The Lesson of Freckles
Adjusted Weights, EPDs and the Mystery of Motherhood

By Richard Gilbert

My wife and I waded into a pen of baaing ewe lambs inside a barn on the Getz Farm outside of Springfield, Ohio. We were buying lambs to expand our sheep flock. We had no records to guide us — no lamb weights to indicate growth rates, no production records of their mothers, not even ear tags to indicate a lamb’s parentage.

In the waning days of the Getz Farm, home to sheep and shepherds for three generations, there was little information concerning the animals that made up what might be the old farm’s last lamb crop.

Farmers often are too busy, or too overwhelmed at key points, to record data for later analysis. Or their smudged notes, scrawled in the heat of battle and jammed onto a rusty nail in the barn, have become almost useless when retrieved months later from the cobwebs and dust.

Without information, we were guessing which ewe lambs would mature into productive ewes. We were evaluating the lambs by appearance and mostly by size.

This is the poorest way to select sheep — or any other livestock for that matter — and the most common. People gravitate to big animals. Some people develop an eye for good conformation. Unfortunately, conformation is of minor economic importance compared with maternal performance. The vital traits of fertility, prolificacy, and mothering ability cannot be appraised visually.

The most profitable ewe in a flock might be sway-backed, narrow-bodied, and cow-hocked. She might be big, little, or medium-sized. She is probably average looking, with decent conformation and high maternal ability that came together through random genetic assortment — chance. She might also have a straight top line and pleasing proportions, the reward for decades of breeding effort to unite muscling and structural correctness with the qualities of motherhood.

It was early summer. The Katahdin ewes at the Getz farm had lambed in the barn in January and February. Their lambs looked wonderful in comparison to my lambs born on pasture three to four months later. In the end, we bought 12 big ewe lambs that summer afternoon.

Three of the ewe lambs grew into sheep distinctive enough to earn names. “Fancy” was big and flashy; she was chocolate brown with a face marked with a white blaze. “Friendly” was a snow-white ewe, long bodied, with a wide, pink muzzle and an outgoing personality. “Freckles” matured as the smallest of the three, a rather dumpy little ewe in comparison to her flashy flock mates. Freckles had short legs and a big belly; she was white with a spray of black spots across her face.

Bred in early December to the same ram, the three ewes lambed in spring 2001 as yearlings. Freckles lambed first, with twins, a ram and a ewe. Five days later, Fancy had a single lamb, a large ram.

That same morning, Friendly had twins, both rams. I learned in later years to pay close attention to a yearling that twinned and did a good job of raising her lambs.

Multiple lambs are difficult for a yearling to raise because she is inexperienced, still growing herself, and produces less milk than a mature ewe. Most shepherds would rather see a yearling have a nice single lamb. But in order for a flock to achieve a 200-percent lamb crop, about half the yearlings must twin and a few older ewes must have triplets.

Basic sire information for groups of lambs is important to prevent unwanted inbreeding. But of equal importance is knowing how many lambs a ewe gave birth to and how many she raised. This is one of the problems with picking out large and appealing lambs when a ewe’s production is not recorded: The shepherd usually is picking singles nursed by older ewes.

Singletons always grow larger and look nicer but result in less total weight to sell than twins. With typical production costs and meat prices, each ewe must twin in order for the farmer to make money. The first lamb covers the expenses and the second produces profit.

Ewes have two teats and should be capable of raising more than one lamb. Yet it took centuries of selection by shepherds to achieve consistent lambing rates of greater than one lamb from each ewe. That reproductive progress is always in danger of being lost. English shepherd Thomas Tusser (1524-1580), the author of Five Hundred Points of Good Husbandry, wrote a poem

"...We were evaluating the lambs by appearance and mostly by size. This is the poorest way to select sheep — or any other livestock for that matter — and the most common...."
about this to guide the selective breeding of sheep:

Ewes yearly by twinning rich
masters do make

The lambs of such twiners for
breeders do take.

Tuoker captured in his pithy
rhyme an important genetic
insight, as well as what was
economic wisdom even in Tudor
times. Moreover, a moment’s
reflection reveals that keeping
records is the vital step toward
taking his advice. By knowing
his ewes well and recording their
production as they lambed (and
probably by some means of mark-
ing their offspring), the wise shep-
herd of antiquity retained lambs
that would grow into fertile and
prolific ewes.

Freckles, Fancy, and Friendly
raised all their lambs their first
time out. I had tagged all my
lambs at birth and knew which
lambs went with which ewes; I
knew which ram had sired which
lambs. My system was
simple but effective.

In the pasture, I car-
rried in my shirt pocket
a small, spiral-bound
Oxford notebook with
thick, notecard pages and
recorded ewe birthing
dates, the tag numbers
and sex of lambs, and
sire information. I also
gave a mothering score
to each ewe.

In the fall, I tried to
evaluate the lambs, to
determine which ewe
lambs to keep and which
to sell. I know this, be-
cause I filled six lined notebook
pages with notes—tag numbers
and dates and impressions.
There apparently was a system
when the notes were made, but it
is difficult to ascertain now. The
biggest failure was in taking the
weights of some lambs (why not
all?) but failing to record the date
of the weighing.

Knowing the age of lambs at
weighing is very important in
evaluating them, their mother,
and their sire. It would have
been late summer or fall, and I am
sure at the time I did not realize
I would look back at my records
months or years later. In the end,
I kept Freckles’ ewe lamb. But it
was clear my selection process
needed to be more systematic.

As someone interested in
creating more ewes that were doc-
ile, successful mothers, I should
have been taking 60-day weights
from the start. Some backsliding is
inevitable without constant selec-
tion by the shepherd—domestic
animals always regress toward
average and worse performance
without selection pressure.

The three named Getz ewes,
bred to my most promising Ka-
athdin ram, all twinned again in
mid-May 2002. I took lamb birth
weights that year and weighed

I ranked my ewes according
to the total weight of their lambs
on that August day. Ewes in the
top group had one-hundred or
more pounds of lamb. Friendly
was the highest-ranked of the
year 2000-born ewe cohort, with
lambs that weighed 112 pounds
together; Fancy’s twins weighed
103 pounds; Freckles was in the
second rank of ewes with ninety-
ine pounds between her twins.

Mothering differences in the
ewe’s became clearer in April
2003. Friendly lambed first, with
nice twins weighing about nine
pounds each; she paid close
attention to them. Eight days
later, Freckles had her first set
of triplets, a wriggling batch of
newborns that weighed almost
twenty-three pounds.

Two days later, Fancy had
triplets, all ewes, but the biggest
ewe lamb—a whopper weighing
more than ten pounds—died dur-
ing birth. Fancy did not clean her
surviving lambs, which sat on the
ground dressed in a slimy film
of placenta. Fancy was uncon-
cernedly grazing near the sod-
den twins when I came upon
the scene.

Freckles had really begun
to shine. Her mothering abil-
ity was impressive. Unlike
Fancy and her ilk, Freckles
never seemed to have a lost
lamb crying for her in the far
corner of a paddock. Freckles
and her brood moved together,
as if welded.

Some ewes that had trip-
lets tried hard to raise them
but failed. Those ewes did
not appear able to keep track of
three lambs, or they lacked other
mothering skills, or they did not
seem to have enough milk. Other
ewes would reject a triplet, or pas-
sively allow it to fall behind and
die, without my intervention.
Triplett lambs are smaller at birth than twins, and often the smallest triplet will not get enough milk; its stronger siblings shove it aside and take the teat. For these reasons, many shepherds want only twins. Triplets, overall, are a management headache in many farm situations. Often a triplet gets pulled off the ewe and raised artificially—but bottle babies are a lot of labor and need expensive milk replacer.

I was not sure I wanted a lot of triplets, but I knew I wanted more ewes like Freckles. If a ewe had triplets, I wanted her to raise them. I could not imagine Freckles rejecting a lamb. Moreover, she seemed to look out for all of her triplets equally. Freckles sailed through motherhood.

When I took 60-day lamb weights, Freckles’ triplet litter weighed 99 pounds. I still had not learned how impressive that accomplishment was on pasture with no creep feed for the lambs. At the time, I admired Friendly’s big twins even as I praised Freckles’ amazing mothering ability. Friendly’s twins, a ram and a ewe, together weighed 94 pounds.

Fancy’s twins weighed 75 pounds, but to make up for her dead lamb I had grafted to her an additional lamb that weighed in at 24 pounds. So she was raising triplets, and her litter totaled 99 pounds.

But it appeared to me that Fancy may have rejected the drafted lamb, which had learned to steal milk from other ewes to survive. I had clouded the picture in being able to evaluate Fancy and was unwilling to give her full credit or blame. She was on probation.

By early August, Freckles’ triplet litter weighed 138 pounds, beginning to show the income advantage that accrues to triplets even when the lambs are smaller individually (her largest lamb, a 49-pound ewe, weighed 10 pounds less than Friendly’s ewe lamb). Friendly’s twins weighed 128 pounds; her ram lamb was particularly nice at 69 pounds.

One of the first breakthroughs in attempting to deal with the challenge of making fair genetic comparisons between ewes was the use of “adjusted weights.” The idea was to figure out a way to compare lambs that were born on different days, whose mothers were of different ages, and whose gender was different.

On-farm programs for the improvement of sheep in the United States were initiated at the University of Wisconsin in 1950, with an extension specialist hired to conduct the program. Research had shown that weight adjustment for type of birth, age of dam and age of lamb at time of weighing would improve selection accuracy by one-third over selection using unadjusted weights.

This method of leveling the playing field allows a shepherd to compare the dainty ewe lamb raised by a yearling mother to the husky twin lambs, a ram and a ewe, raised by a four-year-old ewe in her prime. Without adjustment, most likely the shepherd picks the lamb from the older mother, even though in one year the yearling’s lamb will be the same size, or larger.

The yearling’s lamb may become a more productive ewe. In fact, if the shepherd has been making genetic progress, the yearling should be a better ewe than the four-year-old ewe—and her lamb will be better still. But there’s that size difference: Even a five-pound disparity between two lambs makes a huge difference in how lambs appear at a young age.

First published in 1970, the Sheep Production Handbook of the Sheep Industry Association is the most complete standard reference for shepherds and lists formulas necessary for adjusted weights. The first step is to correct the weaning weight to a standard age, in this case 60 days.

The adjusted age is used with corrections for ewe age, breed of ewe, birth and rearing type (for example, twin-born and twin-raised Katahdin) and the gender of the lambs to give the adjusted weight. Ram lambs and ewe lambs have different adjustment factors, because males grow faster. The written formula for adjusting weights is easy to use if followed step-by-step.

I used this assessment method to compare Freckles’ 2003 triplets to Friendly’s twins of the same year. At the 60-day weighing point, Freckles’ triplet litter weighed 99 pounds on my scale. Friendly’s older twins weighed 94 pounds.

What were the adjusted litter weights? Adjusting for the age of the lambs was important here, because Friendly’s lambs were eight days older. Adjusting for the type of rearing was even more significant—triplets vs. twins—and an adjustment needed to be made as well as for the gender of the lambs.

The result was surprising, given the actual weights and the pleasing appearance of the stocky twins: Freckles’ adjusted litter weight was more than 120 pounds. Friendly’s comparable total was 87 pounds.

But farmers sell actual pounds, not adjusted pounds, and the actual weights were very close. Still, Freckles produced a five-pound advantage at 60 days, which means her smaller lambs would
It goes against human nature to believe the numbers instead of the eyes.... Many farmers steadily lose productivity in their livestock because they will not collect, use, or believe records.

The result of this analysis is a report that lists a numerical value for each trait. These “expected progeny differences,” commonly called EPDs, are the expected difference between the performance of an animal’s progeny and the average performance for all the animals in the breed.

With an EPD of zero being average, a 60-day EPD of plus one pound means that the animal is expected to be a pound heavier than average at that age. The animal would be expected to pass along half of this enhanced growing ability, on average, to its offspring.

These may seem like small amounts, but pounds add up. If each ewe weans, on average, an additional ten pounds worth even ten dollars more, a farmer’s income will leap—especially if he has hundreds of ewes or thousands of ewes. These small increments also will compound over the years. Making 10-percent more accurate selection choices each year for 10 years will increase profit and the genetic value of breeding stock.

An Australian study showed that informed selection of maternal sires to increase the ewe flock’s fertility, prolificacy, milking ability, and transmission of growing ability and carcass traits could actually increase the return per ewe
The sad fact for livestock breeders is that most differences between two animals being compared are due to environmental factors, not genes. Again, what one sees is not what one gets. For instance, less than 25 percent of the size variation between two animals at weaning is said to be due to genetic differences.
1980s. By 1985, BLUP technology had become indispensable for many seedstock breeders. BLUP excels at measuring outputs—weight on the scale and milk in the bucket. Where are such vital traits as fitness for a given environment—survival—and mothering ability?

In 1985, a researcher at the U.S. Sheep Experiment Station in Dubois, Idaho, analyzed ewe behavior between the birth process and first nursing. He identified 17 distinct behavior patterns. From the time a lamb hits the ground, and maybe before, the lamb and the ewe are communicating—or not. The soft grunts of the ewe, the bleats of the lamb, eye contact, body language, and the ewe licking the lamb all must come into play. But 17 things going on—before a lamb even nurses? Amazing.

"Further studies are needed before effective selection criteria can be established. In the meantime, docile, easily handled, easy care ewes that produce heavy litters will be profitable and should be favored as parental candidates for generating future . . . flock replacements," wrote Ohio sheep geneticist Charles Parker, Ph.D., in a paper that cited the DuBois study.

He had described Freckles, Fancy and Friendly were more impressive looking. A sheep judge would favor them over Freckles. But Freckles ovulated and mothered like mad. I looked at her numbers. How was she able to raise decent lambs with below-average milk production and growth to impart?

According to Jim, the NSIP experts and their computers would try to quantify her maternal performance. At least one graduate student was on the case. The peak of 20th-century genetic knowledge and computing power was being brought to bear. BLUP was gearing up for its encounter with Freckles, who chewed her cud without apparent concern.

Spring 2004 arrived. On April 11, Freckles delivered another set of triplets, two rams and a ewe. As always she was attentive. Her newborn lambs weighed just under 25 pounds.

Three days later, Friendly and Fancy lambed. Friendly gave birth to a single lamb. That was not good, not good at all, for one of my biggest four-year-old ewes to single.

Fancy had triplets, beautiful ewe lambs weighing almost 25 pounds. I wrote on her card, "An indifferent mother." Indeed, Fancy soon rejected one of her ewe lambs, forcing us to raise "Juno," as my daughter named her, on the bottle.

During that growing season, I thought about Freckles' poor ranking as I watched her raise triplets as easily as Friendly raised her single lamb. The vision of a flock of Freckles clones came to mind.

I talked to Jim and gave him a hard time. "If a person had a whole flock like Freckles, he would make a lot of money," I declared. "They would all have triplets, never reject a lamb, never lose a lamb. They would be smaller ewes, so you'd breed them to Texel or Suffolk . . ."

Jim did not have a lot to say. I was beating a dead horse. The answer was more obvious to him than it was to me: growth EPDs are one measure. Mothering ability is something else.

"He had lost sleep over this, over using the same kind of EPDs for Katahdins as are used for Suffolks. "We may have the ewe productivity EPD this year," Jim said. "Freckles may look different then."

Dr. Parker was a long-time advocate of such an EPD. He had revised Tusser’s 450-year-old poem, which advises shepherds to pick replacements from twins, to read:

*Ewes yearly twin raiser rich masters do make.*

*Lambs from such raisers for breeders go take.*

He had described Freckles, again—except she had the ability to raise triplets successfully. In late summer, Jim emailed me an Excel file with growth and milk EPDs—and the new ewe productivity EPDs.

Freckles' growth and milk EPDs were still mediocre. Then I sorted the data for my ewes and lambs based on the new pounds-of-lamb-weaned EPD: Freckles was number one in the flock!

She would be expected to wean more than three pounds of lamb above average, this EPD predicted. That number would jump the next year to +5.5 pounds. Moreover, her daughters would be expected to wean more pounds of lamb than average.

Freckles was vindicated. I was embarrassed. I had known by observation and data that Freckles was an amazing mother. I had under-valued her because she was not large. And, on easily quantified traits in isolation, she was one of the worst ewes in the flock.

Evaluated in terms of her repeated success, using an index that rewards ewes for weaning more lambs, Freckles looked a lot different. This composite measure fosters selection for excellent maternal behavior, lamb vigor, optimum prolificacy and potentially even disease resistance. In short, an index can help select for biological fitness and profitability for a given production system.
Without explaining the mystery of Freckles' mothering ability, the computers rewarded it by quantifying her true value: the potential to produce more pounds of lamb than any ewe in my flock.

The beautiful Fancy? She ranked 29th. Friendly, penalized for having a single lamb in her prime, ranked a dismal 127th.

Freckles showed me how easily humans are misled by the emotional reward of bigger animals and bigger numbers. Bigger is not better, not unless it succeeds in the larger context. For animal exhibitors, the show ring is the larger context, the purple ribbon the reward.

For a profit-oriented lamb producer, the larger context is his farm, his production system, his bottom line. For my fescue-covered hills, for rearing lambs on pasture alone, and for bringing in more lambs to sell, ewes like Freckles are what I need.

Freckles has taught me that such ewes are what I want as well.

Freckles raised triplets again in 2005 and twins in 2006. Richard Gilbert works in publishing and takes instructions from Freckles on his farm near Athens, Ohio.