# Effects of Breed Composition on Carcass and Meat Traits

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Brahman-crossed cattle have developed a reputation for having quality and consistency problems, primarily those associated with carcass grading and meat tenderness. Studies from Florida, Louisiana, Texas and Nebraska have questioned the ability of Brahman-crossed steers to deposit sufficient marbling to grade U.S. Choice or to produce consistently tender beef. Numerous presentations at this short course over the years have addressed this topic. However, many of these studies and presentations have been based on a limited number of sires within the breed or breed type designation based on phenotypic evaluation. This presentation will center on preliminary data from a breeding project in progress here at the Pine Acres Beef Unit.

This project was started in 1988 to provide data for development of crossbred expected progeny differences (EPD's) and involves a two-breed diallele type cross between Angus (A), Brahman (B), .75A.25B, .5A.5B, .25A.75B and Brangus sires across dams of the same breed groups (Table 1). Between three and five bulls per breed group are used per year. This design allows the genetic evaluation of animals (sires, dams and calves) and of all possible breed group combinations of Angus and Brahman for both additive and nonadditive genetic effects. At least one sire per breed group is repeated across years, and at least one sire of each purebred group (Angus, Brahman and Brangus) participates in the national sire evaluation of its respective breed. This creates connections across years and with herds in Florida and across the United States.

This project also involves the evaluation of this breeding program on carcass and meat traits. After weaning at approximately 8 months of age, steers are placed on a nutrition trial which carries them through the fall and winter, except for the first year when calves were fed. In early spring, the yearlings are placed in the feedlot and fed a corn protein supplement diet until they reach either .35 or .55 inches of outside fat as determined ultrasonically. After harvest (slaughter), the carcasses are graded at 24 hours postmortem and a sample of the loin removed, vacuum packaged and aged for five days prior to being frozen. The steaks are thawed, broiled to a medium degree of doneness (70°C) and cores are removed for Warner-Bratzler shear force determination. The force required to shear the core perpendicular to the muscle fibers is related to the tenderness of the sample.

For this presentation, means and standard deviations have been calculated by calf group. Six calf groups percentages of Brahman and Angus breeding have been identified: 0% Brahman, 25% Brahman, 37.5% Brahman, 50% Brahman, 75% Brahman or 100% Brahman. Means for steer progeny by sire will be presented. No adjustments of mean values for age or dam have been made.

In the first six years of the project, 335 steer calves have been produced, fed, harvested and the carcasses and mean evaluated. Table 1 presents the specific breeding of these steers. As shown, crossbred steers of a specific final breed combination have been produced by a number of different mating schemes. At this point in the study, the purebred cells are approaching sufficient numbers but many of the crossbreed cells are not, primarily because of difficulties associated with finding adequate crossbred sires.

For this presentation, data on weaning weight, hot carcass weight, marbling score and shear force values have been summarized. In addition, a few

| Table 1. Number of steers (N=335) by sire and dam groups | | | | | | |
|---|---|---|---|---|---|---|
| Dams[a] | Sires[a] | | | | | |
| | A | ¾A ¼B | e A d B | ½A½B | ¼A¾B | B |
| A | 17 | 5 | 11 | 4 | 11 | 14 |
| ¾A ¼B | 4 | 7 | 3 | 2 | 3 | 3 |
| e A d B | 6 | 4 | 24 | 6 | 10 | 11 |
| ½A½B | 13 | 12 | 18 | 10 | 11 | 11 |
| ¼A¾B | 2 | 3 | 6 | 3 | 1 | 3 |
| B | 13 | 15 | 18 | 8 | 9 | 33 |

[a]A=Angus and B=Brahman.

parameters identified in the Beef Quality Audit (1992) have been addressed.

Weaning weight, a primary item of interest to Florida commercial producers, is shown by calf group in Figure 1. The mean values for weaning weights of the crossbred steers were slightly higher than those for straight bred steers, as expected. However, there was quite a bit of variation within groups as shown by the standard deviations. At 75 and 100% Brahman, the standard deviations increased to over 90 lbs. compared to 76 lbs. for the other groups. These values suggest that in those groups with high Brahman breeding, there were some very big calves, but also some very small ones. Calves not weighing 400 lbs. at weaning were culled so they would not be included in these data.

The small size of the 75 and 100% Brahman calves would suggest one of four possibilities: (1) the sires selected were small framed; (2) the Brahman cow herd is small framed; (3) the Brahman calves are later maturing and, thus, grow faster later in life or (4) the Brahman calves were much younger at weaning. To evaluate these possibilities, hot carcass weight by calf group was evaluated (Figure 2).

At harvest, mean values for carcass weight ranged from 671 lbs. (100% Brahman) to 708 lbs. (50% Brahman). These values are slightly lower than expected in the industry since some of the calves were slaughtered at .35 inches of fat rather than .55 inches as done in the industry. Carrying cattle from .35 to .55 inches of outside fat adds approximately 69 lbs. of hot carcass weight, most of which is fat. The similarity of HCW for the various groups would suggest similar frame size among groups. The data reveals that, in fact, the Brahman calves are approximately 30 days younger than the other groups and would be smaller.

Carcasses weighing less than 550 lbs. are discounted by $5 to $10/cwt. since they do not fit in the mainstream of the trade. In the calf groups evaluated in this study, only 2 to 5% of the carcasses were below 550 lbs. except for the straight Brahman group. Again this is possibly associated with feeding some of the steers to .35 inches of fat rather than .55 inches. In this study, no carcasses were above 900 lbs, suggesting that these breeds and crosses were large enough but not too large.

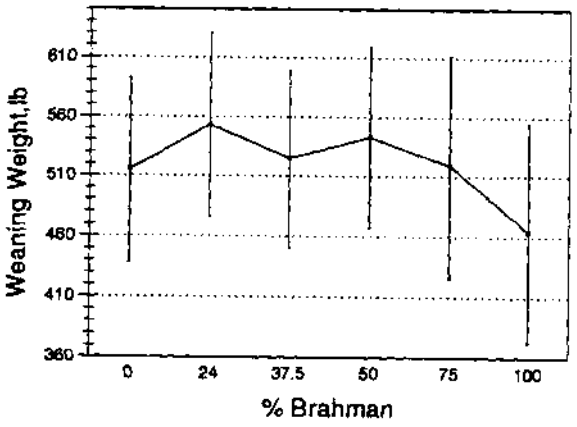


**Figure 1.** Means and standard deviations for steer calf groups presented by percentage of Brahman breeding.

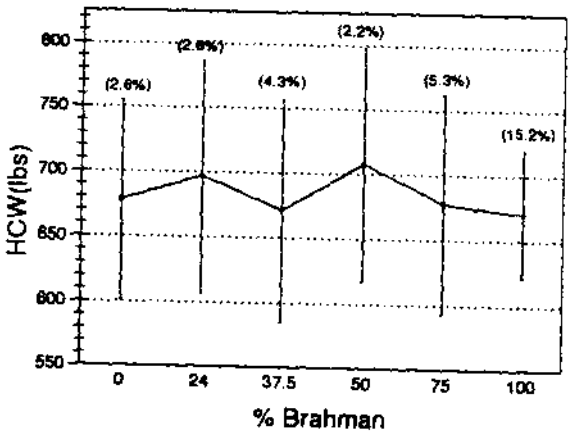


**Figure 2.** Means and standard deviations for hot carcass weight (HCW)presented by the percentage of brahman breeding in the steer calf and the percentage of carcasses weighing less than 550 lb within the group.

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Marbling scores, the primary determinant of carcass grade, by calf groups are shown in Figure 3. The carcasses from straight bred Angus steers averaged 394 ($Sl^{94}$), just 6% below the requirement (Sm°) for U.S. Choice. As the percentage of Brahman breeding increased, mean values decreased to the straightbred Brahman group which had 331 ($Sl^{31}$). These results would agree with numerous previous studies.

The mean values for marbling would suggest that the majority of carcasses grade U.S. Select or higher. However, since the Beef Quality Audit suggested that 8% of carcasses in the industry were low grading (Standard) and cost the industry $21.68 per head, the percentage of carcasses within each group grading U.S. Standard was determined (Figure 3). The percentage of U. S. Standard carcasses ranged from 7.7% in the 75% A–25% B group to 28% in the 100% B group. For all groups, this percentage is too high and leads to discounts in these types of cattle.

In this study, steers were harvested at .35 or .55 inches of outside fat. The purpose of this approach was to test the theory that cattle which have the genetic ability to deposit marbling will do so at low levels of total fatness and that cattle which do not have the genetic ability to deposit marbling will not do so even at high levels of body fatness. In this study, steers harvested at .35 inches of fat had a mean marbling score of 346 ($Sl^{46}$) while those fed to .55 inches had 367 ($Sl^{67}$). These data would support the hypothesis stated previously that marbling deposit is primarily controlled by genetics in young steers. The need to feed the extra feed required to deposition the additional 69 lbs, mostly fat, between .35 and .55 inches is questionable.

These data do lead us to conclude that increases in the ability to deposit marbling is needed in crossbred cattle and that this can be accomplished via genetic selection. The question, however, is whether marbling will continue to have the economic importance that it now has.

The Long Range Planning group of the beef industry has identified lack of consistent palatability (tenderness, juiciness and flavor ) as the number one priority for change needed to increase beef consumption. For years, Brahman crossed cattle have been characterized as being variable in

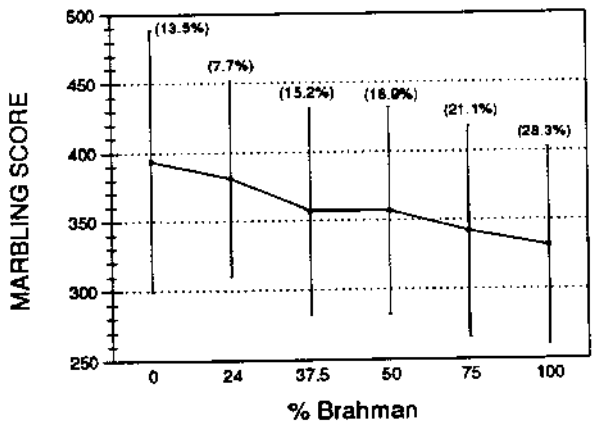


**Figure 3.** Means and standard deviation for marbling score presented by the percentage of Brahman breeding in the steer and the percentage of carcasses with U.S. Standard grade marbling in the group (%STA). Values within 400=Small and within

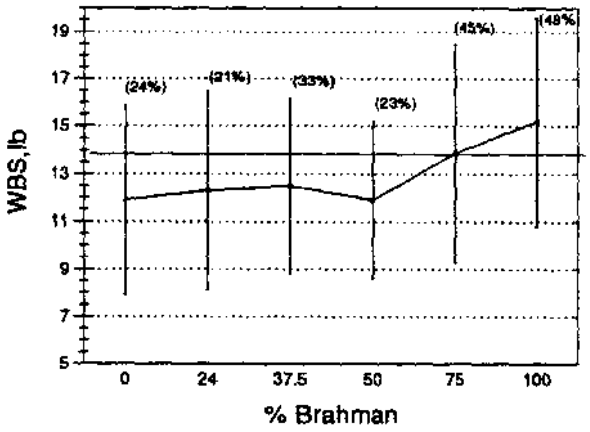


**Figure 4.** Means and standard deviations for shear force values presented by the percentage of Brahman breeding and the percentage within the group that exceeds 13.75 lb of shear.

palatability, particularly tenderness. In the present study, mean values for shear force were similar for calf groups from 0 to 50% Brahman (Figure 4). Mean values for 75 and 100% Brahman calf groups appeared to be higher than for the other groups. Remember that as shear force increases, tenderness decreases.

In this study, samples from over 200 steers were subjected to both shear force and sensory panel evaluation. This information was used to establish what shear force value equated with what tenderness score. Values of 13.75 lbs. of shear force and above were found to be slightly tough or tougher. If we set this shear force (13.75 lbs.) as the acceptability line, we can evaluate the percentage of steers producing loin steaks that are acceptable.

In Figure 4, a line has been drawn at 13.75 lbs. of shear force, and the percentage of samples having shear force values greater that this value presented. Twenty-one to 33% of the samples for the 0 to 50% B calf groups would be judged as unacceptable in tenderness based on the criteria set forth in this study. These figures agree with the National Beef Tenderness Survey (Morgan et al., 1991) which indicated that approximately 25% of samples were unacceptable in tenderness. However, the 45 to 48% unacceptable shear force values in the 75 and 100% groups would suggest a real problem.

What is the significance of this finding relating toughness to percentage of Brahman breeding? Since numerous other studies have shown similar findings, it would suggest that the industry is not making progress in this area. Since the industry is beginning to talk about using some type of instrument to predict palatability rather than using grades, it seems imperative that commercial producers need to get concerned. While some may think this concept is far fetched, a resolution promoting use of shear force for grading, rather than carcass grade as known today, was introduced at the grading committee meeting of NCA in January of this year.

Can the low grading and palatability problems be corrected? They can, but it will take quite a bit of effort. To support this statement, data are presented in Table 2 for Brahman sires used in the present study that have produced more than 4 steer progeny. While numbers of steer progeny arelimited, there are some bulls (#17 and 44) that seem to produce steers with acceptable tenderness, marbling and weaning weight. We need to identify these types of bulls and use them. A number of the breed associations represented here havebegun the process of identifying those sires that are complete

packages—growth, carcass and acceptable meat producers. Commercial producers need to encourage those endeavors.

## References

Morgan, J. B., J. W. Civil, D. S. Hale, R. K. Miller, D. B. Griffin, H. R. Cross and S. D. Shackelford. 1991. National Beef Tenderness Survey. J. Anim. Sci. 69:3274-3283.

**Table 2. Summary of Brahman sires by weaning weight, marbling scores and shear force values**

| Sire # | n | Weaning Weight | Marbling Score | Shear Force (lb) |
|---|---|---|---|---|
| 16 | 4 | 573 | 292 | 16.0 |
| 17 | 10 | 530 | 406 | 12.1 |
| 18 | 12 | 536 | 336 | 11.9 |
| 29 | 5 | 530 | 314 | 17.4 |
| 42 | 4 | 582 | 320 | 16.5 |
| 44 | 4 | 573 | 392 | 12.1 |
| 45 | 4 | 500 | 390 | 13.6 |
| 46 | 6 | 552 | 353 | 14.3 |
| 61 | 6 | 382[a] | 391 | 14.1 |

[a] For this sire, all steer calves were 100% Brahman.