

International Beef Cattle Genetic Evaluation in the United States and the Role of the National Beef Cattle Evaluation Consortium

*K. Darrh Bullock, E. John Pollak, J. Keith Bertrand, Dorrian Garrick,
Mark Enns, Bob Weaber and Doyle E. Wilson*

Currently beef cattle genetic evaluations in the United States are computed by Cornell University (Simmental, Simbrah, Maine Anjou and Chianina), Colorado State University (Red Angus, Braford Red Brangus, Tarentaise, Braunvieh, Romagnola and Santa Gertrudis), Iowa State University (Angus) and the University of Georgia (Beef Master, Brahman, Charolais, Gelbvieh, Limousin and Senepol). Additionally, Australia computes the genetic evaluations for several US breeds. In past years each University conducted their own research and developed their own software necessary to conduct the genetic evaluations. Other than publishing in the scientific literature, there was very little cooperation or sharing of ideas. Each University recruited its own breed associations and generated funds primarily from those associations. In order to recruit or retain breeds the Universities often under priced the research and services they were providing.

Beef Cattle genetic evaluations in the United States is not an ideal model to be copied. Because of the structure discussed above there is very little communication or cooperation, in contrast there is competition and duplication of effort. There has been no direct government funding, although indirectly tax payer funds support the University system, and the association funds have been limited. Additional problems associated with genetic evaluations are that there is no mandatory identification system and many associations do not require whole herd recording.

In 1999 it was recognized by many, and voiced through the Beef Improvement Federation and the Beef Breeds Council of the National Cattlemen's Beef Association, that

this system was not sustainable. The four Universities involved agreed to form a consortium and coordinate their efforts more closely, if funding could be provided. Through efforts from the four Universities, breed associations and individual cattlemen, funding was provided in 2001 from the federal government at a fraction of the requested amount. This funding was increased in 2002 and reached over \$600,000 in 2003.

The National Beef Cattle Evaluation Consortium (NBCEC) has three primary goals: coordinate research necessary for genetic evaluation, both within the member institutions and with other institutions; cooperate on the service aspects of computing genetic evaluations in the form of sharing software or actual computing of evaluations; and education. The educational portion is well underway and has included train-the-trainer programs, direct producer education and literature development. Research at the member institutions has had better coordination, but until this year there were no additional funds for seeking expertise from institutions outside the consortium. This year several other institutions will be sub-contracted for research support. Several pieces of software are currently being shared and there is at least one example of shared evaluation computation for certain traits. There have been growing pains, but the consortium has had successes and continues to build cooperation.

Currently, there are no international projects that are directly funded through the NBCEC. However, Cornell University, Colorado State University and the University of Georgia are currently computing international evaluations and they are certainly

benefitting indirectly. In general the international evaluations in the US are actually US-Canada joint analysis. There are no true international evaluations being computed. The US-Canada evaluations are computed in the same manner as the national evaluations, with assumed homogeneous variance.

The members of NBCEC are very involved in multi-breed evaluations which have some similarities to international evaluations with perhaps more considerations. Each institution has developed their own procedures for multi-breed analysis, but they are similar. For simplicity, Cornell's Multi Breed – International Cattle Evaluation (MB-ICE) will be described in more detail. Cornell's and American Simmental Association's Multi Breed-International Cattle Evaluation (MB-ICE) system is both multi breed and international in scope. The evaluation provides a multiple breed evaluation for the following traits: birth, weaning, yearling, milk, maternal weaning weight, carcass weight, percent retail cuts, marbling, fat thickness, and ribeye area. The new MB-ICE carcass evaluation was just released and is multi-breed and incorporates both carcass and ultrasound data sources. Direct and maternal calving ease Expected Progeny Differences (EPD) are provided for animals with >75% Simmental in a multiple trait model with calving ease as a threshold trait and birth weight as a continuous trait (Y. Zhao *et al.* JAS 66:396-399 and Zhao MS and PhD Theses at Cornell Univ.). A Warner-Bratzler shear force EPD is computed for Simmental and Simbrah sires in two separate evaluations. Daughters' mature weight and height EPDs for Simmental and Simbrah sires (two evaluations) were computed in a multiple trait model with body condition score as a fixed effect and age as a covariate (May 2003, Simmental Register).

Expected Progeny Differences for the American and Canadian Simmental Associations, American Maine Anjou Association, American Chianina Association are produced from the MB-ICE system. The primary breeds of cattle represented in the 5 million record data set aside from Simmental, Simbrah, Maine Anjou and Chianina (Chiangus, etc) are Angus, Red Angus,

Brahman and Hereford. The MB-ICE system for weight traits accounts for breed effects by breed fraction. Major breeds have their individual effect and lesser breeds are grouped together by type. Direct and maternal heterosis adjustments are made to animals records where appropriate by breed fractions and type (breed groups are British, Continental, Bos Indicus, other). Age of dam (AOD) effects (in days of age) are modeled using fourth order regressions, where the regression coefficients are constructed by weighting each of the dams breeds AOD coefficients by her percentage of that breed. For example if a calf is born to a 50% Simmental x 50% Angus dam, the AOD adjustment equation would be 50% of the Simmental AOD coefficient plus 50% of the Angus AOD coefficient. Additionally, the system uses a methodology to correct Adjusted 205 day weights for interactions between age of calf, age of dam and percent Simmental. (B.W. Woodward *et al.* JAS 67:20-27) The system also incorporates external information (EPDs) for Angus and Red Angus sires that have produced progeny included in the MB-ICE dataset. Angus and Red Angus EPDs and accuracies are leveraged using a Bayesian approach to provide additional information about the merit and ranking of those sires in the MB-ICE evaluation.

Colorado State University is computing US-Canadian evaluations for Limousin and Red Angus and multi-breed evaluations for Braford and Red Angus. The University of Georgia is computing US-Canadian evaluations for Charolais, Gelbvieh and Limousin with Gelbvieh and Limousin being multi-breed evaluations.

In summary, the National Beef Cattle Evaluation Consortium was founded to coordinate beef cattle genetic evaluations in the United States and educate producers on the use of the information generated. Member institutions are individually conducting research and developing methodology for international genetic evaluations. Additionally, NBCEC is actively involved in multi-breed genetic evaluations of beef cattle.