The Economics of Profit in California Dairies

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INTRODUCTION

Milk price volatility has increased tremendously over the last 12 years in the dairy industry with milk price peaking every 3 years (Figure 1). There have been also major changes in the grain markets. Grains and grain by-products have risen in price, mostly due to corn being diverted to energy markets and to poor weather.

This extreme market volatility in both milk and feed prices has stressed dairies across the country, resulting in emphasis on reducing costs whenever and wherever possible. Cutting costs is generally a good idea provided milk yield is not sacrificed. Any cost-cutting, management, or feeding decision made that lowers milk sales is likely to decrease the profitability of the herd.

These significant shifts in the dairy economy motivated this look into ways to assist dairyman in California to maintain profitability in difficult economic times. Since the 1950's, the California Department of Food and Agriculture (CADFA) has collected cost of production information from several dairies across California on a quarterly basis. Their analyses report annually the cost of production for individual dairies, a comparison of these dairies within their region and across the state, and a comparison with the prior year.

OBJECTIVE

Our objective was to collaborate with the CADFA to evaluate the cost of production on California dairies to find financial and production trends that could lead to improved profitability.

METHODOLOGY

The database of herds was from the CADFA, consisting of around 150 herds each year from 2006 to 2010. This represents nearly 9% of the herds in California and close to 200,000 dairy cows. The database has dairies from different regions of the state, Northern, Central, and Southern California. Organic herds were excluded from

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the dataset due to differences in pricing relative to conventional dairies. Herds were categorized as Holsteins, Jerseys, and Crossbreds. The herd size in analyses referred to both lactating and dry cows.

Profit on these dairies was defined as milk net income, consisting of mailbox price paid per hundredweight (cwt) less the total cost of producing a cwt of milk for each dairy each year. Total cost included feed cost (forage, concentrate, and supplements), labor cost, herd replacement cost (value of cows entering the herd less the total receipts for the same number of cows culled and dead), operating cost (utilities, supplies, veterinarian, nutritionist, medicine, outside services, repairs and maintenance, bedding, manure hauling, fuel and oil, interest, insurance, taxes, depreciation, and miscellaneous), and milk marketing cost.

Total cost did not include manager's salary since it is quite variable. Heifer replacement costs were a separate enterprise not used in the dataset. Income from the sale of heifer replacements and bulls was also excluded for consistency, removing income from sale of genetics.

Dry matter intake was calculated as the average amount of feed dry matter provided to the cows (orts or weigh-backs were not measured). Solids-corrected milk (SCM) was calculated to 3.5% milk fat and 8.7% solids non-fat content. All milk yield data was analyzed and categorically divided using solids-corrected milk. Feed efficiency was calculated using the average solids-corrected milk divided by average dry matter intake per cow per day for the herd. Data were categorized by housing. Free-stall herds were those with >75% of the cows in free-stalls. Dry lot herds were those with > 75% of the cows in dry lots. Combined herds were those that did not fall into one of these categories.

Data from 2006 through 2010 were statistically analyzed. Non-financial data, which consisted of milk yield, herd size, feed efficiency, housing type, and milking frequency were analyzed relative to the financial data. Proc Glimmix and Proc GLM (SAS 9.2, SAS Institute) were used to analyze continuous variables. Proc Glimmix was also used to analyze categorical variables.

Besides analyzing differences among herds, changes within the herds over the 5-year time period were analyzed. Per-year change in milk yield, herd size, and feed efficiency were correlated to per-year change in total cost/cwt for herds that were in the data set all 5 years.

MILK YIELD AND PROFITABILITY

Total cost/cow per year increased in all breeds as milk yield increased. The range varied by year between the low- and the high-producing herds. For example in Holstein herds, cost/cow per year was as low as $1,500 in 2006 and as high as $2,000 in 2009. When the same data were analyzed per cwt of milk, data had the trend reversed. As milk production increased, total cost/cwt decreased regardless of year or breed.

Holstein herds were categorized by milk production into those producing less or equal to 70 lb/day, between 70 and 80 lb/day, and more than 80 lb/day. Holstein herds producing ≤ 70 lb/day averaged total cost/cwt of $14.97 whereas herds producing > 80 lb/d averaged $13.49/cwt. Jersey herds producing ≤ 55 lb/day had a total cost/cwt of $17.67 whereas herds producing > 65 lb/day spent $2.09/cwt less. The data clearly show that as herds produced more milk/cow per day, total cost/cwt declined. Feed, labor, replacement, and operational costs followed the same statistical trend. This is due to the ability of herds producing more milk per cow to dilute the dairy's fixed costs.

Milk net income/cwt (MNI) increased as milk yield increased (Figure 2). Holstein herds producing ≤ 70 lb/day had an average MNI of -$0.29/cwt whereas herds producing > 80 lb/day netted $1.12/cwt over the 5-year period. Jersey herds producing ≤ 55 lb/day lost -$1.36/cwt whereas herds producing > 65 lb/day gained $0.72/cwt. Crossbred herds producing ≤ 70 lb/day had a MNI of $0.83 whereas herds producing > 70 lb/day had $0.98/cwt. The trend from low- to high-producing herds was similar across Holsteins and Jerseys. Top-producing Holstein and Jersey herds have been profitable on average over the last 5 years whereas low-producing herds have not. Interestingly, crossbred herds were profitable regardless of milk production, but included only 7 herds.

HERD SIZE AND PROFIT

Larger herds can capitalize on economies of scale and dilute their costs of production by milking more cows. Herd size in this data set ranged from 100 to 4,600 cows. Pooled across all other variables, Holstein herds larger than 1,000 cows had significantly lower total cost of production and larger MNI per cwt than herds with fewer than 1,000 cows (Figure 3). Herds > 1,000 cows had $1.05 lower total cost/cwt and $0.74 greater milk net income/cwt than herds with < 1,000 cows. Herds with > 2,000 cows were not statistically different from herds with 1,000 to 2,000 cows in total cost or income/cwt, although their total cost of production was a smaller number.

Across all other variables, Jersey herds larger than 500 cows had significantly lower total cost of production than herds with less than 500 cows. Herds > 500 cows had $1.70 lower total cost/cwt than herds with < 500 cows. Herds with > 2,000 cows were not statistically different from herds with 500 to 2,000 cows in cost/cwt but they had numerically lower total cost of production. Jersey herds larger than 2,000 cows had significantly greater milk net income ($0.84/cwt) than herds with less than 2,000 cows, which averaged a $0.55/cwt loss.

Similar trends in costs and net income by herd size occurred in each milk yield category. In each production category for Holstein herds (≤ 70, 70 to 80 and > 80 lb/day), larger herds had decreased total cost of production/cwt. There were not enough Jersey herds to break the data into all of these production-by-size categories. In Holstein herds producing ≤ 70 lb/day, milk net income was $0.19, $0, and -$0.96/cwt.; herds producing 70 to 80 lb/day, milk net income was $0.35, $0.32, and $0/cwt; and for herds producing > 80 lb/day, milk net income was $1.10, $1.20, and $0.85 for herds with > 2,000, 1,000 to 2,000 and < 1,000 cows, respectively. These data clearly demonstrate that larger herds within each milk production category made more profit per cwt. However, increasing milk yield had a more significant response to profitability than herd size. Regardless of size, all herds producing > 80 lb/day were highly profitable over the 5-year period.

ECONOMICS OF FEED EFFICIENCY

To validate the feed intake data, feed efficiency (FE, (SCM/dry matter intake)) was regressed on milk yield. There was a positive relationship between FE and milk yield for Holsteins (R^2 = 0.44) and Jerseys (R^2 = 0.85). Feed efficiency results should be interpreted carefully as these are field data; no orts or weigh backs were measured. Intake was expressed as dry matter offered. When analyzed by year, larger FE was associated with smaller total cost/cwt regardless of breed or year.

Holstein herds with FE ≤ 1.30 had a total cost of production of $15.05/cwt. Herds with FE of 1.30 to 1.45 had a cost of $14.46/cwt, and herds with FE of > 1.45 had a cost of $13.76/cwt. Similarly, although at a different FE scale, Jersey herds also had lower cost of production for higher FE. Jersey herds had a total cost of production of $17.59, 16.67, and 15.39/cwt for herds with FE of ≤ 1.37, 1.37 to 1.57, and > 1.57, respectively. When analyzed for MNI, Holstein herds with the lowest FE lost $0.41/cwt whereas herds with the best FE profited $0.87/cwt. Similarly, Jersey herds with the lowest FE lost $1.16/cwt whereas herds with the best FE profited $0.97/cwt.

Herds with greater milk yield within each FE category had significantly lower cost of production in Holstein herds although not significant in Jersey herds. Clearly, one way of reducing cost is by improving the FE of the herd. Therefore, careful consideration should be given when making changes in nutrition or management that affect FE or that change milk production.

FACILITY TYPE AND PROFIT

California dairy cows are housed mostly in free-stalls, dry lots, or the combination of both systems. Dairymen choose a system depending on the region of the state and the amount of rainfall. As described before, high milk yield reduced total cost of production/cwt. Interestingly, for Holstein herds producing around 75 lb/day, all facility types had similar cost of production, near $14.30/cwt. Dry lot herds had an advantage over free-stall herds at lower milk yield. Dry lot herds producing 60 lb/day had a total cost of production of $14.84 whereas free-stall herds at the same milk cost $15.43/cwt. Dry lot herds seem to be less expensive to operate at low production. On the other side, at greater milk yield, free-stall herds had a lower cost of production. At 85 lb/day, dry lot herds had a total cost of production of $13.89/cwt whereas free-stall herds were at $13.37/cwt. The lowest cost of production was with free-stall herds producing 90 lb/day at a cost of $12.87/cwt. Cows in no other facility type produced this much milk.

When these data were analyzed by herd size, the largest herds had the lowest cost of production in all herd type categories. Dry lot herds with 500 cows had a total cost of production of $14.90/cwt whereas herds with 3,500 cows had a $2.18/cwt lower cost. Free-stall herds with 500 cows had a total cost of production of $14.47/cwt whereas herds with 5,500 cows had a $1.97/cwt lower cost. Largest herds definitely enjoyed greater economic efficiency. However, they are increasingly challenged by environmental regulations in the California market.

MILKING FREQUENCY AND PROFITABILITY

There were not enough Jersey herds in the data set milking three times per day (3X) to make a good analysis of milking frequency. Therefore, this analysis is just for Holstein herds. At similar milk yields, there was no difference in the total cost of production for herds milked 2X versus 3X. The relationship of milk yield and total cost of production was similar for 2X and 3X herds. Herds producing 85 lb/day had a total cost of $13.56/cwt for 2X and $13.46/cwt for 3X. However when cost of production was analyzed by herd size and milking frequency, 3X herds had a lower total cost of production/cwt and the difference got larger as herd size increased. Herds with 500 cows (2X) had a cost of production of $14.67/cwt whereas 3X herds had a cost of

$14.16/cwt, a 51¢ /cwt advantage. However, herds with 5,000 cows (2X) had a cost of production of $13.76/cwt whereas 3X herds had $12.81/cwt, a 95¢/cwt advantage. With two herd size categories, 2X and 3X herds were significantly different only in the largest herd size category. Herds with >2,000 cows and milked 3X had a lower cost of production/cwt than herds milked 2X. At similar levels of milk yield, milking frequency was not as economically important as milk yield or herd size.

WITHIN HERDS COMPARISON

Herds that were in the study all 5 years were separated into a 108-herd dataset. Milk yield change (lb/day) within herd over the 5-year period was regressed on change in total expense/cwt. Milk yield change within herd averaged +0.03 lb/cow per day each year for the 108 herds, ranging from +2.72 to -2.88. Change in total expense per cwt/year averaged +$0.42/cwt, ranging from +$2.67 to +$0.27.

Holstein herds with the same milk yield from 2006 to 2010 had an increased total cost of $0.34/cwt per year. The cost of production inflated by $1.75/cwt over the 5-year period. Herds that lost 1.5 lb/year in daily milk yield per cow from 2006 to 2010 had an increased total cost of $0.60/cwt/year. This means that herds that lost 7.5 lb/day of milk over 5 years increased in cost of production by $3.0/cwt in the 5-year period. However, herds that increased milk yield by 1.5 lb/year in the same time period had an increased total cost of $0.25/cwt per year or an increased cost of production of $1.25/cwt over the 5 years. The R^2 for the relationship between change in milk and change in cost/cwt within herd was 0.45 and was significant both linearly and quadratically (Figure 4).

Even though regression of change in herd size (cows/year) against change in total expense/cwt had a low R^2, the trend was that increasing herd size reduced the total cost/cwt change per year. Also, increasing FE change/year linearly decreased the total cost/cwt. In the 5-year period, herds that did not change or lost FE increased total cost/cwt about $0.40/year whereas herds that improved FE by 0.045/year increased total cost/cwt $0.15/year. These changes in milk production, herd size, and efficiency clearly indicate that as time progressed, herds that kept improving had a better chance of remaining more profitable compared with herds that stayed the same or reduced their efficiencies.

CONCLUSIONS

It is evident that the price of milk has a major impact on the profitability of dairies in California; however, dairies have little control over it. Considering factors that dairies can control, milk yield is a very important part of the profitability equation. High producing herds were predominantly profitable in good and poor economies regardless of herd size. The data demonstrated that herds with greater milk yield maximized net income/cwt in years of high milk price and minimized losses in years of low milk prices. Increasing herd size improved the economic efficiency of herds in California, but milk yield/cow had a greater impact.

Therefore, the greatest opportunity to increase the likelihood of profitability on California dairies is to improve individual animal efficiency with higher yield and higher feed efficiency. Focus on fundamentals, such as cow comfort, and increase herd size for efficiency taking advantage of economics of scale and volume. Spend money wisely and use technologies that give evidence of economic return. Control the controllable. Repeat this process for continuous improvement.

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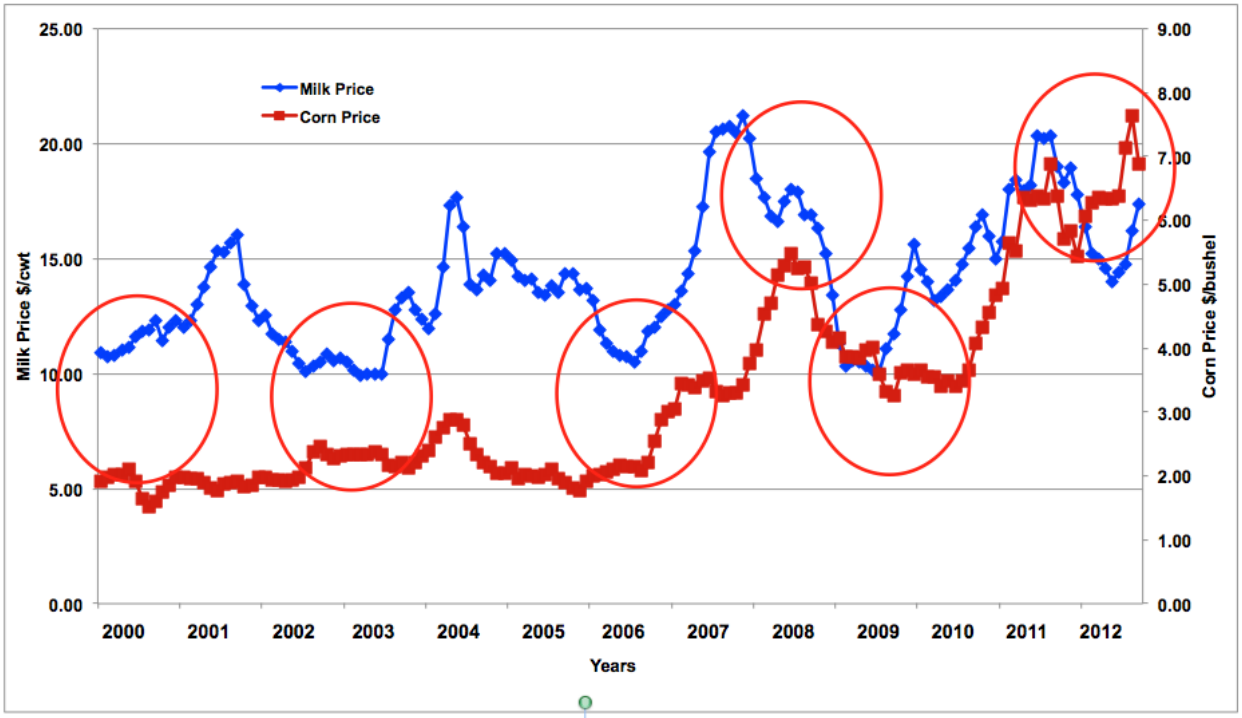

Figure 1. Historic California State blend (quota and over-base) price and US corn price paid to corn growers. Circles indicate periods of economic stress in dairies.

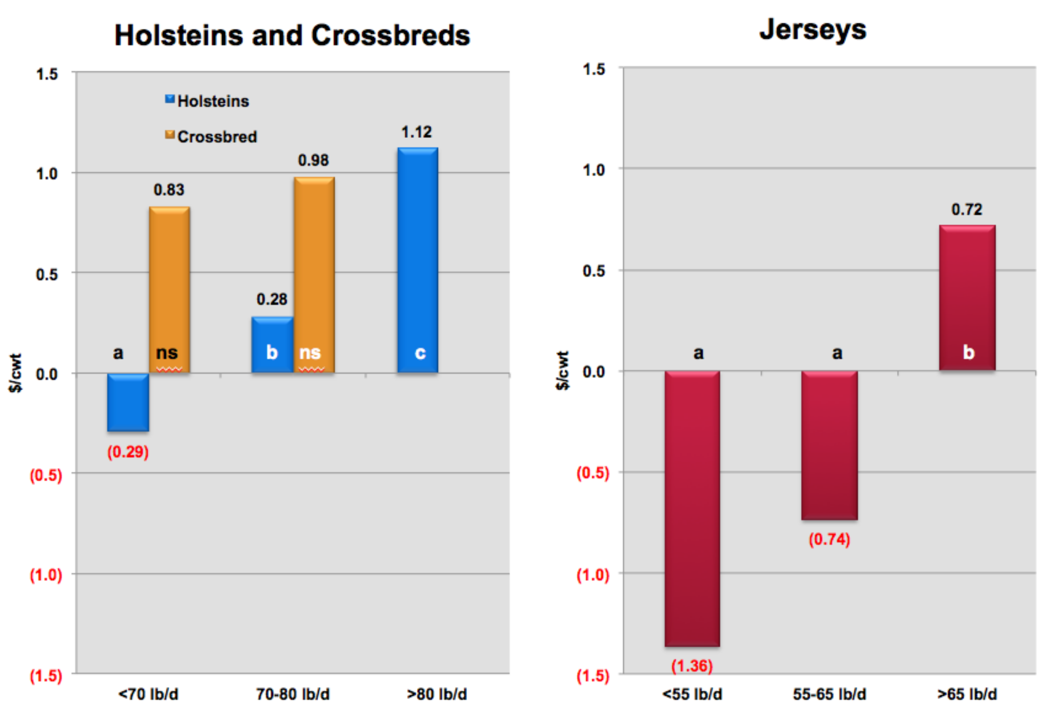

Figure 2. Milk net income/cwt by milk yield and breed. Increasing milk yield increased average profit for the 5-year period.

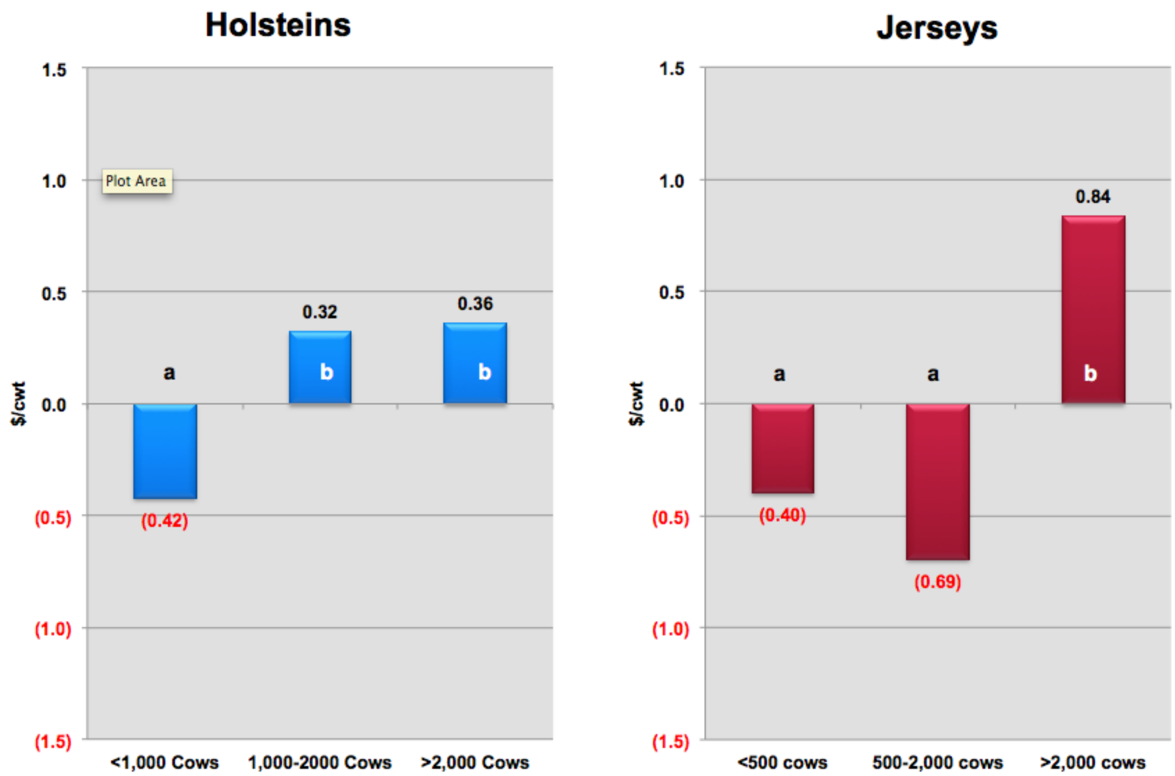

Figure 3. Milk net income/cwt by herd size and breed. Increasing herd size increased average profit for the 5-year period.

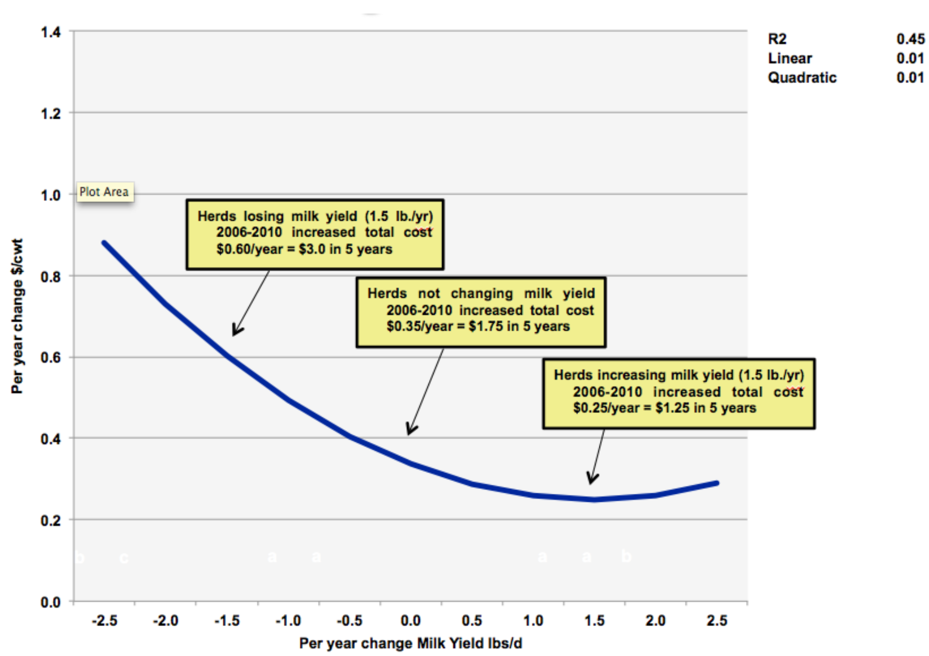

Figure 4. Total cost/cwt and milk yield change in Holstein herds over the 5-year period.

SESSION NOTES