

9-2013

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Recommended Citation

Howard, Tabitha; Garcia, Matthew; Bondioli, Kenneth; and Derouen, Sidney, "Evaluation of 54 Years of Centralized Performance Bull Testing at the Dean Lee Research and Extension Center (Bulletin #893)" (2013). *LSU AgCenter Bulletins*. 3.

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Performance Bull Testing

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Pub. B-893 (online only) 09/13

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Introduction

The LSU AgCenter's Dean Lee Research and Extension Center at Alexandria, La., has conducted performance bull tests for interested breeders in the state for more than 50 years. Performance tests are an excellent way for producers to evaluate their young herd sires for growth and efficiency.

Centralized performance tests are conducted under standard conditions as a method to identify genetically superior bulls for producers to incorporate into their mating systems (Liu et al., 1993). The Dean Lee Research and Extension Center's primary objective of the performance bull tests is to evaluate and compare the capability of weanling bull calves after being tested under uniform or common environmental conditions for the capacity to gain rapidly and efficiently by the time they are a year old. Each performance bull test was conducted for 140 days from 1958 to 1990. Starting in 1991, however, the tests were shortened to 112 days. Two tests conducted each year – one in the summer and one in the winter.

The analyses herein are based on evaluations of 54 years of performance bull test data to determine the variation for growth traits throughout the years that performance bull tests have been conducted at the Dean Lee facility. The growth traits were individually graphed to illustrate the improvement and quality of bulls on test from the beginning years to now. The analysis of this data will provide producers in Louisiana a method to evaluate how bulls in the region have changed over the past 54 years.

Objective

The first objective of this study was to evaluate 54 years of performance data to analyze performance trends from a centralized performance bull testing program conducted in central Louisiana. The second objective was to discuss how changes in performance trends observed in the Dean Lee Performance Bull Tests compare to other multidecade bull performance tests.

Materials and Methods

Experimental Animals

Performance data was evaluated from 54 years of bull test data provided by the LSU AgCenter's Dean Lee Research and Extension Center. By the winter of the 2011 and 2012 performance bull tests, 7,488 bulls from 34 different breeds had been tested.

Initial weight was collected after a three-week acclimation period, and each bull was weighed every 28 days until the completion of the test at 112 days. At the completion of the test, growth traits were calculated, including average daily gain and weight per day of age. In addition, final weight, total gain, adjusted 365 weight (not until 1974) and scrotal circumference (not until 1987) were recorded. All performance

tests since the Dean Lee 81st annual test have included carcass traits such as ribeye area, backfat thickness and intramuscular fat percentage.

Statistical Analysis

Using the mixed model procedures of SAS (version 9.2, SAS Institute, Cary, NC), changes in performance data for bulls participating in the Dean Lee Research and Extension Center's Performance Bull Tests from 1958 through the winter of 2011-12 were evaluated. Birth weight, initial weight, 112-day weight, average daily gain, adjusted yearling weight and scrotal circumference were fit as random variables in the model, and year, breed and an interaction effect of breed year were fit as fixed variables.

Initial analysis evaluated the number of bulls within each breed participating in performance bull tests over a 54-year period. After further evaluation of the data was conducted, it was determined that breeds with greater than 500 bulls tested would be evaluated individually. These breeds included Angus, Charolais, Hereford and Simmental.

Regression analyses using the Proc Reg function of SAS were conducted to analyze rate of change in bull test growth and performance traits across years. Traits evaluated included birth weight, initial weight, 112-day weight, average daily gain, adjusted yearling weight and scrotal circumference. In addition, interval regression analyses, as described by Steele et al. (1997), were conducted to determine if overall improvement across all years between breeds differed significantly.

Results

All breeds and numbers of bulls within each breed are listed in Table 1.1. A total of 7,488 bulls have been evaluated in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through winter 2011-12. The breeds that were most represented in the tests – with more than 500 of each breed included – were the Angus, Charolais, Hereford and Simmental breeds (Figure 1.1).

Independent variables of breeds and interaction of breeds and years were significant ($P < 0.05$) sources of variation in prediction of growth traits. Analysis also was performed on breeds with more than 500 bulls.

In 1958, initial weights averaged 249.90 kilograms, and 112-day weights averaged 362.95 kilograms. Initial weights and 112-day weights in 2011 averaged 335.49 kilograms and 511.56 kilograms, respectively. Analyses revealed that all growth traits for all bulls, regardless of breed, demonstrated a linear increase across the years with birth weights and scrotum circumferences being the lone exceptions (Figures 1.2-1.7).

Birth weight demonstrated a decrease over all years when comparing the Angus and Charolais breeds, which were not significantly different from one another. The Hereford and Simmental breeds, however, were significantly different ($P < 0.05$) than Angus and Charolais and exhibited a greater decrease in birth weight.

For initial weight, levels of change were significantly different ($P < 0.05$) for all of the breeds with greater than 500 animals, with Simmental and Angus breeds exhibiting the greatest increase in weight over the 54 years of testing. The Angus and Simmental breeds also displayed the greatest increase in final 112-day weight and average daily gains and were significantly different ($P < 0.05$) when compared to the Charolais and Hereford breeds.

When evaluating the trait of adjusted yearling weight, all of the breeds with more than 500 animals in the program were significantly different in their rate of change from one another ($P < 0.05$), with the greatest increase observed in the Simmental breed.

When evaluating scrotal circumference in all animals tested during the 54 years, there was a minimal increase in performance (0.02 centimeters). When evaluating the breeds with greater than 500 individuals tested, however, there was a uniform decrease in scrotal circumference performance during the 54 years. Although the Simmental breed

numerically exhibited the largest decrease in scrotal circumference, its animals' results were not significantly different from the Angus breed. Furthermore, while the Angus and Charolais breeds were not significantly different from each other in their negative trend for scrotal circumference, they were significantly different ($P < 0.05$) from the Hereford breed, which, in turn, was significantly different ($P < 0.05$) from the Simmental breed.

Table 1.1: Breeds evaluated and number of bulls tested per breed in the Dean Lee Research and Extension Center Performance Bull Tests from 1958-2011.

Breed of Bulls	Number of Bulls
Angus	2,638
Angus +	2
Beefmaster	235
Black Maximizer	14
Black Simmental	5
Blonde d'Aquitaine	2
Braford	66
Brahman	143
Brangus	297
Braunvieh	7
Brown-Swiss	5
Char-Angus	4
Charbray	6
Charolais	1,274
Char-Swiss	5
Chi-Angus	1
Chianina	3
Chimaine	1
Devon	11
Gelbray	55
Gelbvieh	325
Hereford	1,211
Limousin	33
Maine-Anjou	10
Red Angus	49
Red Brahman	24
Red Brangus	36
Red Poll	42
Santa Gertrudis	262
Senepol	4
Shorthorn	20
Simbrah	79
Simmental	596
Texas Longhorn	23
Total	7,488

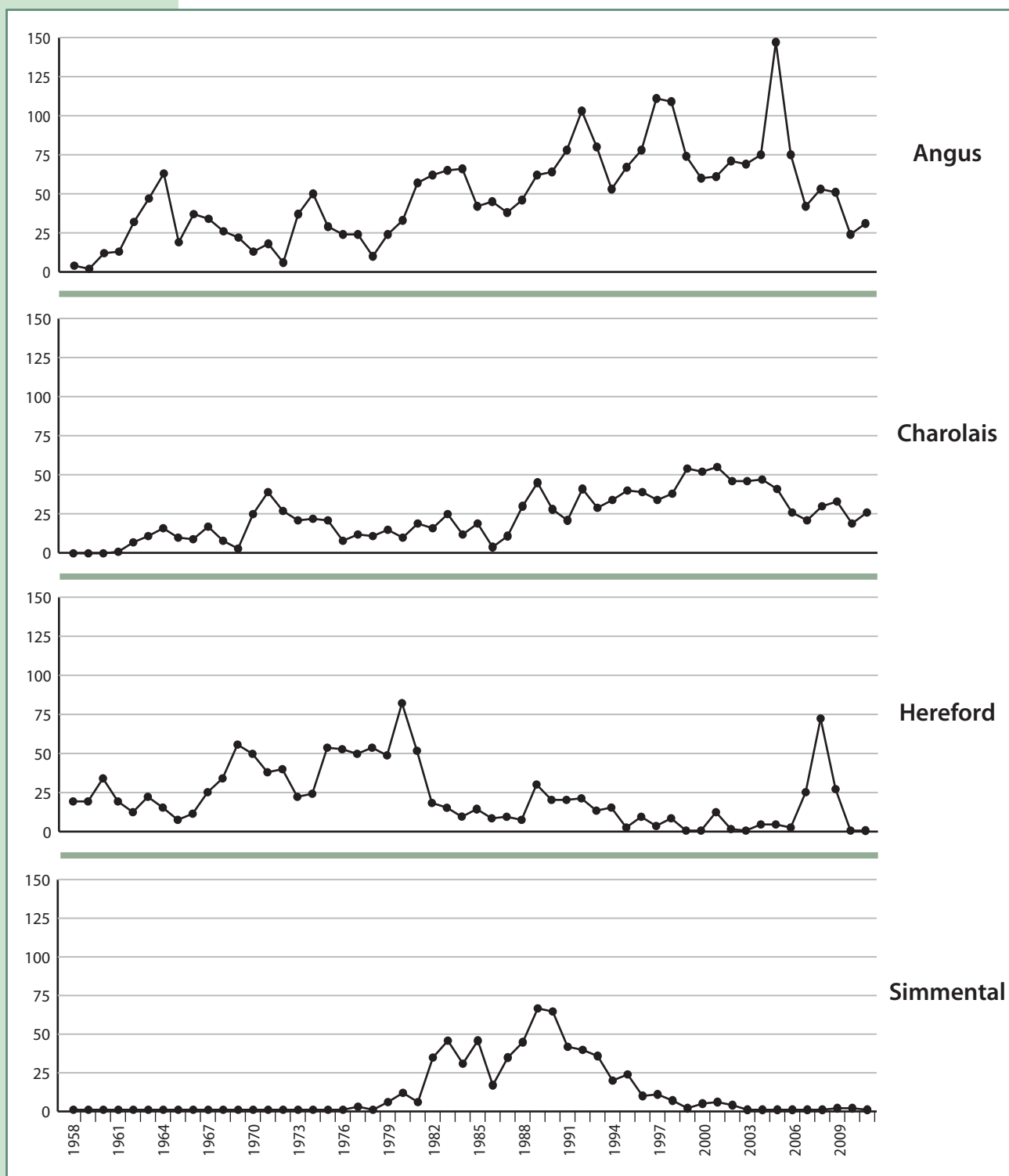


Figure 1.1 Number of bulls tested from breeds with more than 500 bulls evaluated in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011.

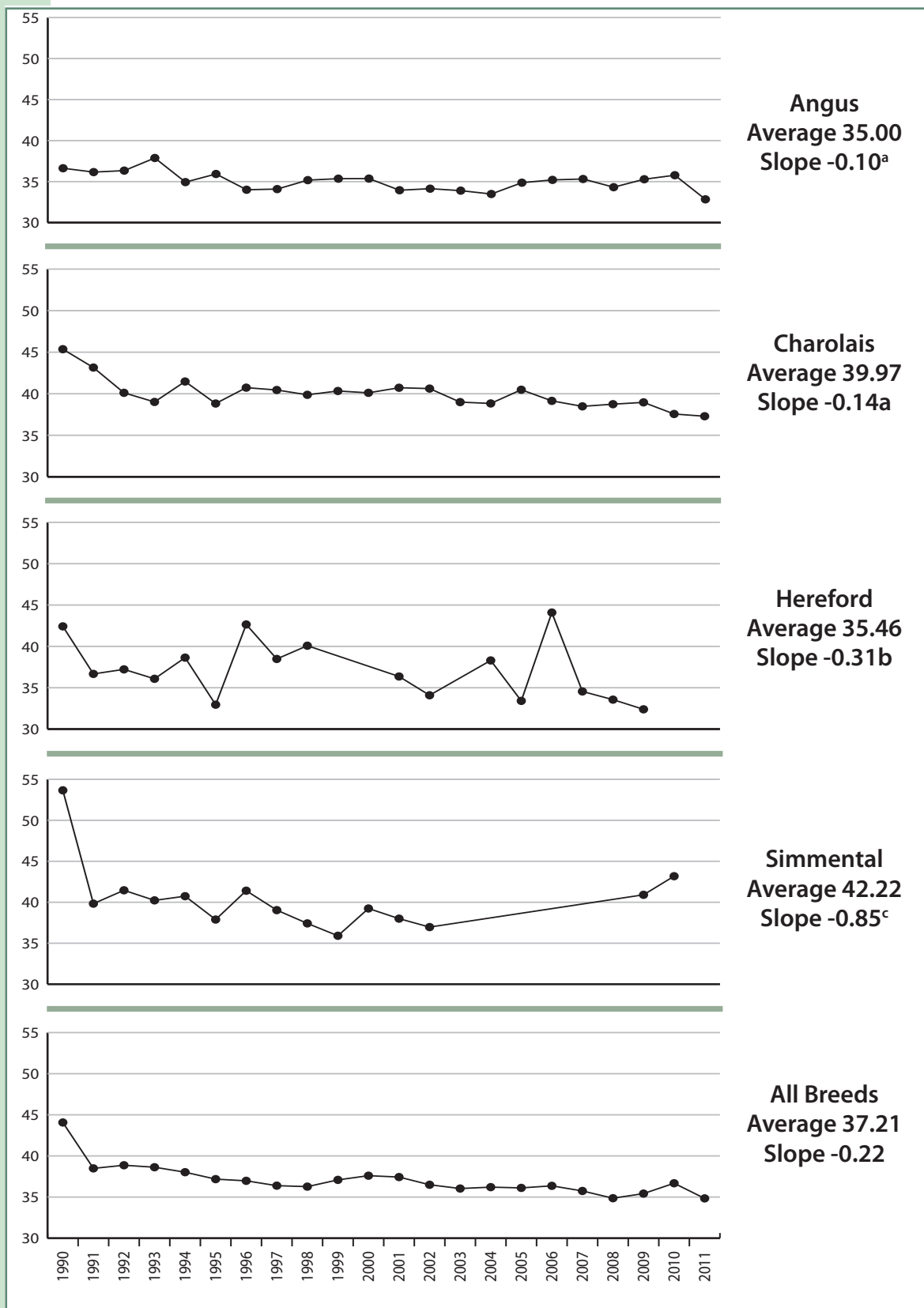


Figure 1.2 Means of birth weight, in kilograms, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

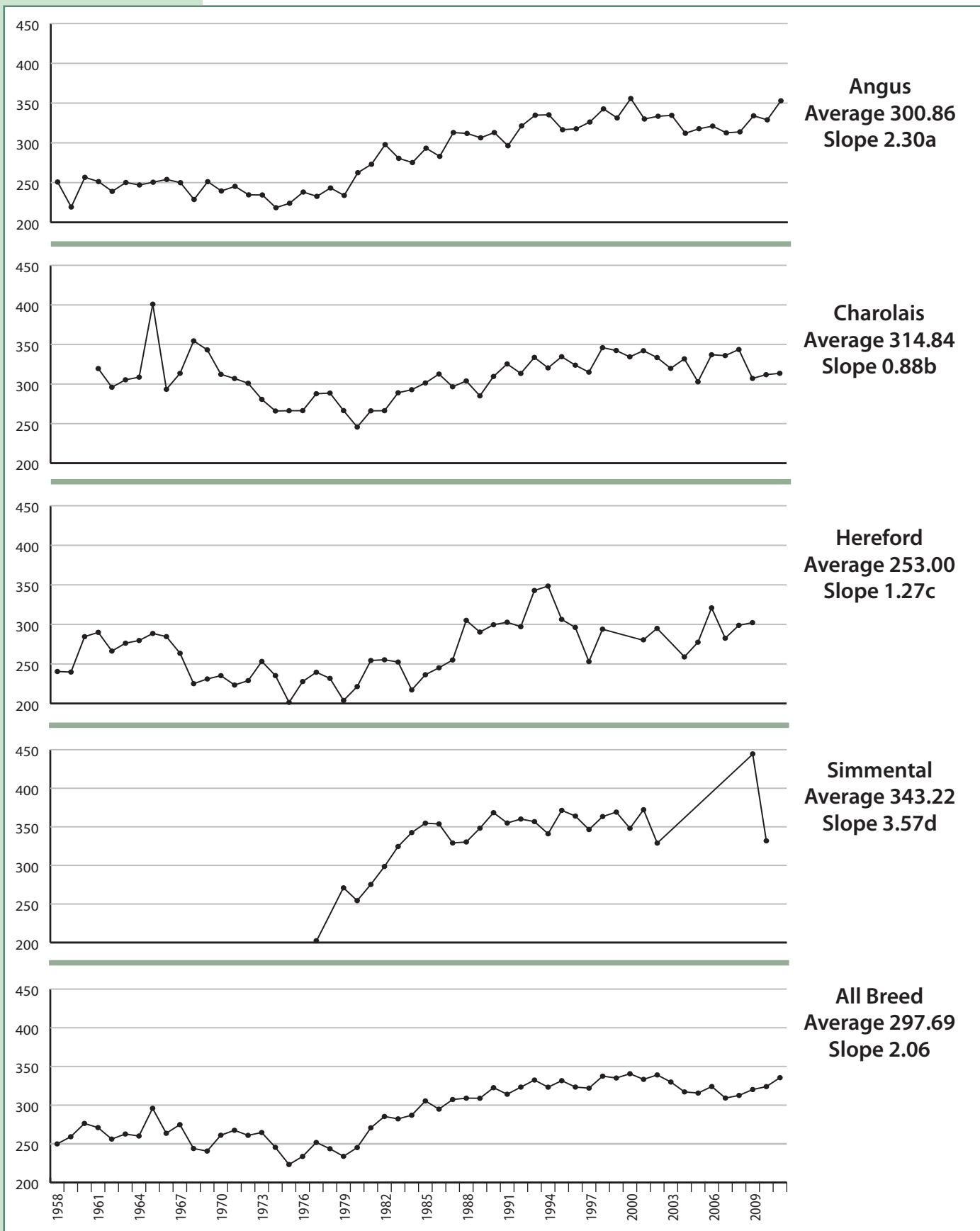


Figure 1.3: Means of initial weight, in kilograms, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

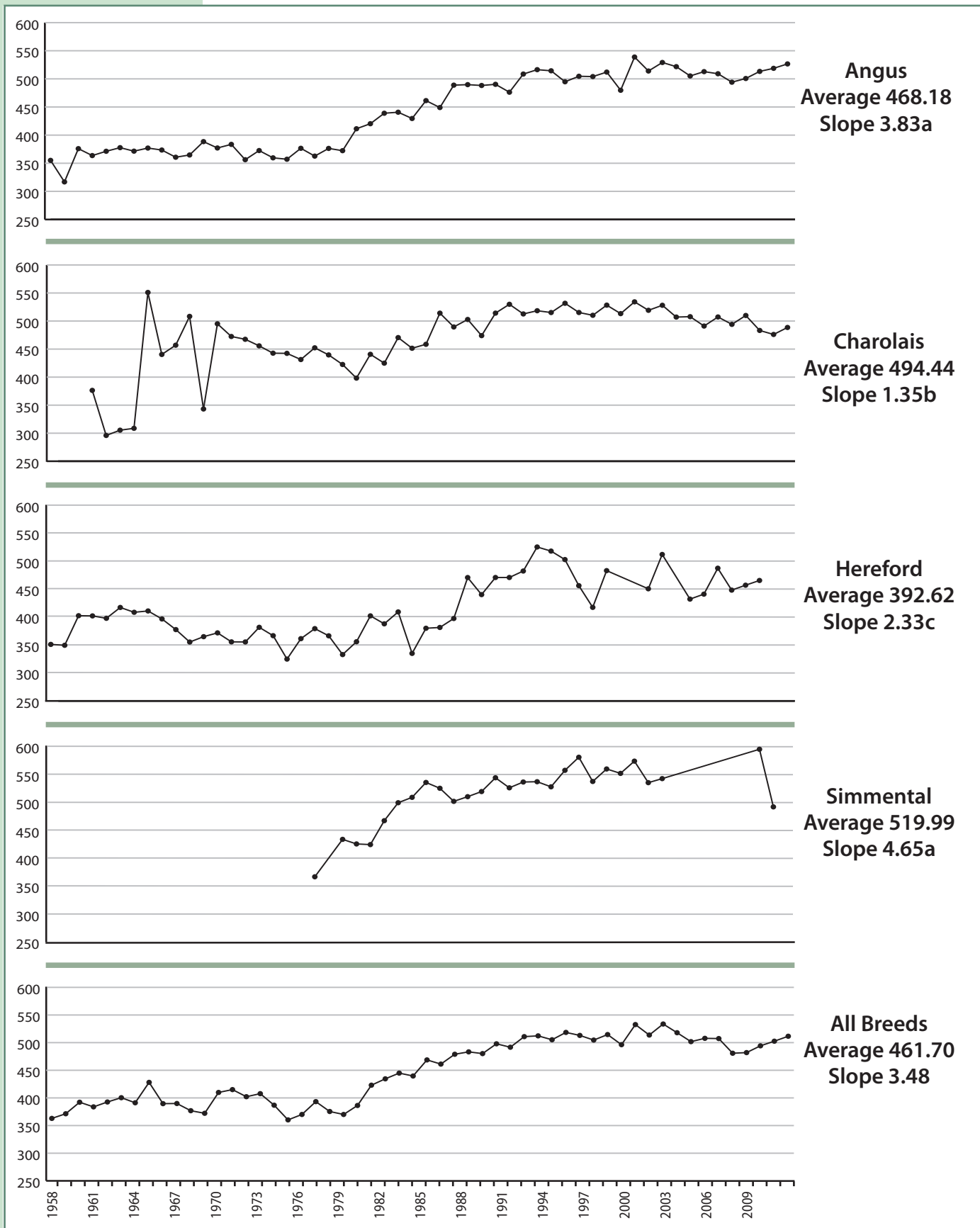


Figure 1.4: Means of 112-day weight, in kilograms, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

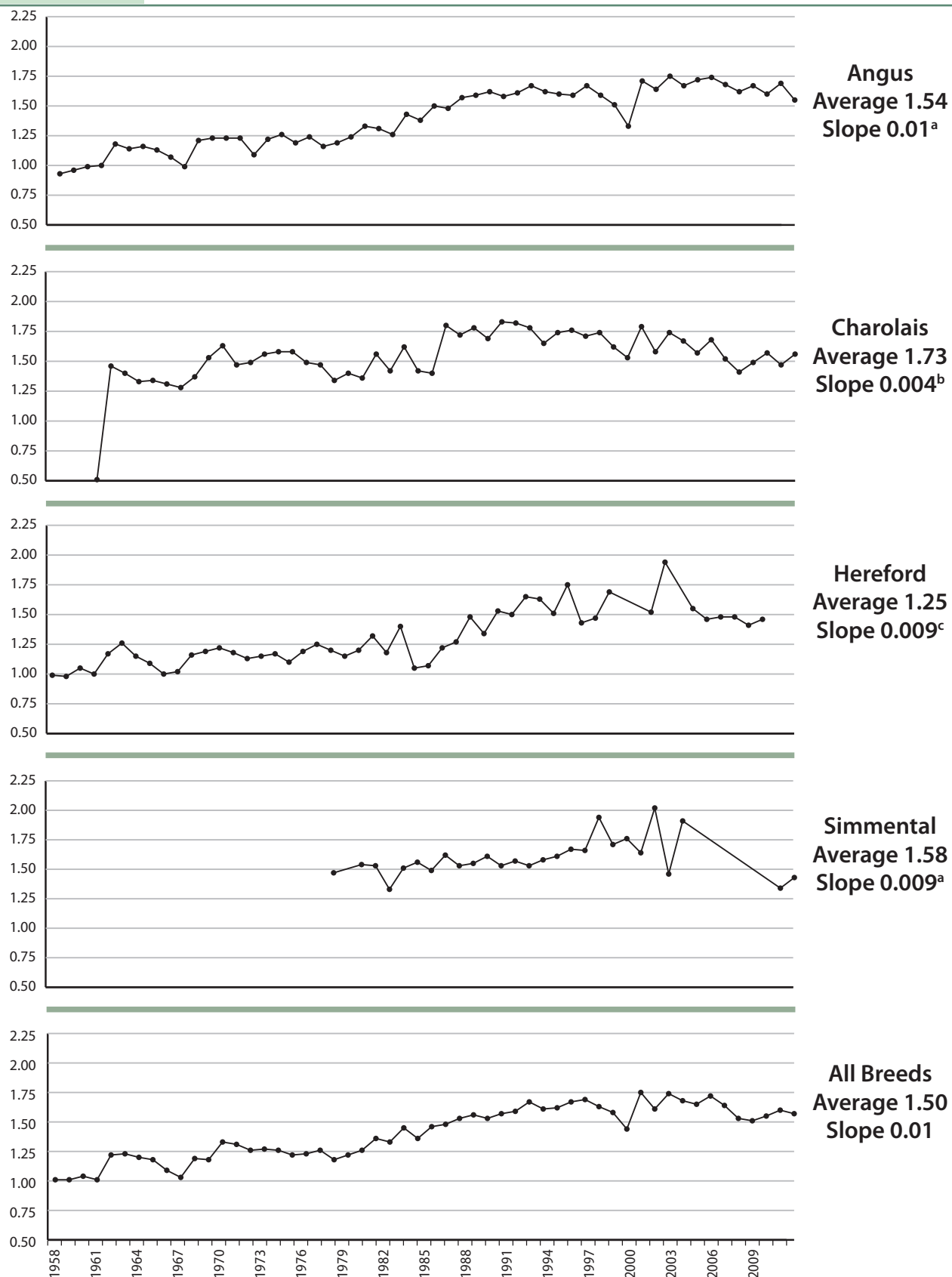


Figure 1.5 Means of average daily gains, in kilogram, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

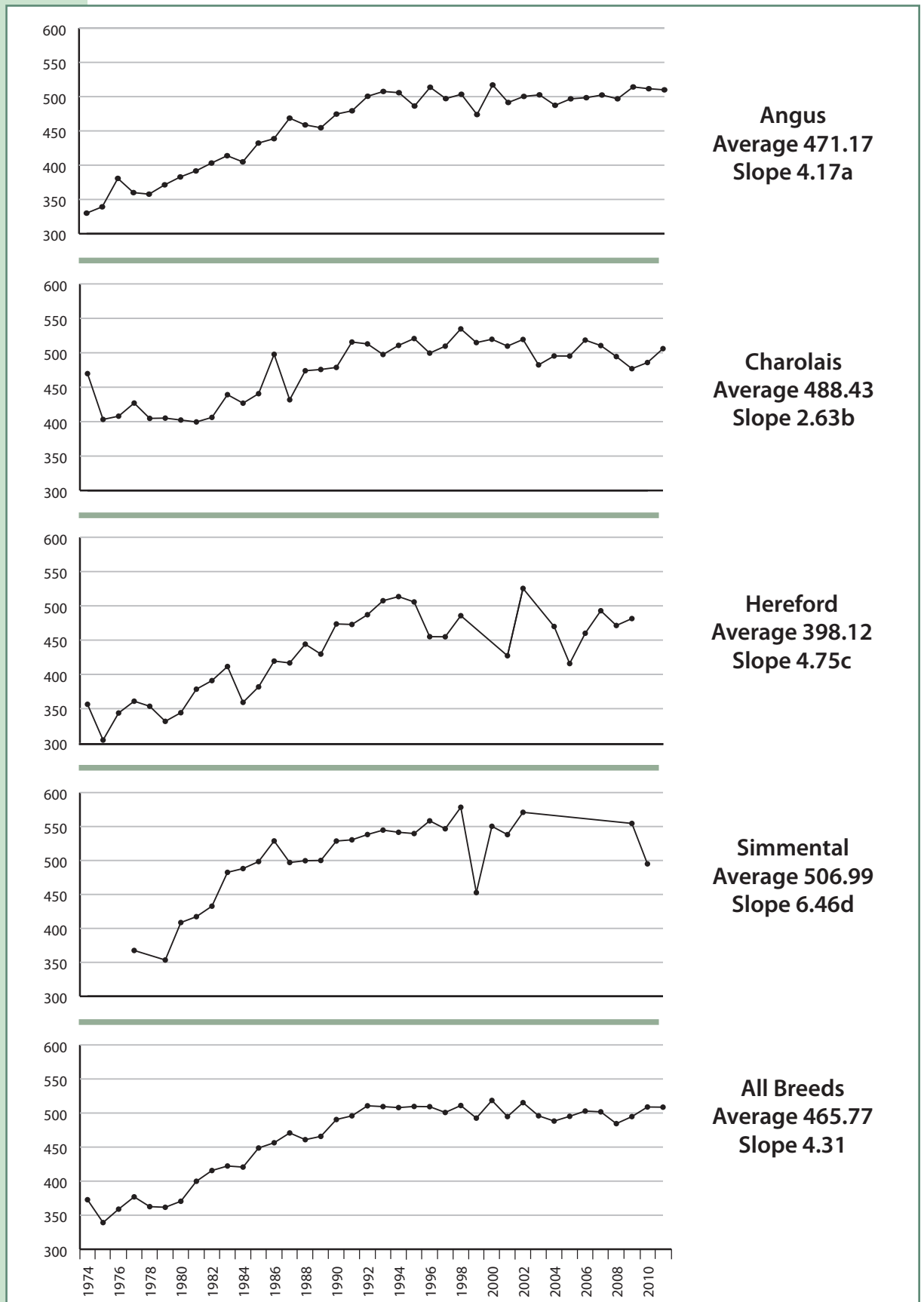


Figure 1.6 Means of adjusted yearling weight, in kilograms, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

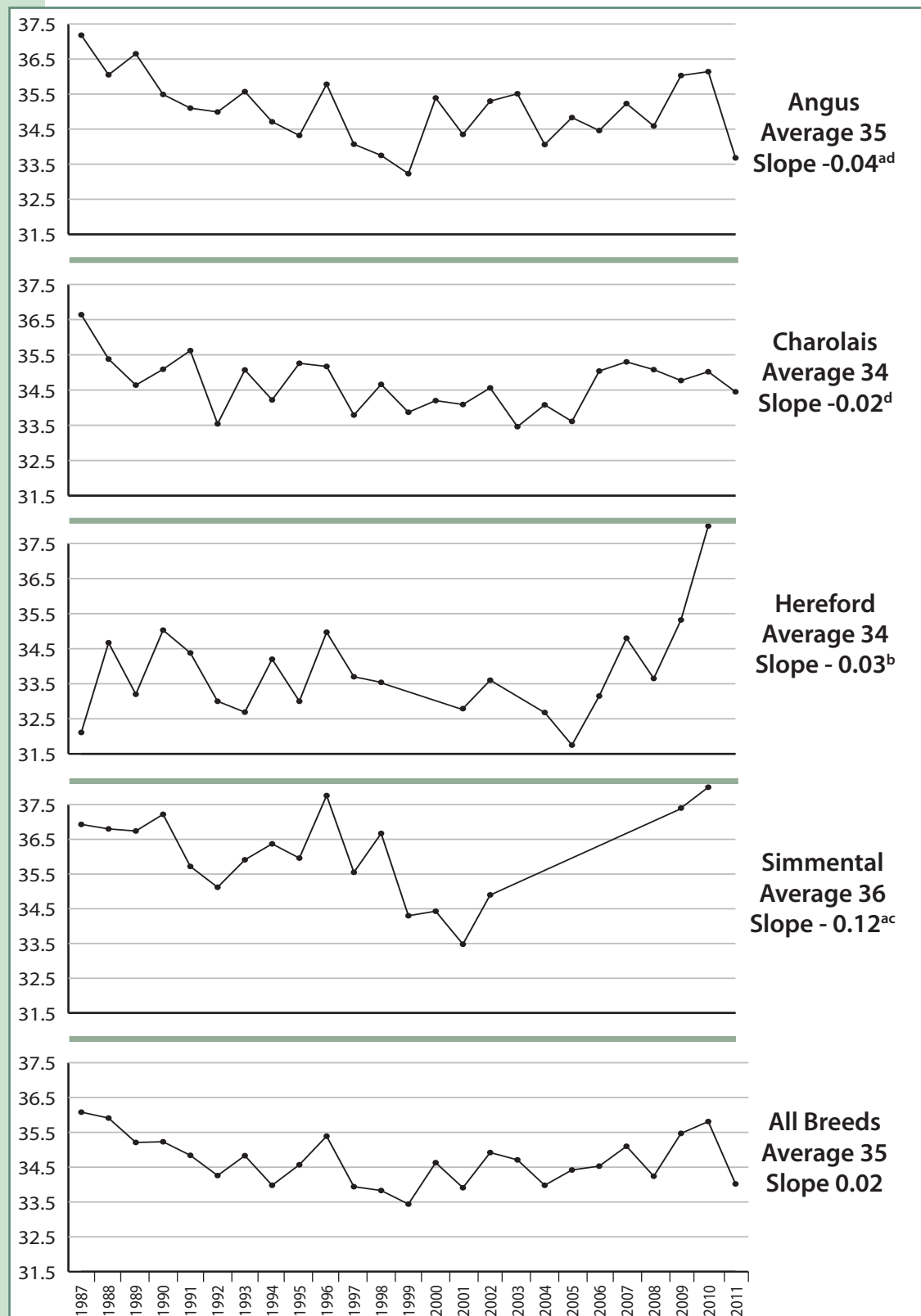


Figure 1.7: Means of scrotal circumference, in centimeters, for all breeds (bottom panel) and the most represented breeds (top 4 panels) participating in the Dean Lee Research and Extension Center Performance Bull Tests from 1958 through 2011. (Superscripts differ at $P < 0.05$)

Discussion

Evaluation of 54 years of data from the LSU AgCenter's Dean Lee Research and Extension Center Performance Bull Tests revealed breed representation from 1958 through 2011 was dynamic due to market trends and emphasis on different phenotypic trends that have changed over the years. The Angus, Charolais and Simmental breeds exhibited an increase in representation, but the Hereford breed became less prevalent in later years. Changes in breed representation could be attributed to changing breed preferences over time or to producers adapting their mating schemes with different breeds during the evaluated time period.

Knowledge of the differences in performance associated with different breeds allows producers to select for breeds that are more suitable for their production systems (Freetly et al., 1998, Gregory et al., 1979). Analysis of the performance potential of different breeds also is required to exploit heterosis in crossbreeding systems to match genetic potential with diverse markets, feed resources and climates (Cundiff et al., 1993).

Growth traits for all bulls, regardless of breed, exhibited a linear increase across all years, with birth weights and scrotal circumferences being the only exceptions. The results were in agreement with the findings of Garcia and associates (2004) when compared to growth and performance rates of Angus, Charolais and Hereford breeds. That study did not include the Simmental breed as one of its most represented breeds, however, although Simmental were among the most represented in this study.

Over the years of testing, the Simmental breed had the highest levels of growth and exhibited the greatest rate of change when compared to the other three breeds. The Hereford breed exhibited the lowest levels of performance for each trait evaluated. That is most likely due, however, to the high representation of the Hereford breed in the early years of the testing and declining representation in the later decades of the performance tests. These findings are similar to the findings of Schenkel and associates (2003), with the Simmental breed exhibiting faster growth rates and larger sizes while the Hereford breed displayed lower levels of gain.

Birth weight and scrotal circumference were the only two traits that displayed a decrease over the years, with Simmental exhibiting the greatest rate of change. The findings of a decrease in scrotal circumference over the years is contradictory to the findings of Simpson and associates (1986), who reported that as growth traits increased scrotal circumference increased, as well. The results found here are in agreement, however, with findings reported by Garcia and associates (2004) in which scrotal circumference exhibited a negative trend.

The Angus and Simmental breeds exhibited the greatest rates of change over the years for initial weight and final weight, as well as average daily gains. For adjusted yearling weight, the Simmental breed had a significantly higher ($P < 0.05$) rate of change than the other most represented breeds in the study.

As previously stated, performance testing of beef cattle has proven a beneficial tool for producers and has allowed for the implementation of superior genetics into their beef cattle herds. This has been accomplished through the evaluation of superior bulls and replacement heifers of multiple breeds in a uniform environment (Auchtung et al., 2001). By evaluating performance bull test data, producers are able to select an elite bull (or elite bulls) to incorporate into the production scheme. Elite bulls will, in return, increase profit and sustainability in the herds.

Conclusion

As a result of proper management and selection, the Dean Lee Research and Extension Center Performance Bull Tests have made linear improvements of all growth and performance traits over a 54-year period. Beef producers participating in the performance bull tests have been very successful in producing bulls with greater

levels of growth traits while maintaining birth weights at an acceptable level. Knowledge of these performance trends from 54 years of Louisiana performance bull testing allows producers a method to understand how cattle have changed across decades and provides information that could be deemed valuable for future selection or management strategies.

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