

UT GENETIC IMPROVEMENT DEMONSTRATIONS

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Background

Today's beef cattle market is demanding feeder cattle which are of some known genetics, preferably of superior feedlot and carcass performance traits. It also wants cattle which are low risk from a health perspective, which means they have been vaccinated for diseases common in the feedlot environment. Weaned calves are also preferred since they withstand transportation and go on feed more readily. University of Tennessee research by McLemore and Rawls 1993 indicated that the breed distribution of 53,000 feeder cattle on Tennessee auctions were as follows: Angus 20%, Angus cross 22%, Charolais cross 15%, Hereford 11%, Mixed 11%, and Brahman cross 4%. Further lack of uniformity was indicated by the fact that 23% of the lots and 38% of the male cattle were bulls, 63% were Number 1 Muscle, 34% were Number 2 Muscle, and 16% were Small Framed.

Purpose

The purpose of this demonstration was to show how genetic improvement can be made quickly through the use of superior bulls. In addition through the use of the Beef Cattle fIRM record keeping software, progress was measured through evaluation of production measures such as weaning weights of the calf crop produced from the beef producer's existing genetics and the improved genetics.

Procedure

There were a total of 17 herds from 16 counties participating as demonstrators in the state. The herds were Spring calving and consisted of up to 50 females of which up to 16 could be heifers. The producers were all provided with a pre-breeding vaccine (Bovi-Shield FP 4 + VL5) given 30 days prior to breeding. Estrus was synchronized in all females using a timed-breeding protocol in which on Day 0, all animals were given 10 cc of Vitamin A,D&E and an Eazi-Breed CIDR (progesterone vaginal insert) and only the cows were given 2 cc of Cystorelin (GnRH). On Day 7, the Eazi-Breed CIDR was removed and the animal injected with 5 cc of Lutalyse (Prostaglandin F_{2alpha}). On Day 9, all animals were artificially inseminated and administered 2 cc of Cystorelin (GnRH). It must be noted that the use of Cysterolin for estrus synchronization is considered "extra-label use" and should only be used following guidelines of a veterinarian. On Day 14 following AI breeding, a clean up bull of genetics comparable to the AI bull was turned with the cows for approximately 60 days. At weaning or approximately 205 days, the calves were weighed.

Sires selected for the AI breeding were based on the cow description supplied by the producer and the desires of the producer regarding breed. All of the bulls were registered Angus bulls. Sires needed to have the following EPDs with high accuracy: Birth weight - cows +3.5 or lower, heifers + 2.5 or lower, weaning weight + 40 or higher, yearling weight +80 or higher.

Three of the four bulls used had above breed average EPDs for milk, even though this was not one of the criteria.

Table 1. Artificial Insemination Sires

Sire Name	Reg. Number	----- EPDs -----			
		Birth Weight	Weaning Weight	Yearling Weight	Milk
Julio	13352944	+2.6(0.86)	+51(0.86)	+83(0.81)	+28(0.69)
Bottomline	13026915	+2.1(0.93)	+41(0.93)	+85(0.89)	+23(0.88)
Riptide	12677801	+1.9(0.82)	+42(0.82)	+79(0.74)	+24(0.64)
Exceptional**	12716815	+0.9(0.87)	+40(0.87)	+89(0.83)	+10(0.77)

* Accuracies listed in parenthesis

**Used on all heifers

Cleanup bulls of comparable genetics to the A.I. bulls were provided for 12 of the 17 herds. The remaining herds used their own bulls which had recently been purchased and met the criteria for the cleanup bulls.

Two artificial insemination technicians provided by Southeast Select Sires, Inc. were at each of the seventeen locations on day of AI breeding. Selection of AI sires and purchase and placement of leased cleanup sires was provided by Tennessee Livestock Producers.

Performance and Production Measures

When measuring the impact of the improved genetics and management on the 17 herds, we looked at measures such as weaning weights, weight per day of age, percent body weight weaned, and the calving distribution.

Weaning Weights and Weight Per Day of Age

A production measure that most producers are very familiar with is weaning weight. We can look at the actual weaning weights to compare the calf crops, but the best measure to use is the adjusted 205-day weaning weight. The adjusted 205-day weaning weight allows you to more accurately compare calves, because it is adjusted for age of dam and age of calf.

When comparing the 2003 and 2004 calf crops for the demonstration herds, we looked at the adjusted 205-day weaning weights for each. Most of the herds showed an increase in the adjusted 205-day weaning weight. Shown in Table 2 are the adjusted 205-day weaning weights for the 2003 and 2004 calf crops for three of the demonstration herds. Lawrence County was where the greatest increase was achieved at an average of 95 pounds per head from 522 pounds in 2003 to 617 pounds in 2004. More typical of the demonstration herds was Roane County where an increase of 37 pounds was achieved. The 2004 calves' average weight per day of age of 2.79 pounds is 0.23 pounds greater than the 2003 average even though the 2004 calves are 17 days younger. In addition, the 2003 calves were creep fed twice as long as calves in 2004, as well as, being implanted twice while 2004 calves were not.

In considering the economic value of the additional weight achieved, a fifty cow herd with a 90% calf crop valued at the average of the five year average prices for both 500-600 pounds heifers and steers were assumed. The additional weight achieved in Roane County would give the producer an additional \$32.66 per head or a total of \$1470. Using the five year average prices for both 600-700 pounds heifers and steers, the additional weight achieved in Lawrence County would increase the value per head by \$80.28 or a total of \$3613 and the increase in Bledsoe County would increase the value per head by \$59.16 or a total of \$2662.

Table 2. Adjusted 205-day Weaning Weights, Age, and Weight Per Day of Age

	Lawrence County		Bledsoe County		Roane County	
	2003	2004	2003	2004	2003	2004
Avg. adjusted 205-day weaning weight	522	617	534	604	549	586
Avg. Age (days)	230	204	201	206	220	203
Avg. weight per day of age (lbs)	1.84	2.38	2.45	2.85	2.56	2.79

Percent Body Weight Weaned

Another measure which relates to weaning weight is that of percent body weight weaned. This measure tells the percentage of a cow's weight her calf weighs at weaning. The recommended percent body weight weaned is 50%. The demonstration herd in Lawrence County had an average percent body weight weaned in 2003 of 44.8% and in 2004 an average of 52.4%. This was the largest increase in percent body weight weaned. The typical increase in percent body weight weaned was two to three percent. The increase of 7.6% body weight weaned in Lawrence County on an average cow weight of 1100 pounds is an additional 84 pounds per head weaned. Using the five year average prices for both 500-600 pounds heifers and steers, this additional weight gives the producer an additional \$74.14 per head. On a fifty head herd with a calf crop percent of 90%, this increase in percent body weight weaned would add an additional \$3336 in revenue.

Calving Distribution

One advantage of using estrous synchronization is the ability to shorten the calving period, which in turn allows a producer to have a more uniform calf crop to market as a group. One demonstration herd which showed an improvement in the percent of calves born earlier in the calving period was in Bledsoe County. Shown in Figure 1 are the calving distributions for the 2003 and 2004 calf crops. The calving period is divided into calving intervals based on the predicted due date which is 283 days from the first date of exposure to a bull or AI breeding. Calves born prior to the 283rd day are in the early time period, while calves born between the due date and 21 days later are in the first calving interval. The second calving interval is the next 21 days, and so on.

The 2003 calf crop in Bledsoe County was born between January 1, 2003 and March 31, 2003. The 2003 calving distribution shows that it was not until the second calving interval that

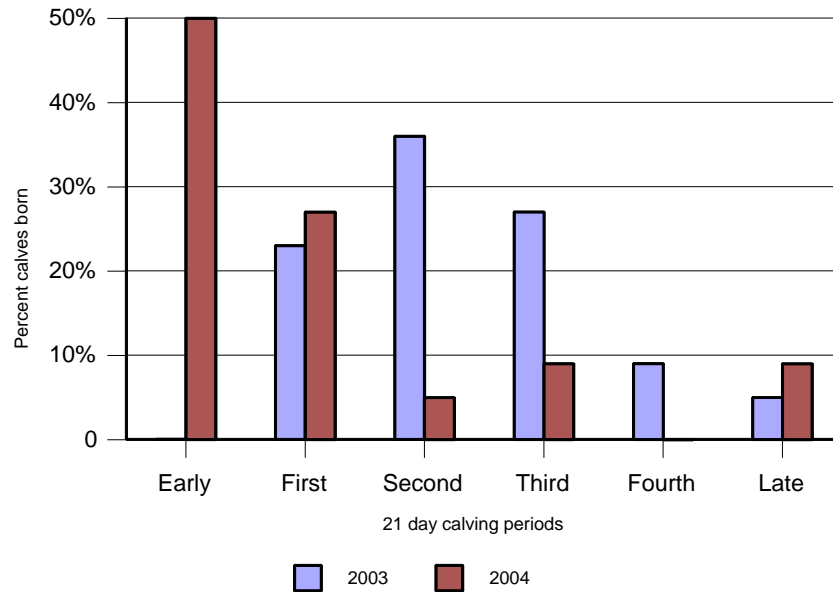


Figure 1. 2003 and 2004 Calving Distributions - Bledsoe County

over 50% of the calves were born while an additional 25% was born in the third calving interval. The 2004 calving distribution shows that 50 percent of the calves were born prior to the January 27, 2004 estimated due date based on April 17, 2003 artificial breeding date. Within the first interval following the calculated due date, 27 percent of the calves were born. Therefore, almost 80 percent of calves in 2004 were born between January 20 and February 17.

When considering the calving distribution, we can calculate the potential value of tightening the time period in which the majority of the calves are born. The calving distribution for the Bledsoe County herd in 2003 is shown in Table 3. The number of calves born during each calving interval is listed as well as their average actual weaning weight. The average pounds per head to be gained is the additional pounds which could be weaned if one female could calve in the previous interval. Moving just one of the two females in the fourth calving interval up to the third interval would increase the pounds weaned by 87 pounds.

According to Harlan Hughes, North Dakota State University professor emeritus, “these added pounds are the economic reward to tightening up the calving interval”. For example, moving the one female from the late calving interval and half of the females from the third and fourth calving interval forward just 21 days would increase the total pounds weaned by 360 pounds. Using the five year average prices for both heifers and steers for each weight range, this additional weight gives the producer an additional \$337.48. If all females in the third, fourth, and late calving intervals moved forward 21 days, the increase in total pounds weaned would be 645 pounds which would give the producer an additional \$595.42.

Table 3. 2003 Calving Distribution - Bledsoe County

	Early	First	Second	Third	Fourth	Late
Number of calves born	0	5	8	6	2	1
Avg. actual weaning weight (lbs)		565	537	471	384	309
Avg. pounds per head to be gained		28	66	87	75	
Avg. \$/cwt			\$88.26	\$95.61	\$106.07	
Added value if half moved forward 21 days			\$174.75	\$83.18	\$79.55	
Added value if all moved forward 21 days			\$349.51	\$166.36	\$79.55	

How Much Can You Afford to Pay For A Bull?

When considering the purchase of a bull sometimes it is difficult to determine how much you can afford to pay. From this demonstration we were able to compare the sires used for the 2003 calf crop to the A.I. and cleanup sires used for the 2004 calf crop and determine based on the added weight from the improved genetics the additional funds available to purchase a bull.

In the Loudon County herd we compared the adjusted 205-day weaning weights of calves from the cleanup bull used, UT MR 1291, to the 2003 herd sires. The average adjusted 205-day weaning weights for steers from the 2003 herd sires was 564 pounds and for heifers it was 509 pounds. The average adjusted 205-day weaning weights for steers from UT MR 1291 in 2004 was 643 pounds or 79 pounds higher than 2003 steers and for heifers it was 573 pounds or 64 pounds higher than 2003. Using the five year average price for 600-700 pound steers, the additional value generated by UT MR 1291 in 2004 was \$66.84 per head. Using the five year average price for 500-600 pound heifers, the additional value generated by UT MR 1291 in 2004 was \$54.36 per head.

Consider a two year old bull which can service up to 30 cows and assuming a 90% calf crop or 27 calves weaned, 14 steers and 13 heifers, and the possible increase in weaning weights achieved in Loudon County. Using the per head additional value calculated, for 14 steers the total additional value would be \$935.76 and for the 13 heifers an additional \$706.68. This would mean an additional \$1642 would be available for the purchase of a bull which would be expected to show this much improvement.

Post-weaning Feeding

All producers had the opportunity to take part in an on-farm post-weaning feeding demonstration with the calves from the improved genetics. One farm which took part was in Loudon County. The 2004 calf crop was weaned July 22, 2004 and then were fed for 50 days until being marketed in the Southeast Pride Sale in Sweetwater, Tennessee on September 10, 2004. Thirty calves were used in the analysis of the post-weaning feeding program. The calves were weighed the day of weaning and had an average actual weaning weight of 568 pounds.

Ending weights used in the analysis were the pay weights from the day of sale which averaged 648 pounds.

The Southeast Pride Sale health and feeding program was followed for the post-weaning feeding period. The health program includes two rounds of vaccinations for IBR, BVD, PI3, BRSV with the second vaccine used being a modified live vaccine. The program also includes two vaccinations for Clostridial (7-way) and Haemophilus Somnus. The calves were vaccinated one time for Pasteurella Bacterin-Toxoid. The calves were also treated with a dewormer. The total cost of the health program was \$9.31 per head. The calves were fed a 14% Select Hi E mixed feed at the rate of 13 pounds per head per day. They were also fed hay at the rate of 4.3 pounds per head per day. The total cost of the feeding program was \$45.48 per head.

The calves on average gained 81 pounds during the 50 days of feeding as shown in Table 4. The heifer calves' weaning weights averaged 530 pounds and their pay weights averaged 597 pounds, an average gain of 67 pounds. The steers calves gained an average of 90 pounds from their average weaning weight of 593 pounds to their average pay weight of 683 pounds. The heifers' average daily gain was 1.35 pounds while the steers' average daily gain was 1.80 pounds.

Table 4. Post-weaning Feeding Cattle Performance - Loudon County

	Date	Average weight (lbs)	Average daily gain (lbs)
Steers	7-22-04	593	
	9-10-04	683	1.80
Heifers	7-22-04	530	
	9-10-04	597	1.35
Overall	7-22-04	568	
	9-10-04	648	1.62

The economic benefit of a post-weaning program can be significantly impacted by the price change from beginning to end. A graded sale was chosen to value the animals at the beginning of the post-weaning period due to the fact that the graded sale would be the next best marketing alternative for this producer if the post-weaning feeding demonstration had not been conducted. The graded sale was conducted in Sweetwater on August 6, 2004. This was two weeks after weaning, therefore valuing the calves based on their weaning weights actually gives the calves an advantage due to valuing them at a lower weight than they would possibly have weighed at the graded sale. The average value of calves using the graded sale price was \$670.63 per head.

The average final value placed on the calves at the Southeast Pride sale was \$757.75 per head. The difference between the final value and the initial value using the graded sale is \$87.12 per head. After taking out the cost of the health and feeding program (\$54.79 per head) the value of the calves on average increased by \$32.33 per head above their value at time of weaning.

Table 5. Net Added Value - Graded Sale versus Southeast Pride Sale

Value at graded sale (08/06/04)*	\$ 670.63
Value at Southeast Pride Sale (9/10/04)	757.75
Difference	87.12
Less cost of program	54.79
Net added value	32.33
* Graded Sale on August 6, 2004 in Sweetwater	

Impact of Demonstration

Meetings were conducted on a majority of farms involved in the demonstrations so that producers from the county and surrounding counties could learn about the demonstration and see the calves produced. Presentations on the results of the demonstrations, estrous synchronization and artificial insemination, and preconditioning of feeder cattle were shared. After the meetings, all attendees were mailed a short survey regarding their plans for use of improved genetics in their herds.

The first on-farm meeting was held in Loudon County. Eighteen of the attendees which were mailed a survey responded. Of those 18, when asked if they plan to use better genetics in their beef herd in the future, 89% indicated they planned to do so, 11% did not answer and none answered no. When asked to rank actions they plan to take to improve the genetics of their herd, 56% of respondents ranked use of purebred bulls with better expected progeny differences (EPD) first, while 39% ranked buying performance tested bulls first. Thirty-three percent ranked use of A.I. to breed better bulls to their better cows as first action they would take to improve the genetics of their herd. Respondents could rank more than one action as equally important.

When asked in considering the purchase of a bull the performance characteristics they considered most important 58% of respondents ranked birth weight EPD as most important while 29% ranked carcass trait EPDs as most important. Twenty-four percent of respondents indicated EPD accuracy estimate was the most important performance characteristic they consider. Eighteen percent ranked weaning weight EPD and milk EPD as the most important characteristics. Respondents could rank more than one characteristic as equally important.

The final question asked was to rank other factors considered in selecting a bull in order of importance. Seventy-eight percent of respondents indicated they consider breed most important in selecting a bull. Pedigree, polled, age of bull, disposition, frame score, and structural soundness were ranked most important by 17% of respondents. Respondents could rank more than one characteristic as equally important.

Summary

When considering the impact of using sires with superior genetic traits we have seen that improvements in production and performance measures such as weaning weights, weight per day of age and percent body weight weaned can be achieved quickly. In addition, it is possible to change feeder cattle grade, i.e. frame size and muscling if that is a problem in the herd. It was

not a significant problem in these demonstration herds. We must remember these measures were only evaluated for the calf crop from the superior sires, but the impact of these genetics will be seen for years to come through the offspring of the heifers retained in the herd.

Even though this demonstration was not conducted to encourage the use of artificial insemination, we have shown that it can be used in a commercial herd when limiting factors such as costs, AI technician availability, and labor are taken into account. One way to use AI in a commercial herd is to breed better cows to sires of superior genetics to produce heifers which can be retained as breeding stock. Since the conception rate when synchronizing heifers is usually higher than cows, it is also a good way to get heifers started in production on a short calving period.

Many lessons have been learned as we have progressed through this demonstration. One of which is, when using estrous synchronization and timed AI breeding you must be prepared with the appropriate bull power. You must have a bull or bulls which will be able to handle those cows which did not conceive by AI and will be coming back into heat at the same time. Remember that the age of the bull determines how many cows he can service, i.e. an 18 month old bull should be able to service 18 cows while a 24 month old should be able to service 24 cows. In addition, all synchronization programs require good management, cows which are cycling regularly, and in good body condition (more than body condition of 4 on a scale of 1 to 10).

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