ASC-256

Cooperative Extension Service

Comparison of Production Levels Among U.S. Beef Breeds

Darrh Bullock, Animal and Food Sciences

Darrh Bullock / University of Kentucky

Genetic trends for beef breeds, for many traits, are on the move. The genetic trend for growth in most breeds is strongly positive. Maternal weaning weight (milk) on the other hand is breed dependent, with some breeds showing strong selection for increased milk and others slightly reducing their genetic potential for milking ability. For that reason, it is important to monitor relative differences between breeds for various production traits to assist beef producers in their breed selection decisions.

One of the greatest resources the U.S. beef industry has is the USDA ARS U.S. Meat Animal Research Center (USMARC) in Clay Center, Nebraska. This location delivers the primary research on breed differences to monitor how breeds have changed over time. The USMARC Germplasm Evaluation Program began in 1970 and has been monitoring breed differences since inception. This program has evaluated all influential U.S. breeds and many other unique breeds. This program has been the foundation for many of the genetic evaluation programs that include multiple breeds and allow for the computation of their Expected Progeny Differences (EPD). Additionally, the information generated from this program has been adjusted for sire sampling within breed and can be used to see how the breeds compare for various traits. This information can assist beef producers in determining which breeds work the best for their management, market, and production environment.

To assist beef producers in comparing breeds, Dr. Larry Cundiff with USMARC developed an "X" system to show the level of production that each breed had for each trait. Breeds with more X's have higher values for that trait. More X's could be a benefit or a liability depending on the trait and the producer's goals and production environment. For example, more X's for marbling means the average animal in that breed is more likely to reach the Choice Grade, while having more X's for fat thickness indicated lower yielding carcasses. This system enabled producers to easily make comparisons of breeds without getting bogged down in specific values. The last time Dr. Cundiff updated the table was in 2003, and he retired in 2007. Since that time, breeds have gone through significant changes and more traits have been studied in the USMARC germplasm program. Table 1 is an updated version of Dr. Cundiff's original work and reflects current breed differences with additional traits. For specific values reported by USMARC, and other studies, please see Table 2. As an example, Angus were once considered a moderate growth breed, but substantial changes in how they compare to other breeds for growth traits can be observed. They are now one of the largest mature weight and highest growth breeds, while maintaining lower birth weights and high marbling. Their carcasses also tend to be fatter and lighter muscled compared to many other breeds at similar ages of slaughter.

Understanding breed differences for various traits can help guide beef producers in their breed selection decisions and help guide seedstock producers in making selection decisions to improve their breed for various traits. This information reemphasizes the point that there is no perfect breed—each has their plusses and minuses. Also remember, there is much variation within breeds, so many animals will not fit this general description and final selection decisions should be made based on an individual's performance measures (EPD). These data can serve as a guide for commercial beef producers in deciding which breeds to use in crossbreeding programs, allowing comparisons of strengths and weaknesses in various traits.

Table 1. Relative Breed Differences for U.S. Beef Breeds.

Breed*	Birth Wt. (lb)[1]	Weaning Wt. (lb)[1]	Yearling Wt. (lb)[1]	Mature Wt. (lb)[1,2]	Maternal Milk (lb)[1]	Marbling Score[3]	Ribeye Area (in^2)[4]	Fat (in)[5]	Carcass Wt.(lb)[1]	Lean to-fat[6]	BCS[7]	FE Index Steer[8]
Angus	XX	XXXX	XXXXX	XXXX	XXXX	XXXXX	XX	XXXXX	XXXXX	X	XXXX	XX
Beefmaster	XXX	XXX	XXX	XX	XX						XXX	XXXXX
Brahman	XXXXX	XXXXX	XXX	XXXX	XXX	X	XX	XXX	XX	XXX	XXXX	XXX
Brangus	XXX	XXX	XXX	XXX	XXXX						XXX	XX
Braunvieh	XXX	XX	XX	X	XXXXX	XXX	XXXX	XX	XX	XXXX	X	XXX
Charolais	XXXX	XXXX	XXXX	XXXX	XXX	XXX	XXXX	XX	XXXX	XXXX	XXXX	XXX
Chiangus	XXX	XX	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXXX
Gelbvieh	XXX	XXXX	XXXX	XX	XXXX	XXX	XXXX	XXX	XXXX	XXX	XX	XXX
Hereford	XXX	XXX	XXX	XXX	XX	XXX	XX	XXXX	XXX	XX	XXXX	XXX
Limousin	XX	XXX	XXX	XX	XXX	XXX	XXXX	XXX	XXXX	XXX	XX	XXXXX
Maine-Anjou	XXX	X	X	XXX	X	XX	XXXX	XX	XX	XXXX	XXX	XXXX
Red Angus	X	XXX	XXXX	XXX	XXXX	XXXXX	XX	XXXXX	XXXX	X	XXXX	XX
Salers	XX	XXX	XXX	XXXX	XXXX	XX	XXXX	XX	XX	XXXX	XXX	XXX
Santa Gertrudis	XXX	XXX	XXX	XXX	XXX	XX	X	XXXX	XXX	XX	XX	XXXX
Shorthorn	XXXX	XX	XX	XXX	XXX	XXX	XX	XXX	XXX	XXX	XX	XXX
Simmental	XXX	XXXX	XXXX	XXXX	XXX	XXX	XXXX	XXX	XXXX	XXX	XXX	XX
South Devon	XXX	XX	XX		XXX	XXX	XXX	XX	XX	XXX		X
Tarentaise	XX	XXX	XX		XX							XXX

Adapted from: Encyclopedia of Animal Science – Beef Cattle: Breeds and Genetics. Cundiff, 2003

* Sire Breed; Hereford-Angus on dam side. Differences in X's does not imply statistical differences!

[1]Breeds with more X's indicates greater weight for this trait (X = lighter weight, XXXXX = heavier weight) at the same age

[2]Not adjusted for Body Condition Score

[3]Breeds with more X's indicates higher marbling score (X = lighter marbling, XXXXX = heavier marbling) when harvested at the same age

[4]Breeds with more X's indicates greater ribeye area (X = smaller ribeye, XXXXX = larger ribeye) when harvested at the same age

[5]Breeds with more X's indicates greater fat thickness at the 12th rib (X = less fat, XXXXX = more fat) when harvested at the same age

[6]Breeds with more X's indicates more lean compared to fat based on calculated yield grade (X = higher yield grade, XXXXX = lower yield grade) when harvested at the same age; yield grade calculated assuming equal kidney, pelvic and heart fat

[7]Breeds with more X's indicates higher cow body condition scores (X = lower condition, XXXXX = higher condition) at the same stage of production and same parity

[8]Breeds with more X's indicates a higher index value (better feed efficiency; X = less efficient, XXXXX = more efficient) on a high concentrate finishing diet

Sources:

Birth, weaning, yearling and carcass weight, maternal milk, marbling, ribeye area, fat, carcass weight (Kuehn and Thallman, BIF 2022)

Mature weight and body condition score (Ribeiro, A.M.F., et al.. Genetic parameters, heterosis, and breed effects for body condition score and mature cow weight in beef cattle. Journal of Animal Science. Volume 100, Issue 2. February 2022. skac017. https://doi.org/10.1093/jas/skac017)

Feed efficiency index (Retallick, K. J., et al.. Genetic variance and covariance and breed differences for feed intake and average daily gain to improve feed efficiency in growing cattle. Journal of Animal Science. Volume 95, Issue 4. April 2017. https://doi.org/10.2527/jas.2016.1260)

Table 2. Actual Breed Differences for U.S. Beef Breeds.

Breed*	Birth Wt. (lb)	Weaning Wt. (lb)	Yearling Wt. (lb)	Maternal Milk (lb)	Mature Wt. (lb)[1]	Marbling Score	Ribeye Area (in^2)	Fat (in)	Carcass Wt.(lb)	Yield Grade[2]	BCS[1,3]	FE Index Steers[1,4]
Angus	84.7	539.2	978.6	521.1	0.0	6.19	13.71	0.663	920.8	3.27	0.00	0.000
Beefmaster	87.4	528.2	920.1	507.8	-76.1						-0.13	0.201
Brahman	94.4	557.4	928.7	513.5	20.9	4.86	13.49	0.509	859.3	2.72	0.08	0.100
Brangus	87.1	520.8	929.7	519.0	-45.0						-0.12	-0.002
Braunvieh	88.2	511.7	902.7	528.8	-194.7	5.49	14.47	0.487	853.4	2.33	-0.55	0.073
Charolais	89.5	540.8	950.2	515.8	14.3	5.34	14.57	0.463	898.1	2.41	0.00	0.070
Chiangus	87.9	507.0	907.0	512.6	-33.1	5.46	14.01	0.524	872.9	2.64	-0.17	0.130
Gelbvieh	86.5	537.8	955.6	520.2	-71.2	5.30	14.42	0.522	890.0	2.57	-0.53	0.107
Hereford	87.2	517.2	914.7	508.9	-30.4	5.31	13.50	0.590	868.7	2.96	-0.11	0.099
Limousin	85.5	530.1	926.2	512.3	-76.3	5.39	14.52	0.531	892.8	2.57	-0.40	0.206
Maine-Anjou	86.3	496.8	876.9	503.8	-62.6	5.17	14.40	0.454	855.4	2.28	-0.29	0.130
Red Angus	83.9	518.6	937.5	521.6	-47.8	5.87	13.47	0.631	885.5	3.13	0.04	-0.014
Salers	85.9	517.9	916.8	518.7	-20.1	5.17	14.39	0.475	861.1	2.35	-0.20	0.070
Santa Gertrudis	88.4	528.2	920.7	512.3	-33.1	5.11	13.32	0.579	873.2	3.00	-0.41	0.119
Shorthorn	89.0	500.9	901.9	514.2	-49.8	5.45	13.71	0.529	867.5	2.73	-0.50	0.070
Simmental	87.1	542.0	959.1	516.1	-17.0	5.50	14.45	0.501	897.5	2.54	-0.22	0.027
South Devon	88.2	506.0	893.5	518.1		5.29	13.90	0.493	850.6	2.52		-0.041
Tarentaise	86.2	523.1	892.1	505.7								0.050

* Sire Breed; Hereford-Angus on dam side. Missing values means the breed was not represented in that study

[1]Values are a deviation from an Angus base

[2]Yield grade calculated assuming equal kidney, pelvic and heart fat. Lower values means better lean to fat ratio

[3]BCS = Body Condition Score

[4]Feed Efficiency (FE) index was an unrestricted index using on-test ADFI and on-test ADG based of steers on a high concentrate finishing diet where higher values means better efficiency (Gain:Feed)

Sources:

Birth, weaning, yearling and carcass weight, maternal milk, marbling, ribeye area, fat, carcass weight (Kuehn and Thallman, BIF 2022)

Mature weight and body condition score (Ribeiro, A.M.F., et al.. Genetic parameters, heterosis, and breed effects for body condition score and mature cow weight in beef cattle. Journal of Animal Science. Volume 100, Issue 2. February 2022. skac017. https://doi.org/10.1093/jas/skac017)

Feed efficiency index (Retallick, K. J., et al.. Genetic variance and covariance and breed differences for feed intake and average daily gain to improve feed efficiency in growing cattle. Journal of Animal Science. Volume 95, Issue 4. April 2017. https://doi.org/10.2527/jas.2016.1260)

Cooperative Extension Service

Agriculture and Natural Resources
Family and Consumer Sciences
4-H Youth Development
Community and Economic Development

MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Educational programs of Kentucky Cooperative Extension serve all people regardless of economic or social status and will not discriminate on the basis of race, color, ethnic origin, national origin, creed, religion, political belief, sex, sexual orientation, gender identity, gender expression, pregnancy, marital status, genetic information, age, veteran status, physical or mental disability or reprisal or retaliation for prior civil rights activity. Reasonable accommodation of disability may be available with prior notice. Program information may be made available in languages other than English. University of Kentucky, Kentucky State University, U.S. Department of Agriculture, and Kentucky Counties, Cooperating.

Disabilities accommodated with prior notification.

Lexington, KY 40506 Issued 08-2023