INDUSTRY NEWS

Research Update

▶ **Summaries** of current **beef cattle** research

Research highlights and trends

The following research highlights are presented by Harlan Ritchie, Steven Rust and Daniel Buskirk, beef cattle specialists at Michigan State University, East Lansing. The reviews summarize studies and trends reported at scientific meetings or in scientific and industry publications, which are cited at the end of each item.

BREEDING/GENETICS

Economic effect of using high-accuracy genetics in an AI program

The objective of this University of Missouri study was to determine the effect of using proven genetics in an artificial insemination (AI) program. The study involved a total of 328 steers from four sire groups that were categorized based on their expected progeny difference (EPD) accuracies:

1. High-accuracy AI (HA);
2. Low-accuracy AI (LA);
3. Calving-ease AI (CE); or
4. Natural service (NS).

HA sires were bulls with EPD accuracies 0.85 for birth weight (BW), weaning weight (WW) and yearling weight (YW). All sire groups were harvested at the same yield grade, based on ultrasound measurements.

Steers sired by HA sires finished at a significantly younger age ($P<0.0001$) than other sire groups (HA, 408 days; LA, 430 days; CE, 443 days; NS, 416 days) with greater average quality grades (HA, high-Choice; LA, low-Choice; CE, average-Choice; NS, low-Choice).

HA-sired steers also finished with significantly greater ($P<0.0001$) net return compared to other sire groups (LA, +$50.69; CE, +$53.83; and NS, +$89.66).

Estimated lifetime value of HA-sired replacement females compared to NS-sired replacement females ranged from $248.43 (four-year productive life) to $416.40 (seven-year productive life). The authors concluded that AI to sires with high-accuracy EPDs provides the opportunity to increase the profitability and marketability of both terminal and replacement female calf crops.

[Schafer et al. 2007. J. Anim. Sci. 85 (Suppl. 1). Abstract T43]

Selection for scrotal circumference should not influence carcass traits

Cattle breeders have recently questioned whether scrotal circumference has an effect on ultrasound predictions of intramuscular fat (IMF). The objective of this Kansas State University study was to examine the relationship between ultrasound IMF, carcass marbling score (MS), and yearling scrotal circumference (SC) in Angus cattle. The American Angus Association provided EPDs for 290 Angus sires and performance records from 332,162 progeny of these sires and their contemporaries.

Correlations of SC EPD with IMF EPD and MS EPD were not significant. However, there were significant correlations ($P<0.05$) between SC EPD and EPD for birth weight, weaning weight, yearling weight, yearling height, mature height, and ultrasound scan weight. Intramuscular fat EPD was highly significant ($P<0.01$) in predicting MS EPD. The authors concluded that selection for SC should not significantly influence carcass traits such as intramuscular fat.

See "Scrotal Vindication," beginning on page 131 of the November 2007 *Angus Journal* for additional information.

[Arnett et al. 2007. J. Anim. Sci. 85 (Suppl. 1). Abstract 221]

COW-CALF

Raising vs. buying replacement heifers

Cattle-Fax analysts recently discussed the issue of whether to raise or buy replacement heifers. When calf prices are low, it is often advantageous to buy replacements. Herd size is another factor. Small-scale cow-calf producers may find that purchasing replacements is more cost-effective due to economies of scale. Other factors affecting the decision to raise or buy replacements include opportunity costs, feed costs, interest, labor and tax considerations.

Table 1 is an estimate of heifer development costs that may serve as a benchmark for commercial cow-calf producers. The authors noted that this analysis is not all-inclusive. It does not include charges for labor, the cost of open heifers, or the opportunity cost of foregoing any interest made from selling the example $616 heifer calf.

Blood parameters in newborn calves to predict weaning weight

Texas A&M University researchers conducted an experiment to determine the ability of various blood parameters obtained at birth to predict the future performance of beef calves. Plasma and serum samples were taken from 111 Brahman calves and analyzed for plasma protein, serum protein, IgA, IgM, and IgG concentrations. Calf body weights

CONTINUED ON PAGE 344

Table 2: U.S. beef production per cow, lb.

Year	Production, lb./cow
1965	363
1970	447
1975	435
1980	449
1985	480
1990	530
1995	565
2000	625
2006	620

This table shows that beef production per cow has increased dramatically during the past 41 years. Compared to 1965, U.S. cow-calf producers have increased their output by 70%.

Source: USDA.

Table 1: Estimate of heifer development costs

Item	Estimate, $
Value of heifer at weaning (550 lb. x $1.12 per lb.)	$616
Cost of gain, weaning to breeding (50¢ per lb. x 200 lb.)	$100
Bull cost (bull cost-less salvage per 25 cows for 3 years)	$20
Interest at 10%	$38
Grazing and feeding cost, breeding to calving	$220
Veterinary, medical, vaccinations	$30
Death loss, 1.5%	$15
TOTAL	$1,039

CONTINUED FROM PAGE 343

were taken at birth and at weaning (avg. age = 172 days).

Of the five blood parameters analyzed, only serum protein had a significant relationship with calf weaning weight. Consequently, the authors concluded the results suggest that, of the blood parameters evaluated, serum protein may be the most appropriate measure for predicting the future performance of beef calves.

[Banta et al. 2007. J. Anim. Sci. 85 (Suppl. 1) Abstract 765]

STOCKER/FEEDLOT

BRD had significant negative effects on feedlot performance and carcass traits

The objective of this Iowa State University study was to evaluate the effects of bovine respiratory (BRD) treatments on the performance and carcass characteristics of Angus cattle sired by different Angus bulls.

Performance and health records on 1,714 Angus-sired calves fed in various feedlots during a three-year period (2003-2005) were used in the analysis. A partial summary of results is shown in Table 5. The data represent the reduction in performance resulting from the number of BRD treatments.

Respiratory treatments significantly reduced performance and carcass traits, except for WDA and marbling score in cattle treated one to two times. Although not shown here, number of respiratory treatments also had significant effects on ribeye area per 100 pounds (lb.) of carcass weight and calculated yield grade.

In addition, sire, percent shrink upon feedlot entry and temperament score were all shown to have significant effects ($P<0.05$) on number of treatments. However, sex did not affect the number of respiratory treatments.

(*Schneider et al. 2007. Iowa State Univ. Animal Industry Report*)

Improved efficiency of low-RFI a result of reduced energy losses

Kenneth Eng recently presented an excellent review of research on residual feed intake (RFI), a measure of feed efficiency in cattle. RFI is defined as actual feed intake minus expected feed intake. A negative RFI is indicative of improved feed efficiency.

Previous research has revealed that if cattle are segregated into low-, medium- and high-RFI groups, there is no difference in gain, but a significant improvement in feed efficiency for the lower-intake (lower-RFI) cattle. Moreover, there are no differences in carcass traits, as shown in Table 6 (Fox et al., 2004).

A possible basis for the improved efficiency of the lower-RFI cattle has been suggested by other scientists (Nkrumah et al., 2006). They found that low-RFI cattle had significantly lower losses of feed energy via methane, urine and nitrogen losses and higher protein and fiber digestion compared to the other two groups.

(*Feedstuffs magazine*)

Table 4: Top 10 U.S. feed companies, 2007

Company	Annual manufacturing capacity, million tons
1. Land O'Lakes – Purina LLC	12.8
2. Cargill Animal Nutrition	9.5
3. ADM Alliance Nutrition Inc.	3.2
4. J.D. Heiskell & Co.	2.8
5. Westway Feed Products	2.0
6. Kent Feeds	2.0
7. Southern States Co-op	1.7
8. Ridley Inc.[a]	1.6
9. Quality Liquid Feeds	0.8
10. Pennfield Corp.	0.7

[a]Includes Canadian feed tonnage.

Table 5: Effects of BRD treatments on performance and carcass characteristics

No. of treatments	No. of cattle	ADG, lb.	WDA, lb.	Hot carcass wt., lb.	Marbling score
0	1,527	---	---	---	---
1 to 2	157	-0.17***	---	-15.51**	-0.09
3 to 6	25	0.39***	-0.13**	-44.54***	-0.64**

Statistical significance: **P<0.01; ***P<0.0001

Table 3: Returns for U.S. cow-calf producers

Year	Net return, $/head
1986	25
1987	88
1988	40
1989	60
1990	75
1991	76
1992	58
1993	47
1994	7
1995	-45
1996	-85
1997	5
1998	-30
1999	30
2000	40
2001	45
2002	15
2003	85
2004	147
2005	135
2006	50
2007 (projected)	49

As shown above, net returns for most cow-calf producers have been generally profitable during the past 22 years. Only for 1994-98 were profits negative or barely breakeven.

Source: USDA and James Mintert, Kansas State University.

Grass-fed standard established by USDA

A voluntary standard for a grass (forage)-fed livestock marketing claim was established by the U.S. Department of Agriculture (USDA), effective Nov. 15, 2007. The standard covers the minimum requirements that will allow producers to request that a grass (forage)-fed claim be verified by the USDA through an audit of their production process.

The standard states that grass and/or forage shall be the feed source consumed for the lifetime of the ruminant animal, with the exception of milk consumed prior to weaning. The diet must be derived solely from forage; animals cannot be fed grain or grain byproducts and must have continuous access to pasture during the growing season.

(*Cattle-Fax Update*)

Limit-feeding a high-energy diet to backgrounding cattle improved feed efficiency

University of Saskatchewan scientists conducted three winter trials to compare the effects of a limit-fed high-grain diet with that of an *ad libitum* full-fed high-forage diet on performance of growing cattle with similar total energy intakes. The diets contained 82% and 37% rolled barley, respectively. Trials ranged in length from 77 to 90 days. Table 7 contains a summary of results.

Table 6: Effects of feed intake on feed efficiency

Item	RFI group		
	Low	Medium	High
Dry-matter intake, lb./day	15.76[a]	18.45[b]	20.13[c]
Avg. daily gain, lb./day	2.40	2.49	2.43
Feed/gain	6.72[a]	7.50[b]	8.49[c]
RFI, lb./day	-2.14[a]	0.11[b]	1.17[c]
Hot carcass wt., lb.	681	688	690
Backfat, in.	0.25	0.30	0.30
Ribeye area, sq. in.	12.82	13.34	13.36
KPH fat, %	1.53	1.60	1.53
Yield grade	1.85	1.89	1.83
Quality grade	3.52	3.61	3.63

[a,b,c] Means are significantly different (P<0.05).

Table 7: Effects of limit-fed high-energy diet vs. full-fed high-forage diet on performance

	Diet	
	Full-fed high-forage	Limit-fed high-grain
Avg. daily gain, lb./day	2.82	2.93
Dry-matter intake, lb./day	17.40[a]	14.79[b]
Feed efficiency, gain/feed	0.162[a]	0.198[b]

[a,b]Statistically significant (P<0.01).

As shown in Table 7, there was no significant difference in daily gain. However, due to significantly lower dry-matter intake (DMI), limit-fed high-grain steers were significantly more efficient than full-fed high-forage steers. Although not shown here, backfat accretion rates were significantly greater (P<0.05) for the limit-fed high-grain cattle, indicating differences in energy partitioning. Furthermore, incidence of severe liver abscesses was significantly greater (P<0.05) for limit-fed high-grain cattle in Trial 2. The authors concluded that limit feeding a high-grain diet to backgrounding cattle can be employed to target specific rates of gain and improve feed efficiency, although managing acidosis to prevent liver abscesses may be an issue.

(Klinger et al. Can. J. Anim. Sci. 87:385)

Table 8: U.S. average cattle-feeding returns

Year	Net return, $/head
1986	20
1987	56
1988	-5
1989	-12
1990	18
1991	-60
1992	16
1993	0
1994	-55
1995	0
1996	-13
1997	-29
1998	-70
1999	26
2000	-35
2001	-43
2002	-50
2003	102
2004	-42
2005	-26
2006	-72
2007	-27

As indicated in Table 8, cattle feeding is a volatile business, with average returns ranging from -72 to +102 dollars per head during the last 22 years.

Source: Livestock Marketing Information Center.

Performance and economics of a long-yearling vs. a calf-fed finishing system

University of Nebraska scientists analyzed research data from 1996 to 2004 to compare the performance and economics of calf- vs. long-yearling feeding systems. All calves in these trials were spring-born and purchased the subsequent autumn. The heaviest calves (644 lb.) were placed directly into the feedlot and fed an average of 168 days (calf-fed), whereas the lighter calves (527 lb.) were grazed on corn residue followed by summer grazing before entering the feedlot and fed an average of 90 days (long-yearlings).

At the start of the finishing period, long-yearlings were 317 lb. heavier than calf-feds (959 lb. vs. 642 lb.). Following is a summary of results.

- Daily dry-matter intake (DMI) was significantly greater (P<0.01) for long-yearlings, but calf-feds consumed more total dry matter (DM) during finishing.
- Long-yearlings had significantly greater ADG (P<0.01) during finishing than calf-feds, but calf-feds were 18.7% more efficient (P<0.01).
- At harvest, long-yearlings were 84 lb. heavier and had carcasses that were 53 lb. heavier than calf-feds.
- Quality grades were not significantly different, but calf-fed carcasses had significantly greater (P<0.01) fat thickness than long-yearlings (0.53 in. vs. 0.47 in.) and higher numerical yield grades (2.71 vs. 2.60).

Long-yearlings were more profitable than calf-feds due to their lower feed cost, yardage, initial animal cost and greater final body weight.

(Griffin et al. 2007. Prof. Anim. Sci. 23:490)

CARCASS/MEAT SCIENCE

Factors that influence consumer attitudes toward beef products

The objective of this Iowa State University study was to examine the relative attributes of a set of beef steak characteristics evaluated by a national sample of 1,432 consumers, as well as additional localized samples of university business and animal science undergraduate students. The researchers used an analysis technique (conjoint analysis) that is used in the field of marketing to quantify consumer preferences for products.

Results indicated that among all respondents (aggregate results), region of origin is by far the most important characteristic. This is followed by animal breed, traceability, animal feed and beef quality. Alternatively, the cost of cut, farm ownership, the use (or nonuse) of growth promotants, and whether the product is guaranteed tender were the least important characteristics. Results for animal science undergraduates were similar to the aggregate results, except that these students emphasized beef quality at the expense of traceability and the nonuse of growth promotants. Business students also emphasized region of origin, but then emphasized traceability and cost.

The ideal steak for the national sample is from a locally produced, USDA Choice Angus, fed a mixture of grain and grass that is traceable to the farm of origin. If the product is not produced locally, respondents indicated that their preferred production states are, in order from most to least preferred, Iowa, Texas, Nebraska and Kansas.

(Mennecke et al. 2007. J. Anim. Sci. 85:2639)