

HOW MUCH CAN YOU AFFORD TO
PAY FOR SEMEN?

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This question faces all dairymen. Since semen is a cash expense, even dairymen who do not purchase semen consider semen price if they are raising or purchasing their own sires to use naturally, or from which to collect semen. Unfortunately, there is no single answer to the question. A dairy which does not raise replacements has a completely different set of inputs upon which to make a decision than a dairy which raises its replacements and is planning to stay in business for 10 years or more.

We will consider only the situation where the dairy is breeding its own cows by AI, raising its own replacements, and planning to stay in business for a reasonable length of time. A dairy which did not fit these categories might be advised to buy the cheapest semen it could find which had a high conception rate. If the dairy doesn't raise replacements or doesn't plan to stay in business long, then differences in value between offspring of good and poor sires can almost be ignored.

If the dairyman is interested in differences in the value of offspring of different sires, then he needs to consider the number of ampules of semen required for a milking daughter. A simple formula helps tell how much semen costs are to get one milking daughter of a sire.

$$\text{Cost} = \frac{(\text{\$per ampule}) (\text{number of ampules for conception}) (2)}{1 - \% \text{ calves lost before freshening}} + \text{Fixed costs}$$

Many dairymen underestimate the number of ampules required for conception. We may have lived so long with reports of 70% conception that we believe it only takes 1.5 ampules for a pregnancy. Values such as 70% generally refer to 60 to 90 day non-return rates and not to actual pregnancy rates which are 10 to 20% lower. Under large herd management and climate conditions Florida, the discrepancy may be even more. A 15 year study in the University of Florida Dairy Research Unit showed that about 40% of the inseminations up to the fifth resulted in a diagnosed pregnancy or birth of a calf. This suggests that 2.5 ampules are needed.

The real number is even higher than this, however. Some cows are pregnant when sold, so those ampules must be counted even though no calf resulted. Cows are sold for infertility after having been bred several times; these ampules must be counted. If you suffered abortions for any reason, these ampules must be counted. The only valid method of calculating semen costs has to be the number of ampules purchased divided by the number of calves born. One multiplies by two because about 50% of calves are males.

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One needs to avoid underestimating the number of calves lost. About 1 or 2% of calves born are stillborn. Unless care is taken, that value can be higher. About 0.5% are freemartins. Some calves die within the first few days. Between the birth of a live, normal female and its parturition, a lot of things seem to happen. Some 5 to 10% of females are sterile. Unfortunately by this time the breeder already has considerable investment in these animals. Also, don't forget to count semen used on them. A dairy which can bring 80% of the female calves born into the milking herd is doing very well. Most do not do as well.

Fixed costs vary from farm to farm and are about the same for all sires. They include costs of the tank, supplies, semen losses, and cost of insemination.

Few dairies are getting a milking daughter from less than 7 ampules of semen. Whatever the value is for each herd, one can multiply it by the cost per ampule, add in the fixed costs, and have the semen cost per milking daughter.

An additional factor to consider in determining semen value is the discount (interest) rate, and the number years one wishes to discount costs. Discount rates probably start at 8% today, or higher. Of course the less money invested in semen, the lower are interest charges. The number of years discounted turns out to be an even more important factor, however.

Breeders are willing to purchase semen from some bulls but not from others because they realize that daughters of some sires are more valuable than others. The properties of daughters which cause them to vary in value includes milk yield, fat content, reproductive efficiency, disease resistance, body conformation and others. Among these, milk yield is by far the most important. Thus is widely appreciated by dairy cattle breeders.

Reproductive performance also is an economically important trait. Florida researchers recently completed still another study of reproductive performance. Once again it was demonstrated that heritability of common measures of reproductive performance is about zero. Although some animals have higher reproductive efficiency than others, it is not because they differ genetically. Likewise, repeatability of reproductive performance from year to year is near zero. Thus one cannot predict what a cow will do next year from what she did this year, as far as her reproductive performance is concerned. This trait then need not be considered in evaluating sires.

Each breeder should decide on the value of desirable type for himself. It is economically important in some operations, but apparently of little economic value in others.

It would be nice if all animals were resistant to all diseases known, and also those not yet discovered. This includes mastitis, TB and Bang's, of course. Fortunately, the genetics of disease resistance are such that we need not concern ourselves too much with selection for it. Animals not resistant leave fewer offspring than those which are resistant. Hence, there already is some selection pressure being exerted, without conscious effort on the part of the breeder.

In any event, the breeder needs to determine the economic value of these traits, and others not mentioned. He also needs to know the degree to which they are inherited, and genetic interrelationships between them.

Cornell researchers recently published research on income returned over investment in semen. They evaluated effects of several factors on profits from purchase of semen from different bulls under different conditions. They looked at 4 or 5 combinations of each of these factors. Most of our Florida dairies would be included within the range studied; there existed 62,500 possible combinations of these variables.

Sire PD's ranged from +500 lb to 2500 pounds, semen up to \$20, milk price up to \$12.00 per hundred weight. Interest rates ranged from 8 to 14% and years of discounting from 6 to 10. A portion of their results is shown in Table 1.

Table 1. Correlations between several variables and economic returns^a

PD milk	.69	Milk price	.19
Years discounted	.43	Discount rate	-.16
First service cost	-.37	% calves lost	.04
Conception rate	.21		

^aEverett, J. Dairy Sci. 58:1717,1975. Correlations are for direct service of cows.

These correlations suggest the relative importance (within a reasonable range) each input has in determining profit. They do not apply to very unusual situations (e.g. \$100 semen or 10% conception rates). Conception rates in the study ranged from 30 to 70%. PD milk was shown to be the most important determinant of profits. In comparing sires and their PD's one needs to consider that 55 to 65% of the extra value of milk is extra income over feed costs.

Years discounted ranked second in importance. Money invested in semen returns slowly because of the long generation interval of dairy cattle and the fact that some produce milk over a period of many years. The remaining correlations need little explanation. Their ranking and relative magnitude are the items of importance when pricing semen.

Based on similar determinations, Cornell researcher Van Vleck presented a comparison of two hypothetical sires, and the type of decision facing the semen purchaser (Table 2).

Table 2. Comparison of costs and returns from purchase of semen from two hypothetical sires.^a

	Sire A	Sire B
PD milk	+500 lb.	+1000 lb.
Conception rate	70%	50%
Cost per ampule	\$6	\$12
Return over cost		
5 year discounting	-\$8	-\$28
20 year discounting	+\$34	+\$57

^aVan Vleck, Large Dairy Herd Management Symposium, Gainesville, FL January 1976.

In the short run, money would have been lost with purchase of either sire. In the long run, more would have been gained by purchase of the more expensive sire with the higher PD, even though his conception rate was lower.

In summary, these results are not surprising. Genetic change is slow. Money invested now will bring excellent returns in time, even with high interest rates, but these may not be realized in the short term. Female calves differ in value at birth, and these differences make semen from some sires more valuable. Good rules of thumb for semen purchase would be (1) consider that takes 7 or more ampules of semen to get a milking daughter, (2) the breeder needs to be able to assign dollars to traits of economic importance, and (3) it would be helpful if one could decide on how long he planned to stay in business, and he also could predict future long term prices.