Ultrasound Guidelines Council
Field Technician Study Guide
2012 Edition

Chapter VIII - UGC Partnership in Action

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Purpose

The purpose of this chapter is to outline how ultrasound images collected by UGC-Certified Field Technicians are translated into data and used by UGC-member breed associations to conduct national genetic evaluations for carcass traits.

National Genetic Evaluation

In the US beef industry the term "national genetic evaluation" (NCE) refers to the process of gathering, organizing, and storing performance and pedigree data and then using these data to compute Expected Progeny Differences (EPD). EPD are the "currency" by which the beef industry measures and communicates breeding value, which geneticists define as the genetic merit of an animal as a parent for a specific trait (see chapter IV). The process of NCE is complicated and requires the collaboration of many people and organizations. The statistical computations alone are extremely complex and will not be described here.

Breed associations are generally responsible for NCE within their breed. Some breed associations handle their own statistical computations, while most contract with other organizations or universities for this work. The frequency of a full NCE run (i.e., re-computing all the statistics leading to EPD) varies by breed. Some breed associations run a full NCE as often as every week, while others might only do this once per year.

In the following paragraphs we will attempt to "follow the data" from collecting images chute-side to published carcass EPD, outlining the major steps in the process. UGC Field Technicians do not need to be geneticists, but they should have a reasonable understanding of how NCE relates to their business.

Images to Data

The collection of ultrasound data begins with the beef cattle breeder. The breeder contacts a UGC-Certified Field Technician (UGC Tech) to arrange a scanning date and contacts the breed association to receive a "barnsheet." An example barnsheet is associated with this chapter. The barnsheet includes the registration numbers of all the animals to be scanned and has spaces for the technician or breeder to enter additional data like scan weights, and information that will be used by the breed association to assign animals to contemporary groups – things such as diet, management group, etc. Breed policies regarding barnsheets differ. See chapter IX for more information about breed policies.

Once the cattle have been scanned, the UGC Tech sends the images and the completed barnsheet to a UGC Lab. The lab checks to make sure the barnsheet is complete before the images are processed. Processing the images includes assigning an UGC image quality score to each image,

then interpreting those images that meet the image quality standards (see chapter VI). UGC-Certified Lab Technicians use sophisticated computerized software view and interpret the images. Rib images yield estimates of ribeye area and rib fat depth; rump images yield estimates of rump fat depth, and IMF images yield estimates of intramuscular fat percent. These values are sent to the breed association along with the barnsheet.

Edits

Essentially all data received by the breed association (e.g., weights, dates, scores, ultrasound measures, etc.) are checked for errors before they are entered into the breed's database. Extreme or unusual records or inconsistencies are flagged for further inspection or deleted.

Ultrasound measures are checked to make sure the animals were scanned within the breed specified age-ranges. Research has shown that scans taken within the specified age-ranges yield records that have higher heritabilities than scans taken outside these ranges.

Contemporary Groups

One of the most important steps in the NCE process is the assignment of animals to contemporary groups. The foundation of accurate genetic evaluation is that fair comparisons of phenotype can only be made within contemporary groups. The Beef Improvement Association (BIF) defines a contemporary group as a group of cattle that are of the same breed and sex, are similar in age, and have been raised in the same management group (same location, feed and pasture). In other words, fair and accurate comparisons of animal performance can only be made when all the animals to be compared have an equal opportunity to perform. Without contemporary groups, genetic effects on performance (i.e., phenotype) cannot be distinguished from environmental effects. Hence, records from animals that have no contemporaries yield no genetic information for NCE. The BIF Guidelines include a more thorough discussion of contemporary groups (http://www.beefimprovement.org/library.html).

Breed associations use information submitted by breeders prior to scanning, plus information from the barnsheet to assign animals to contemporary groups. If images collected on some animals are rejected at the lab there will be missing data from those images. If those animals are re-scanned at a later date, without rescanning all their contemporaries, they will not be included in their original contemporary group.

Adjustments

Within each contemporary group, ultrasound measurements are adjusted by the breed association for predictable environmental effects. The most common adjustments made are for differences in animal age at scanning or growth rate. In effect, the adjustments attempt to compare the animals as if they were all the same age, etc. The reason for using adjusted records in NCE is that they have higher heritabilities than unadjusted records.

Pedigree, Carcass and Genomic Data

The goal of NCE for carcass traits is to produce EPD for the actual carcass measurements – i.e., ribeye area, rib fat, and marbling measured in the cooler at the packing plant. These are the true economically relevant traits (ERT), and the ultrasound measurements are indicator traits.

Indicator traits are extremely important to NCE because they provide genetic information about the ERT. See chapter III for more details about ERT and indicator traits.

The statistical procedures used for NCE incorporate information from several sources to compute EPD for carcass traits. Critical to this process is the use of pedigree relationships among animals in the database and the heritabilities of and the genetic correlations among the ERT and indicator traits. Each source of information contributes according to its genetic relationship to the trait of interest. For each animal of interest, the different sources of information (illustrated in Figure 1) include ultrasound records of all relatives in the database (e.g., parents, sibs, progeny, cousins, etc.), actual carcass records of all relatives, and genomic information on the animal. As more information is used to compute an EPD, the accuracy of the EPD increases. Hence, sires with many progeny have EPD with higher accuracies than yearling bulls. See chapter III for a discussion of EPD and accuracy.

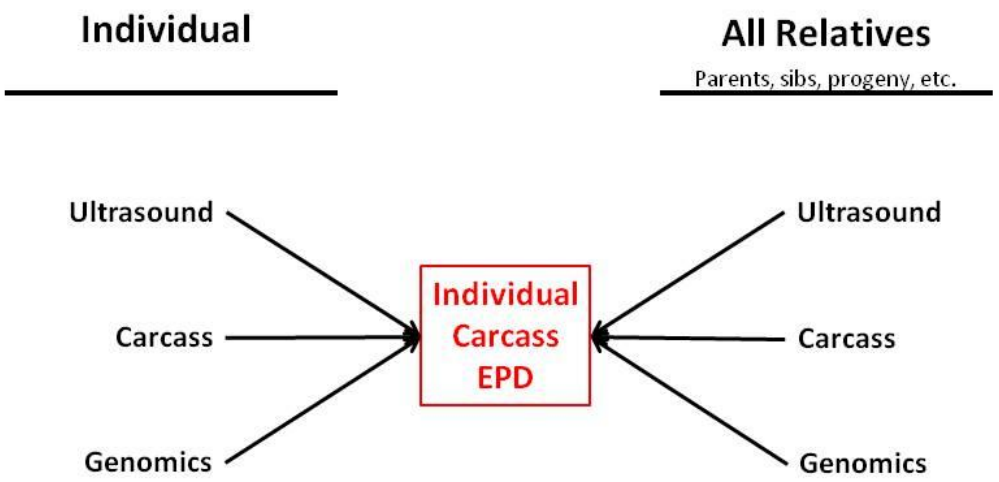

Figure 1. Sources of information used in the computation of carcass EPD

As mentioned above, some breeds complete their NCE statistical runs only one or two times per year. When records are received in between NCE runs, breed associations often compute "interim EPD." Interim EPD are computed from contemporary group performance deviations that are combined with the parent's most recent EPD. Although not as accurate as EPD computed from the full NCE runs, interim EPD provide breeders a way to make early selection decisions on animals prior to the next full NCE run.

Sire Summaries and Breeder Reports

The finished products of NCE are the EPD for the animals in the database. The NCE methodology attempts to utilize the latest science and technology to maximize the accuracy of genetic evaluation. EPD are communicated to breeders electronically and via sire summaries. For ultrasound measurements, breed associations often produce an ultrasound report for the breeder. These reports include both unadjusted and adjusted ultrasound records, within contemporary group trait ratios, and the latest carcass EPD for each animal scanned. Summary data for sires and dams may also be included in the report. A sample report is associated with this chapter.

Teamwork

Figure 2 illustrates the process of NCE for carcass traits using ultrasound data. UGC partners (UGC-member breed associations, UGC Field Technicians, UGC Labs, and UGC Lab Technicians) play critical roles in the successful delivery of accurate carcass EPD to the beef industry.

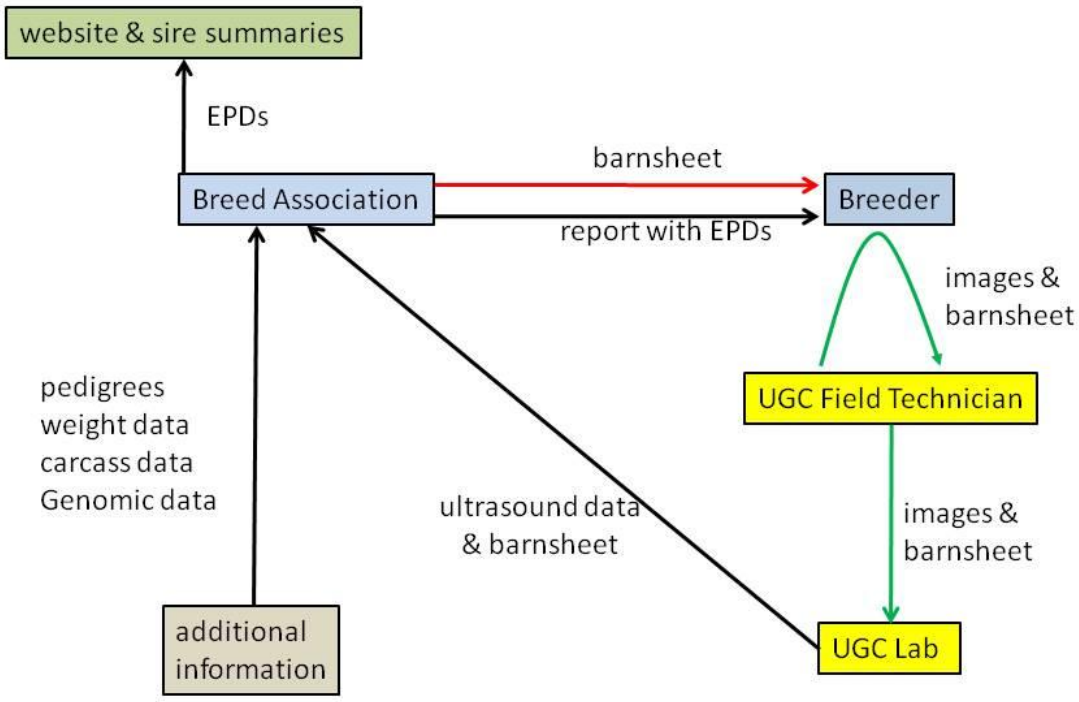

Figure 2. Illustration of information flow in the production of EPD for carcass traits

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