

Dorset NSIP Notebook

December 29, 2008

Number 9

David Notter
Department of Animal and Poultry Sciences
Virginia Tech

The 2008 Dorset Genetic Evaluation

Introduction

The US National Sheep Improvement Program (NSIP) is pleased to release this summary of the 2008 Dorset genetic evaluation. This year's report again included ewe producing abilities for weaning weights and percent lamb crop. Also, as discussed in detail below, the genetic base for EPDs has now been fixed at the mean of all lambs born in 1996 to allow a clearer understanding of the zero EPD point for each trait.

The 2008 Dorset Data

Seven Dorset flocks, including three from Michigan and one each from Massachusetts, Pennsylvania, Wisconsin, and Virginia, submitted data for the 2008 genetic evaluation. Records were received on 301 breeding ewes and 453 live lambs born after May 1, 2007. After editing, the numbers of valid records received for each trait in the current year, the total number of records in the database for each trait, and means for each trait are shown in Table 1. Weaning weights were adjusted to a twin birth and rearing, adult dam, and ewe lamb basis. Postweaning gains were not adjusted, but male and female lambs were placed in different contemporary groups. Postweaning weights at 120 days of age were calculated as the sum of the 60-day weaning weight plus 60 times the postweaning average daily gain. Litter sizes were adjusted to an adult ewe basis.

Table 1. Final numbers of valid records and trait means for 2007-08 lambs and in the total database

Trait	Number of records in:		Mean
	2006-07	Total	
60-day weaning weight, lb	319	5,930	53.6
Postweaning average daily gain, lb/d	137	2,007	0.71
120-day postweaning weight, lb	137	2,007	96.4
Litter size	279	4,595	1.85

For 2008, EPDs were calculated for a total of 10,051 Dorset animals. While many of these animals are no longer active, their pedigree connections with currently active animals still contribute to current EPDs. Mean EPDs for each trait for Dorset lambs born after July 1, 2007 are shown in Table 2. For 2008, the genetic base (i.e., the zero EPD point) for the Dorset EPDs has been set at the average of all animals born in 1996, and the zero EPD point corresponds to the average genetic merit of these animals. This change will cause some change in the absolute values of the reported EPDs, but should not affect the relative rankings of the animals. Further discussion of the rationale for this decision and the significance of the genetic base are discussed below in the section on "Specification of the Genetic Base for EPDs".

Table 2. Mean EPDs for 2007-08 Dorset lambs

Trait	Mean EPD
60-day Weaning Weight	0.34
60-day Maternal Milk	0.00
60-day Milk plus Growth	0.15
120-day Postweaning Weight	0.70
Litter size	0.00

EPD Reports

Each participating breeder will receive a spreadsheet containing EPDs for all animals in their flock. Animals in the spreadsheet will be listed in the following order:

- Breeding ewes
- Ewe lambs
- Breeding rams
- Ram lambs

The listing should contain all breeding animals listed on the preprinted data entry spreadsheet and all surviving lambs from the current lamb crop. Animals that were culled or died will be identified; EPDs will be provided for these animals, but they will not appear on next year's inventory spreadsheet.

Ewe Producing Abilities for Weaning Weight and Percent Lamb Crop

This year's genetic evaluation report again provides listings of ewe **producing abilities** for weaning weight and percent lamb crop. These producing abilities are calculated only for ewes that have weaned lambs (for weaning weight) or produced litters (for percent lamb crop). The producing ability of a ewe is an index of her expected future performance as a commercial ewe. This is in contrast to the EPDs, which predict the genetic merit of future offspring. The two measures are clearly related, but differ in subtle ways and clearly differ in the way they should be used. The material below is repeated from last year's Dorset NSIP Notebook and discusses the definition and use of ewe producing abilities.

Most of you are already familiar with the EPDs. The EPD measures the expected performance of offspring of an individual. It is derived from measurements on the animal itself, its relatives, and, particularly, its progeny. It is clearly the best indicator that we have of the genetic merit of the individual. All animals have EPDs. Those of baby lambs are based on the performance of their parents, and can be calculated at birth. The initial EPDs are then updated as the individual has offspring or as more records accumulated on other related sheep. Selection to improve the genetic merit of the flock should clearly be based on EPDs.

In contrast, the producing ability uses only previous records of individual ewes to predict their future performance. Records of relatives and progeny are not considered. The producing ability includes both genetic and nongenetic effects, and is thus less useful than the EPDs as a tool for genetic improvement. However, the producing abilities are quite useful as a culling tool to remove ewes with low predicted future performance or as a merchandising tool in selling adult ewes for breeding in commercial flocks (where current performance may be more important than progeny genetic merit). Only ewes that have produced lambs can have producing abilities calculated.

Producing abilities and EPDs are clearly related. This is most easily seen by comparing the EPDs and producing abilities for percent lamb crop. Producing abilities spread out more than EPDs. This happens for two reasons. First, the EPD represents only the sample one half of the animal's genes that are transmitted to its offspring, whereas the producing ability reflects the full genetic merit of the ewe. Second, the producing ability includes nongenetic, but repeatable, effects that may influence ewe performance but not be transmitted to her offspring. Thus we find that ewe producing abilities for percent lamb crop are often approximately twice the EPD, but are not exactly twice the EPD because of the additional influence of the nongenetic effects.

For weaning weight, the producing ability includes twice the maternal milk EPD, the weaning weight EPD, and nongenetic permanent effects on mothering ability. To understand some of the reasons why EPDs and producing abilities may differ, consider a ewe with high genetic merit for maternal milk, but that experiences mastitis as a ewe lamb, with associated permanent damage to her udder. Her genetic merit is unaffected by the disease, but she will never give as much milk as she otherwise would and the future weaning weights of her lambs will suffer. Thus her producing ability may not be very good; her lambs will not be very heavy because of the damage to her udder. But her genetic merit is unaffected and her daughters are still expected to milk well. In order to decide what to do with such a ewe, you will have to

study your priorities. If sale of heavy commercial lambs is a priority, you will react to her low producing ability by culling her out of the flock. But if production of breeding stock with high genetic merit for milk production is a priority, you may choose to keep her around.

Just remember: EPDs are the best indicator of the expected genetic merit of future progeny and selection on EPDs will result in the most rapid genetic progress. Selection on producing abilities will assist in removing less productive ewes from the flock and in maximizing short-term (i.e., next year's) performance of the ewe flock but will not maximize long-term genetic improvement. Practical selection decision will consider both pieces of information, depending on your own production and breeding priorities.

The 2008 Dorset Sire Summary

In order to be eligible for the Sire Summary, a ram must have at least five progeny with weaning weight records or at least 10 daughters with litter size records. Rams listed in the Sire Summary must also have a prediction error of not more than 1.5 pounds for weaning weight, 2.0 pounds for 120-d postweaning weight, or 1.1 pounds for maternal milk. The 2008 Dorset sire summary contains EPDs for 65 sires. Of these, 19 met accuracy requirements for listing and were born after July 1, 2000.

Genetic Trends in the Dorset Breed

Patterns of change in Dorset EPDs since 1996 are shown in Figure 1. These results document the traits that have received emphasis in participating Polypay flocks. Each point represents the average EPD of all animals born in each year. We chose to use 1996 as the reference year because several of the participating NSIP Dorset flocks are relatively recent enrollees, because 1996 represents the year when we first introduced across-flock EPDs, and because 1996 is currently used as the genetic base. Thus all EPDs have a mean of zero for 1996 and genetic trends are represented relative to this base. Results before 1996 were generally inconsistent relative to more recent genetic trends.

Body weight EPDs show a clear upward trend, but have considerable variation from year to year, mainly because of the relatively small numbers of animals and participating flocks. Maternal milk EPDs have not changed much over time, and, when combined with weaning weight EPDs, result in only a modest positive trend in milk + growth EPDs. There seems to be a negative trends in percent lamb crop EPD, but the scale of the change (at most approximately 1.5 lambs per 100 lambings from 2002 to 2007) is small. However, these results suggest that NSIP Dorset breeders are placing little emphasis on increasing prolificacy.

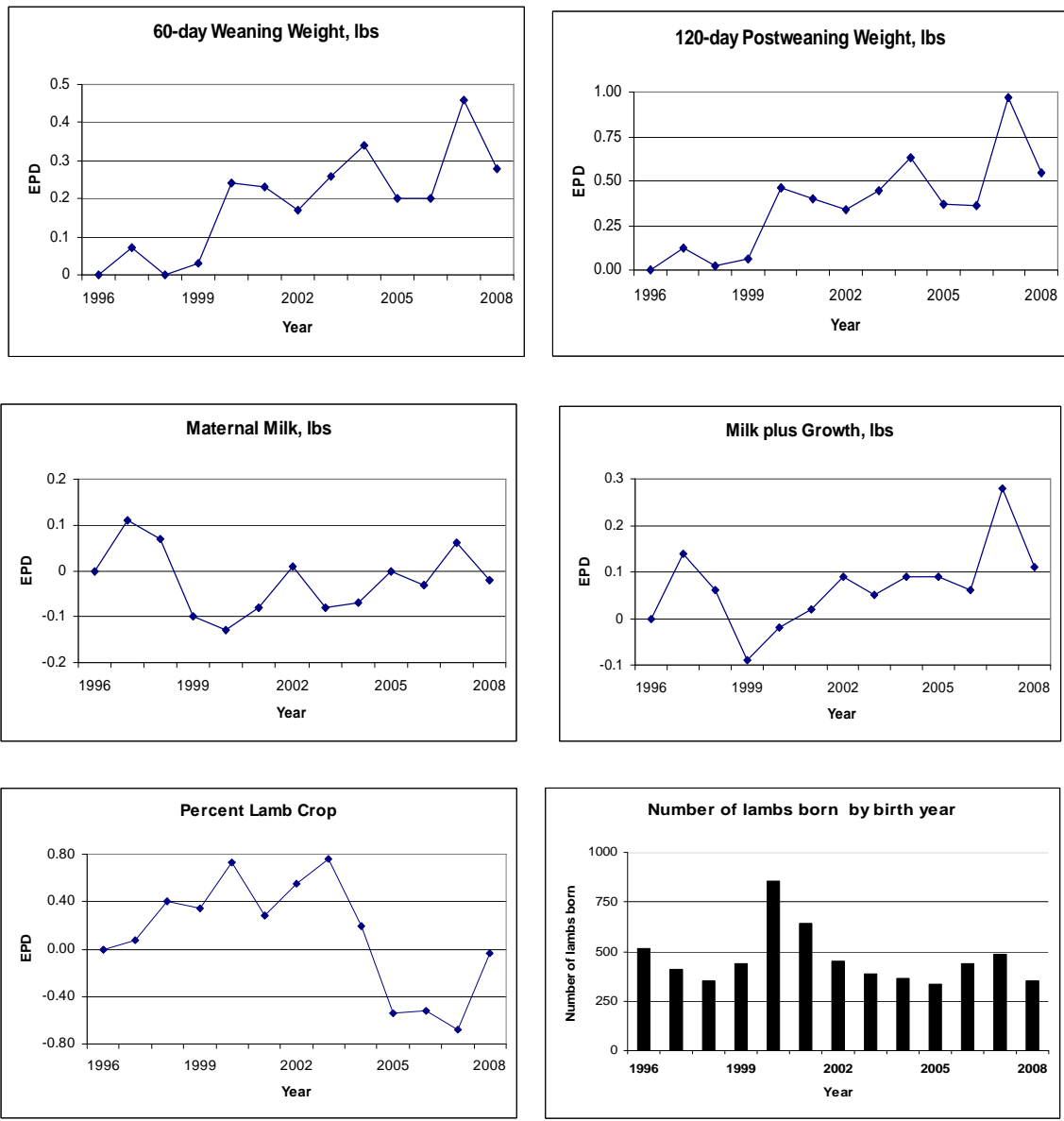
Specification of the Genetic Base for EPDs (or, What Does an EPD of Zero Really Mean??):

This issue revolves around the scale used to express EPDs. By the traditional definition, an EPD of zero is supposed to be 'average'. But if you look at the genetic trends for your breed in this Notebook, it is clear that for most breeds and most traits, an EPD of zero is certainly NOT average any more, or is at least not average for today's lambs. So if an EPD of zero is supposed to be 'average', we are led to ask: **the average of what?**

As the EPDs come out of my computer, a zero EPD has a clear meaning. It is the average EPD of the 'founder' animals, and a founder animal is any animal that does not have parents listed in the data. This set of animals that defines the zero EPD point is called the **'genetic base'** for the EPDs.

Thus on the day you first inventoried your flock in NSIP, your founder animals were either the sheep you first put on inventory or, more likely, the sires and dams that you listed for those first animals. But after that it gets complicated. If you bought a ram last year from a non-NSIP flock, he is a founder too, even though he may have entered your flock 20 years after you first enrolled in NSIP. And every time a new flock enrolls, many of its animals become founders and their EPDs become a part of the average that defines the genetic base. So if newly enrolled flocks are inferior to existing flocks, those new flocks dilute the genetic base, 'zero' becomes a little lower than it was before, and the EPDs for the established flocks go

Figure 1. Genetic Trends in NSIP Dorset Flocks



up a bit. If newly enrolled flocks are in some cases superior to existing flocks, then 'zero' goes up a bit, and the EPDs of established flocks edge downward.

For making breeding or purchasing decisions, the genetic base is not an issue. You pick among candidates for purchase or breeding based on the differences in EPDs among the sheep on offer. Pick the best ones, regardless of whether their EPD is +1 or +100. However, you do need to know the average EPD of the currently available sheep. If the average weaning weight EPD for the 2008 lamb crop is +1.0 and the ram you are considering buying is +0.5, then that lamb clearly has an EPD that is below the current breed average. The fact that his EPD is positive only tells you that he is better than the breed **used to be a few years ago** (for whatever that's worth). So when you look at sheep to buy or use, you really only need to know two, or maybe three, things: what is the animal's EPD, what is the current breed average, and,

perhaps, what is the current breed range in EPDs (so you can tell how far above, or below, average the animal really is).

NSIP Polypay breeders have recognized the importance of expressing EPDs relative to current performance level for the past several years, by consistently showing EPD averages for the current lamb crop. Beginning this year, the mean EPDs for each trait in the current lamb crop will be included in all NSIP Notebooks.

So the genetic base doesn't really matter too much, but we still have to have one. We can take the default base that comes out of my computer, or we can set something else as the base. The most commonly used 'something else' is the mean EPD of lambs born in some specified year. Beginning this year, the genetic trend graphs provided to most of the established NSIP breeds will have the genetic base (the zero EPD point) defined as the average of all lambs born in 1996. I chose 1996 because that was the first year we produced across-flock EPDs, and the genetic trends before that time were quite flat. So for most breeds, 1996 was the year when NSIP flocks really began making measurable genetic change. Thus for most breeds the 1996 EPD on the genetic trend lines is now zero for all traits.

In contrast, the Targhee breed decided to use a 10-year rolling average genetic base. For 2007, the genetic base was the average of all lambs born in 1996. This year the base was updated to the average of all lambs born in 1997. With that base, the actual value of an EPD includes the impact of the past decade of selection.

There is no magic 'right' way to set the genetic base. As long as NSIP is growing, new flocks can affect the base, but as the number of new flocks declines in proportion to the number of existing flocks, that impact will decline. Each breed is encouraged to discuss how they wish to define their genetic base, and we will be happy to discuss the issue in greater detail with the breed coordinators. For now, unless an alternative decision is made by individual breeds, the genetic base will remain at the average of the 1996 lamb crop.

Submitting Data for the 2009 Lamb Crop

Each NSIP Dorset breeder will receive a new, preprinted data entry spreadsheet for reporting data from your next lamb crop. All active animals in each flock, including breeding ewes, ewe lambs, breeding rams, and ram lambs will be listed in a single spreadsheet. The spreadsheet will be arranged in sections corresponding to the different classes of animals.

Use of the preprinted spreadsheet to report data is mandatory. Errors in animal identification (birth dates, tags, registration numbers, parents) can be corrected as needed, missing data can be added, and newly registered animals can have their registration numbers reported. The objective is to avoid recopying animal identification information from year to year. In this way, we will know that reported changes in animal identification information do represent corrections made by the producers. Newly purchased animals can be added at the bottom of the spreadsheet with identification information and performance records. There is still substantial missing pedigree information on the spreadsheets. **It is critical that missing registration numbers and birth dates be added whenever possible.**

The preprinted data entry spreadsheet for next year will be divided into the following four sections.

Section 1: Breeding Ewes. The breeding ewe section will include all active, adult ewes. An active, adult ewe is defined as a ewe that appeared on last year's data entry spreadsheet and was not identified on that spreadsheet as having been culled or died. This section should include the complete adult ewe inventory for the flock on the date you submitted your records for last year's lamb crop.

Section 2: Ewe Lambs. This section will include all ewe lambs from last year's data entry spreadsheet that were not listed as sold or died on that spreadsheet. This section should thus include all your replacement ewe lambs from this year as well as ewe lambs that had not yet been marketed at the time you

submitted your records. It is important that you report accurate disposal codes for these ewe lambs. First, it will ensure that ewe lambs that have died or been sold are removed from inventory. Second, it will allow us to add your replacement ewe lambs to your active breeding ewe inventory. Also, it is important that you take this opportunity to update registration information on ewe lambs, including both those you kept and those you sold for breeding. Many of this year's lambs were not yet registered when their records were sent to NSIP. Registration information is critical to the across-flock analysis, both to provide accurate animal identification within flocks and to document the genetic ties between flocks that are necessary for the across-flock analysis. Therefore be sure to always add new registration information to the data entry spreadsheets.

Section 3: Breeding Rams. This section will include all active rams that appeared on this year's inventory and were not coded as having been sold or died. The identification of "active" rams is more difficult than the identification of active ewes. We require that all rams used to produce lambs on your farm be placed on your inventory, but in some cases (borrowed or leased rams, AI) that ram may not be physically located on your farm. If you remove him from inventory, you will no longer get EPDs for that ram on your flock EPD reports. So we have instituted the following guideline for defining an "active" breeding ram. **If you want to continue to have EPDs listed for a given ram, even if he has died, been sold, or is otherwise not physically located on your farm, leave him as an active breeding animal (that is, do not enter a disposal code) on the data entry spreadsheet.** If, at some point in the future, you are no longer interested in getting EPDs on a ram, then insert a disposal code and he will no longer appear on your flock EPD list. Next year's data entry spreadsheet will likely contain several rams that you no longer care about, and may have some rams missing that you do want EPDs on. So next year, be sure to add missing rams to inventory, and put in a disposal code for rams that you no longer care about.

Section 4: Ram Lambs. This section will include all ram lambs from the current data entry spreadsheet that were not listed as sold or died. This section should thus include all your replacement ram lambs from the current lamb crop as well as ram lambs that had not yet been marketed at the time you reported records on this year's lambs. As for the ewe lambs, it is important that you report accurate disposal codes and update registration information for these ram lambs. As for the breeding rams, if you want to continue to see EPDs on a ram lamb that you sold or own in partnership, just leave him as active on the spreadsheet.