Understanding EBVs

Excerpts taken and adapted* from:

- Ccsi.ca: *Canadian dairy goat genetic evaluation and selection program*
- Katahdins.org: *Frequently asked questions about Estimated Breeding Values and NSIP*
- Thedairysite.com: *What is an EBV and how can it help you?*

*Note from Bee Tolman: to make the excerpts clearer, I have entered in "Genovis" or "dairy sheep" where appropriate.

An EBV is a value which expresses the difference (+ or -) between an individual animal and the flock benchmark to which the animal is being compared (in our case, the dairy sheep whose milk production has been submitted to Genovis' North American database). EBVs are reported in terms of actual product such as kg of milk or fat %, etc. EBVs measure the genetic component of these traits, and allow dairy sheep to be compared, excluding their management and environment.

EBVs are the best measure we have of comparing performance traits and important production values between dairy sheep within a flock and between individual animals in different flocks.

You can see the EBVs for milk yield, fat and protein. These are calculated against the current North American dairy flock averages but are expressed in the same units you would use to measure those traits. For instance, if the ewe has a +30 EBV for milk, that means the ewe is estimated to have the genetic potential to produce, over the year, 30 kg more milk than the N.A. flock average. The same principle applies for protein and fat yield.

EBVs are meant to give you useful data to aid in making breeding and culling decision in your flock. The amount of emphasis you put on the numerical values is up to you. The combination of actual milk performance information and EBVs should allow you to quantify the value of each individual ewe. Essentially, an EBV for any particular dam is an estimation of her ability to pass on traits of value to her offspring. For instance, if a dam has a milk EBV of 30 kg, you would estimate that she would pass half of that ability, 15 kg over the breed average, onto any of her daughters (the other half of course coming from the chosen sire).

An EBV is a performance estimate or prediction for the progeny of a ewe or ram, and *not* of their own performance (which will be highly influenced by the environment and management system of the farm she is producing on). EBVs increase the accuracy of selection for superior performance. Typically, only a small portion of the differences between two sheep for a specific trait is genetic. The rest of the differences are due to management, environment, and chance.

The purpose of EBVs are to bring all the dairy sheep within the Genovis system onto a common platform so that those making selection decisions can know they are comparing like with like regardless of the system or location the animals are producing in. It is important at this point to remember that each parent contributes half the resulting lamb's genetic make-up.

This performance estimation measures the parts of the animal that the eye cannot see. An animal's physical appearance (phenotype) is determined by two components, its genetics (genotype) and non

genetic or "environmental" influences. EBVs measure this genetic component and allow dairy sheep within the Genovis system to be compared, excluding their management and environment. The key point here is that what you see is not necessarily what you get!

In general, how are EBVs calculated? Data collected on each ewe is entered into a computerized database program. The actual production is first adjusted for known, non-genetic influences – such as the age of the ewe, the system for rearing of lambs, and number of days in milk – to remove systematic, non-genetic effects on performance. The adjusted performance for each animal is then compared to the average production of a group of contemporary animals (i.e., other North American dairy ewes in the Genovis system). The system then combines the performance record for each animal with the performance records of all its relatives, and weights the relative's information in proportion to how closely the animals are related. Again, all records are expressed in relation to their contemporary groups to remove non-genetic differences (among years, flocks, and so forth) in average performance. Finally, the numbers are adjusted for the heritability of each trait and the numbers of records available. The resulting EBV is the best estimate of the true genetic merit of any individual animal for any specific genetic trait measured. While the mathematics of EBV calculation are complex, the result is a straightforward reflection of the actual performance of the individual and its relatives, expressed relative to their contemporaries (other dairy sheep being performance recorded in North America).

What affects the accuracy of EBVs? The accuracy of the EBVs of a breeding ewe or ram increases with the number of offspring raised in good contemporary group structures, and also increases with the number of flocks where the breeding ram was used as sire. Accuracies of maternal trait EBVs increase with the numbers of daughters that have production records. The EBVs of a sire with 300 offspring in 5 flocks will be more accurate than a ram with 20 offspring in one flock. The accuracy of a ewe's EBVs increases with the number of lactations she has, but not nearly as fast as they do for breeding sires.