefully consider the opportunities available for investments which can enhance the overall accumulation of wealth for the dairy. Each investment should be evaluated in terms of its net present value to the operation. When the weighted average costs of capital is used as a discount factor, net present value analysis will identify investments that will contribute wealth to the overall operation (grow equity and pay down debt).
- *Economies-of-scale* is a special economic principle that is distinct from marginal analysis. As herds get larger they can purchase inputs at volume discounted prices (feeds, semen etc.). A subtler nuance is the inefficiency associated with imbalances in asset capacities observed on small herds. These imbalances are reduced on larger herds (assets/cow) and thus allow for greater returns on assets and ultimately equity.
- Herds should always be investing in new technologies that can improve operation efficiency. Management should be embracing change before they are ultimately forced to accept change.

INCREASING THE WEALTH ON THE DAIRY

There are three fundamental strategies to increase the overall wealth of a dairy operation. These strategies improve the operational efficiency of the dairy, allowing for the purchase of additional assets or to reduce the debt on existing assets.

- 1) ***Improve milk yield.*** Improving the milk yield from existing cows in the herd is very lucrative. There are many strategies that can be involved to improve milk yield from feeding balanced rations, improved forage quality, increased feed bunk space, cooling cows, and improved reproductive efficiency to list a few. Each of these interventions might have an initial investment cost (purchasing fans, 3x milking, rBST, extending the feed bunk, investing in reproductive technologies). In addition, a critical marginal cost of producing additional milk is the associated feed required for the additional milk. This is referred to as the marginal feed cost in contrast to the average feed cost.
- 2) ***Seek cost and price efficiency for inputs and outputs.*** Producers should always be seeking cost efficient inputs into the dairy operation. Some small herds have organized into cooperatives so as to improve their ability to purchase common inputs at a lower cost. Volume discounts for inputs should always be evaluated not only in terms of their reduced unit costs, but also for any associated inventory cost associated with larger input orders.
- 3) ***Increase the size of the herd.*** This decision requires a longer planning horizon, but should always be on the table for consideration. This decision usually has additional capital expenditures (stalls, parlor capacity, manure capacity, feed, land, labor etc.) as well as the purchase of cows and thus offers a lower rate of return when contrasted to the returns realized on increasing milk yield on existing cows.

SEE ALSO

- Economics: Net Present Value (www.fiveminutevet.com/ruminant)
- Client Communication (Appendix 1)

ABBREVIATIONS

ROA = return on Assets

ROE = return on Equity

rBST = recombinant bovine somatotropin

Suggested Reading

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