# CONCEPTION RATES, MILK YIELD AND SEMEN COSTS

by

C.J. Wilcox and H.H. Head
Department of Dairy and Poultry Sciences

Summary

Estimates of genetic parameters for production and reproduction in Florida do not differ from the rest of the U.S., even though mean performance may be below the U.S. average. Early research at Florida suggests that net returns from increasing milk yield by improved selection and management may not be as high as predicted, because of detrimental effects of increased yield on performance. If subsequent research agrees, increased use of young sires would be recommended.

**Introduction.** Many studies have been published over the years concerning milk yield and reproductive performance in Florida, the U.S., and other dairy areas of the world. In recent years huge data sets have become available for study; computer capability also available has expanded incredibly during the past 10 years. Therefore, we continue to revisit questions to which we thought we had the answers, and continue to refine estimates and recommendations for management.

Florida has a unique dairy industry. The same combination of factors such as climate, herd size, milk and feed prices, markets, among others is not found anywhere else in the world. Thus estimates of performance are needed for Florida to determine whether management recommendations specific for Florida are needed.

**Reproduction and its relationship to production.** Latest DHIA data for Florida dairy cow reproduction are in Table 1. Reproductive efficiency is not as good in Florida as elsewhere in the U.S., doubtless because of our climate, large herd size, and other managament factors.

Table 1. Annual Florida DHI averages, 1993[1].

| Variable | Average |
|---|---|
| Proj. Minimum CI[2] | 429 days |
| Days open | 148 |
| Services/conception | 4 |
| First service CR[3] | 31% |

[1] Webb, D.W. Herd testing highlights, Florida DHI program, Dec. 1993 and Jan. 1994.
[2] CI = calving interval.
[3] CR = conception rate.

Conception rates (CR) in some herds are quite good, as shown in Table 2 for one Florida herd. Overall conception rate was 41%, higher in Jerseys than in Brown Swiss and Holsteins.

Table 2. Conception rates (%) by breed[1].

| Breed | Number of services | Rate |
|---|---|---|
| Holstein | 7334 | 39 |
| Jersey | 3137 | 45 |
| Brown Swiss | 976 | 41 |
| Overall | 11447 | 41 |

[1] Badinga, Collier, Thatcher, and Wilcox (1984).

Years ago conception rates in the University DRU herd were quite good, averaging about 38% for all breeds (Table 3). An interesting result of this research was that conception rates did not decline with advancing service number up to the fifth insemination of a cow. This did not agree with conventional wisdom at the time, which was that conception rates declined with advancing service number. This work later was confirmed by research at Cornell University which did not show a decline in rates through the third service.

Table 3. Conception rates (%) by service number.

| Service Number | Rate (%) | Service Number | Rate |
|---|---|---|---|
| 1 | 35.7 | 4 | 39.3 |
| 2 | 37.4 | 5 | 38.4 |
| 3 | 38.1 | Overall[2] | 37.9 |

[1] Gwazdauskas, Wilcox, and Thatcher (1974).

[2] N = 5062 services.

Reasons for this difference are not known. The Florida research involved more sophisticated statistical analyses than done previously. Data were adjusted for service sire, inseminator, season of year, age of cow and other factors known to affect conception rates, for example. In any event it does not appear safe to assume that conception rates decline with advancing service number, at least to the fifth service.

The relationships of milk yield and services per conception

are in Table 4. We have added body weight to the analysis, because it was available.

Table 4. Heritabilities, phenotypic and genetic correlations[1,2].

| | MY | S/C | BW |
|---|---|---|---|
| Milk yield (MY) | .15 | .12 | <.01 |
| Services/conception (S/C) | .38 | .06 | .01 |
| Body weight (BW) | -.09 | .37 | .25 |

[1] Badinga, Collier, Wilcox, and Thatcher (1984).
[2] N = 2263.
[3] Phenotypic correlations above diagonal, heritabilities □ on diagonal, genetic correlations below diagonal.

The heritabilities for milk yield and body weight are a little lower than accepted values for Florida, although the USDA used .19 for milk yield for many years. The value for services per conception is widely accepted all over the world. Conception rate and services per conception have very low heritabilities, meaning that attempting to improve reproductive performance by selection probably is not justified. We already do practice selection for increased efficiency. We cull cows which do not reproduce; we select bulls from cows with several records; and we cull bulls whose semen is not fertile. Additional efforts to improve reproduction by selection do not seem warranted.

The phenotypic correlations are above the diagonal. This shows that cows with higher milk yield require more services per conception (correlation = .12). Note that body weight was essentially unrelated phenotypically to milk yield or services per conception.

Genetic correlations indicate how pairs of variables change from parent to offspring. They may or may not agree with what we see when we look at cows (phenotypic correlations). Increased milk yield is associated genetically with increased services per conception (.38). Increased body weight actually is negatively associated genetically with milk yield and positively associated genetically with services per conception. As we have said for many years, we should not be trying to increase body size of dairy cows just to get bigger cows.

There is no evidence that genetic parameters for Florida dairy cows differ from those of the rest of the U.S. (Table 5). These are the accepted values. Repeatability as used here is the

Table 5. Repeatabilities and heritabilities[1].

| Trait | Repeatability | Heritability |
|---|---|---|
| Milk yield | .50 | .25 |
| Body weight | .60 | .50 |
| Services/conception | .10 | .05 |
| Days open | .10 | .05 |

[1] Wilcox, C.J. 1993. Large Dairy Herd Management.

correlation of performance of the same cow from lactation to lactation. Reproductive performance from year to year repeats itself only very slightly. You cannot really predict reproductive performance of a cow next year based on her performance this year. Milk yield is much more repeatable (and therefore predictable) as is body weight. Reproductive performance has very low heritability, milk yield is moderately heritable (.25), and body weight is highly heritable (.50).

We have just completed research on the economic aspects of the production-reproduction relationship. These were Florida DHI data from 6436 Holsteins and Jerseys in 14 herds. Average performance (Table 6) is quite similar to overall Florida values from earlier tables.

Reproductive performance of Jerseys clearly was better than Holsteins. Other work with Florida data has shown this also. These estimates were used to predict net returns from using AI sires selected for milk yield, either adjusted or not adjusted for effects of yield on reproduction. Our estimates were that for each kilogram additional milk a cow gave, for whatever reason, her reproduction would suffer. For each 100 kg (220 pounds), the cow would require .14 more services and would have calving intervals 2 days (Holsteins) or .76 days longer (Jerseys).

Putting all these values together, for first calf Holsteins and Jerseys, (Table 7), selection of sires for increased milk yield would not result in increased net returns as predicted. For example, net returns of $64.60 for Holsteins freshening in cool weather would be reduced by half to $31.72, if that reproduction suffered as predicted.

These results need to be confirmed by additional work. We used U.S. milk prices. What if we had used Florida prices? What effect would changing some of the other input values have? We don't know.

Table 6. Statistics used for determining net returns.

| Estimate | Holsteins | Jerseys |
|---|---|---|
| Services per conception | | |
| Warm season | 4.00 | 2.55 |
| Cool season | 3.84 | 1.99 |
| Calving interval (d) | | |
| Warm season | 440 | 403 |
| Cool season | 394 | 379 |
| Cost per additional day open | $2.14 | $2.14 |
| Annual replacement rate | .33 | .33 |
| Effect of unit change in milk yield (kg) | | |
| Number of services per conception | .0014 | .0014 |
| Calving interval | .0204 | .0076 |
| Probability of female calf | .50 | .50 |
| Semen price per ampule | $10.20 | $9.80 |
| Age at mid-lactation (first) | 3 | 3 |
| Proportion of income over feed cost | .55 | .55 |
| Annual interest rate | .08 | .08 |

[1] Campos, Wilcox, Spreen and DeLorenzo, Unpublished, 1994.

This work suggests that perhaps we should use more young sires, with their lower semen costs and higher conception rates, particularly with Holsteins being inseminated in hot weather.

Table 7. Effects of breed, season and adjustment for reduced reproductive efficiency of net returns from milk yield[1].

| | Net returns | |
|---|---|---|
| | Holstein | Jersey |
| Cool season | | |
| not adjusted | $64.60 | $ 92.90 |
| adjusted | 32.88 | 64.18 |
| change | -31.72 | -28.72 |
| Warm season | | |
| not adjusted | $60.24 | $106.39 |
| adjusted | 28.57 | 77.25 |
| change | -31.67 | - 29.14 |

[1] Campos, Wilcox, Spreen, DeLorenzo. Unpublished research, 1994.