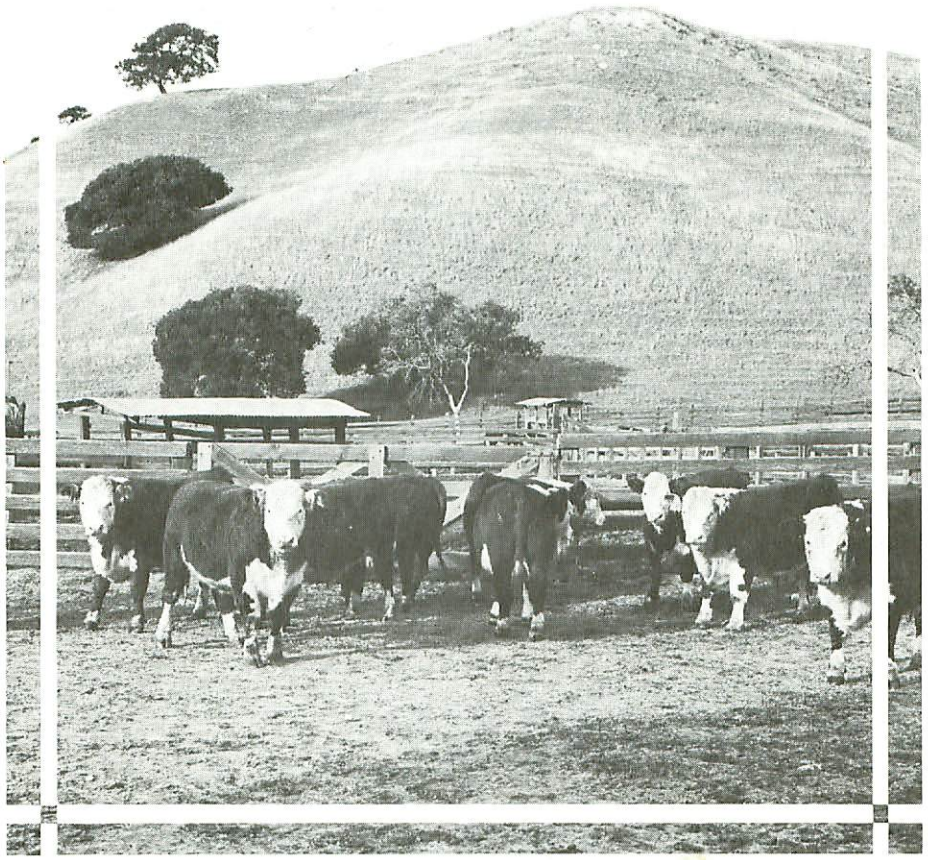
WEIGHT VS. SHAPE

(Beef Cattle)



Division of Agricultural Sciences
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INTRODUCTION

This is a report of the performance of Okie and dairy-bred cattle compared to that of various types of beef breeds. The results of this comparison show excellent daily gains and carcass merit of lower grading cattle. Although the University of California is not advocating the production of Okie and dairy breeds of cattle for beef production, breeders should be aware of the potential of such cattle and plan their selection programs to meet this competition.

Animals look different in the slaughterhouse with hides off than they do alive in the corrals. No matter how high an animal grades, if it doesn't gain rapidly it is not going to make anyone much money. It goes back to the old saying, "If you insist on buying a poor bull, buy a big one."

Conformation, indicated by differences in shape, structure, and soundness, is still important, but cattlemen would do well to increase the emphasis on rate of gain when selecting cattle. It pays to produce cattle that grade high, gain rapidly, and have high fertility and longevity.

These data further point out that live growth rate of the meat-producing muscles of the beef animal is far more important than some of the fine points of conformation that have been emphasized in the past.

Cover picture courtesy W. S. Markham. High-quality, fast-gaining cattle usually bring a premium on any market. These are progeny of one bull.

Formerly AXT–222

WEIGHT VS. SHAPE

(Beef Cattle)

Conformation and rate of gain are important heritable traits in beef cattle breeding. From the dollars and cents standpoint, how much is each worth? That is the big question cattlemen ask.

California ranks sixth in cattle numbers among the states. It also is a large cattle feeding area. In 1975, more than 1,649,000 were finished in this state's feed yards, the third largest number in the nation. According to the California Crop and Livestock Reporting Service,[1] California cattlemen imported 1,809,000 head of feeder cattle during 1975, and 429,000 cattle were imported for immediate slaughter. In 1965, a total of 366.4 million pounds of carcass beef came into the state by truck, or 611,000 head of 1000-pound live steers equivalent, based on 60 percent dressing.[2] Since that time the services collecting these data have been discontinued.

In 1975, 353,000 head of cattle were shipped out of the state. Most of these were high grade feeder cattle of the British breeds.

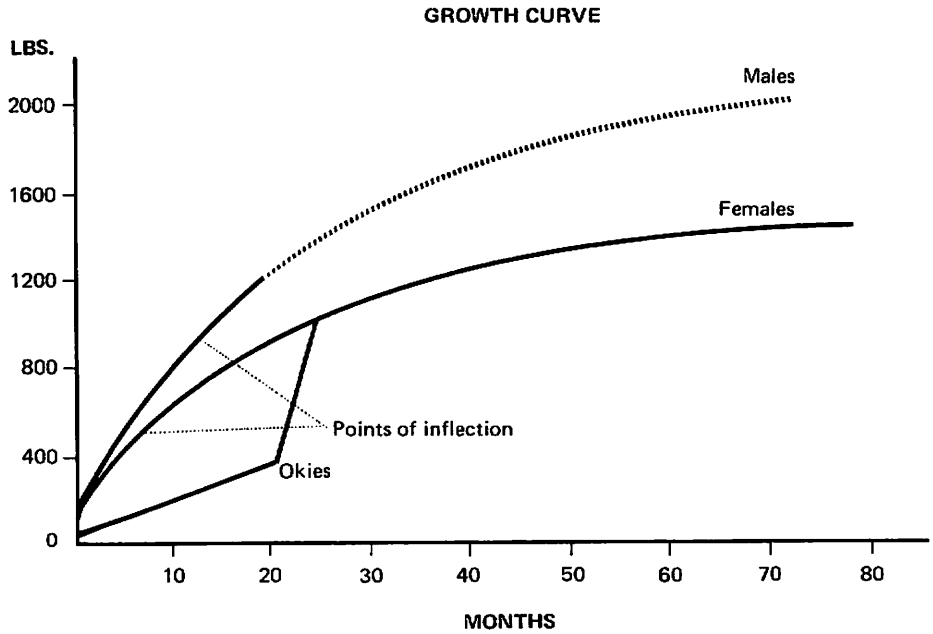
[1] See references on back cover.

During 1975, a total of 528,000 head of feeder cattle were shipped to our state from Texas. However, many originate in the Deep South and are known as Okie cattle.

In 1963, economists from the Bank of America[3] made a survey of the percentages of different types of cattle on feed in this state. The results (table 1) show that Okie cattle have the largest percentage. Another startling figure in this table is that 4 percent of these cattle are dairy breeds, mostly Holsteins.

TABLE 1. KINDS OF CATTLE FED IN CALIFORNIA, 1975

	1963 %	1976 %
English breeds & crosses	30.1	25
Mexicans	14.2	20
Okies	40.1	40
Brahman crosses	11.6	10
Dairy breeds	4.0	5



The two curved lines show the normal growth curves of beef cattle under proper environment. Note that females grow more rapidly from birth to 10 months, and males from birth to 15 months (points of inflection). Okie-type cattle grow more slowly during the first part of their lives when their environment is poor and they are under stress. When put in feedlots in California, their growth curve is steep. This rapid, economical gain is called compensatory growth.

Fran Simpson, Secretary-Manager, California Cattle Feeders Association, estimated percent of various types of cattle on feed in 1976. He further points out that a high percentage of the British breeds of feeder cattle produced in the state are exported to the Midwest for finishing (see table 1).

The question often is asked, Why do California feeders feed so many different types of cattle other than the British breeds? First of all, they can be bought at a lower price as feeders. Because these cattle usually are under stress before reaching California, they gain rapidly here. This fast rate of gain is known as compensatory growth. They usually are older before reaching market than the British breeds, so their carcasses tend to marble better, enabling them to reach the Choice grade in spite of their poor conformation.

In 1964, the University of California established a test to determine the truth of these statements.[4] A total of 125 high-quality Hereford steers were purchased from Siskiyou County. Under the University of California grading system, these animals graded 88-plus. Another 125 Herefords were secured from Humboldt County, and their grades averaged 86-minus (still in the Choice grade). The Okies were No. 2's and graded in the low 80's and high 70's.

The Humboldt County cattle arrived in Davis during September, the Siskiyou cattle in October, and the Okies in November. Eighty percent of the Okies were bulls, and approximately 70 percent had horns. They were castrated and dehorned before the beginning of the test. The investigators of this research program are of the opinion that these operations were an extreme setback to this group of animals.

One-half of each group was put on feed as calves in January and full fed until they reached a low Choice grade. The remaining half was grazed on the range for 215 days and then finished in the feedlot for a yearling phase study. However, because the Okie cattle were smaller than the others, one group of Okies was fed until the animals reached the same weight as the Herefords.

During the calf stage of this experiment, the high-quality animals significantly outgained the Okie cattle (table 2). A live feeder grade was placed on each animal in all of these groups. The average grade for the Herefords was Choice, while the Okies graded Good. However, the conformation scores on the carcasses of these cattle were startling. During the entire feeding period, the Choice cattle did not improve in grade, while the Okie cattle went from Good to high Good and on to Choice.

The final carcass grades on the Hereford cattle were Choice; Okies fed for the same time were Good-plus. However, when the Okies were fed to the same weight as the Herefords, the off-breed cattle had the same final carcass grade (Choice). This, then, indicates that present standards of appraising live cattle are not in keeping with methods used in judging carcasses in the slaughterhouse without the hide, head, and legs. In this test, live grades were Choice and Good; carcass conformation grades all were Choice.

The percentage of fat in the carcass was lower for Okie cattle than for the Herefords (table 2). The cutability (percentage of closely trimmed retail cuts in the round, rump, loin, rib, and chuck) of these cattle was in favor of the Okies, although this was not significant.

The original cost of the high-quality Herefords was $30/cwt; medium Herefords $29; and Okies $26.40. This is the feeder cost plus freight and death loss. This difference in price represents conformation and quality (table 3).

The selling price per 100 pounds of carcass weight was Siskiyou Herefords, $40.16; Humboldt, $39.91; Okies fed for the same time, $39.90; and Okies fed to same weight, $40.48. This again shows that, although live conformation scores of Okie cattle were far below those of Herefords, they sold for just as much money on the hooks as did the others.

When the performance was based on empty body weight, high-quality Hereford cattle returned $6.72 per head more than Okies fed for the same time. Herefords returned about 18 cents per head more than Okies fed to the same weight. This profit was due to rate of gain, because carcass prices were similar. But when the actual purchase weight is considered, high-quality Herefords returned $3.92 per head more than Okies fed for the same time. However, Okies fed to the same weight returned $2.31 per head more than the Herefords.

In the yearling phase of the study, one-half of these cattle were taken to the experimental range in Marysville where they were grazed for 215 days (January to July) before going to the feedlot. During this period, the high-quality Hereford cattle outgained the Okies by 1/2 pound per day. Why the Okie cattle failed to compete on the range when supplemented with cottonseed meal and salt is not known. Dehorning and castration and failure to acclimate to California conditions may be some of the reasons. The performance during this period is highly significant in favor of the two groups of Herefords.

Table 2. UCD Hereford-Okie Experiment, 1964–1965

	CALVES			
	Herefords		Okies	
	Siskiyou County	Humboldt County	Fed for same time	Fed to same weight
Number of steers	30	30	30	20
Days fed	191	191	191	244
Initial weight, pound (empty body)	425	435	383	376
Daily gain, pound	2.95	2.94	2.62	2.51
Carcass weight, pound	633	639	559	633
Feeder grade, live	Choice	Choice	Good	Good
Conformation score	Choice	Choice	Good+	Choice
Carcass grade score	2 Prime 21 Choice 7 Good	1 Prime 20 Choice 9 Good	13 Choice 17 Good	17 Choice 3 Good
Yield grade	4.0	3.9	3.2	3.1
Body fat, percent	23.6	23.1	21.1	23.1
Fat thickness, inches	0.60	0.56	0.41	0.52
Kidney fat, estimated percent	3.2	3.2	3.2	—
Rib-eye area, square inches	10.5	10.8	10.7	11.5
Retail cuts, USDA, actual percent	48.3	48.6	50.2	49.5

Table 3. UCD Hereford-Okie Experiment, 1964–1965 (Costs & Returns)

	CALVES			
	Herefords		Okies	
	Siskiyou County	Humboldt County	Fed for same time	Fed to same weight
Cost/cwt, feedlot	$ 30.00	$ 29.00	$ 26.40	$ 26.40
Cost/head	$127.59	$126.23	$101.11	$ 99.26
Feed cost	97.66	100.63	100.47	128.49
Total	$225.25	$226.86	$201.58	$227.75
Cost/cwt gain	$ 17.35	$ 17.91	$ 20.12	$ 20.98
Carcass value/cwt	40.16	39.91	39.90	40.48
Carcass value/head	247.86	248.87	217.47	250.18
Return/head, purchase weight	9.82	9.31	5.90	12.13
Return/head, empty body weight	22.61	22.01	15.89	22.43

When all three groups of cattle were moved into the feedlot as yearlings and fed for 154 days (part of the Okies for 40 days longer), the Okies outgained the Hereford cattle, especially in the group fed for the same time (table 4). The conformation score at the beginning of the test and the final carcass score were very similar, as was the case when these different types of cattle were fed as calves. The Okies were upgraded from Good to Choice, while the Hereford cattle remained the same grade (Choice).

As yearlings, the Okie cattle (when fed to the same weight as the high-quality animals) had 2.6 percent more fat than the Herefords. In this yearling phase of the study, the Okie cattle gained faster and used their feed more efficiently than did the Herefords. The purchase price could have been the same for both groups, and still the Okie cattle would have returned as much profit as the others (table 5). This is due to rate and economy of gain and to the price received for the carcasses.

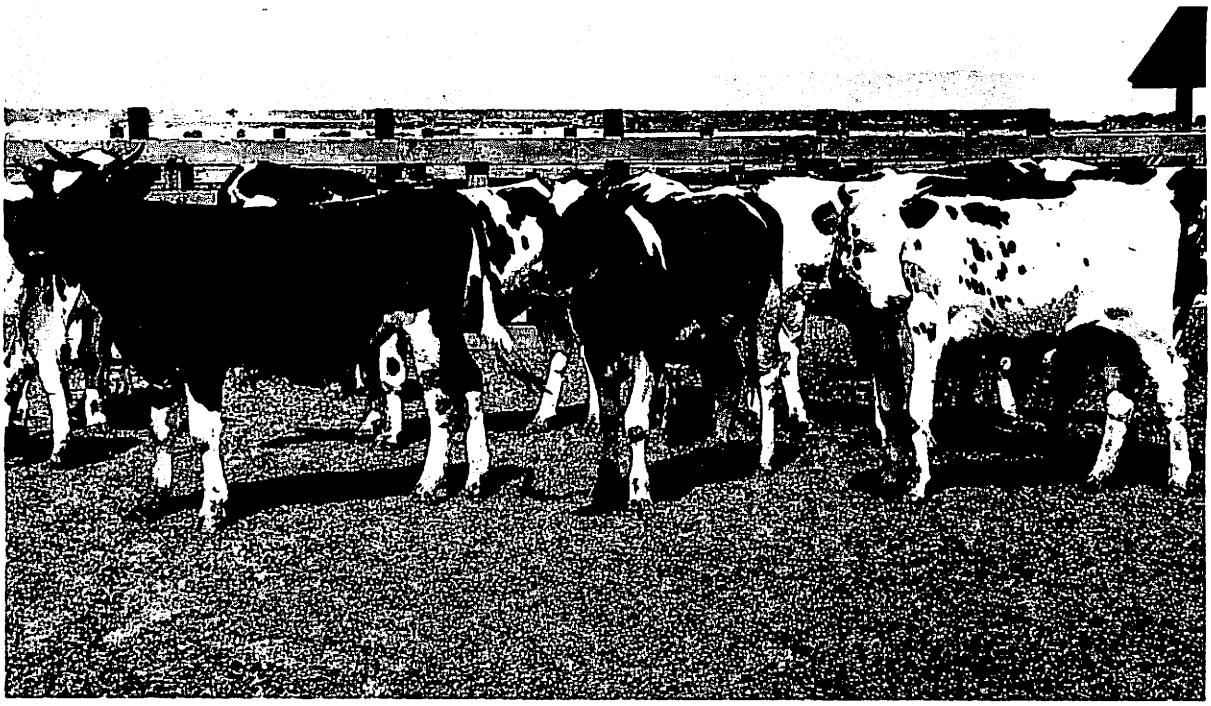
Table 4. UCD Hereford- Okie Experiment, 1964–1965

	YEARLINGS			
	Herefords		Okies	
	Siskiyou County	Humboldt County	Fed for same time	Fed to same weight
Number of steers	30	30	10	18
Days fed	153	153	148	189
Initial weight, pound (empty body)	636	654	532	531
Daily gain, pound	2.55	2.60	2.64	2.53
Carcass weight, pound	658	677	596	648
Feeder grade, live	Choice	Choice	Good	Good
Conformation score	Choice	Choice	Good+	Choice
Carcass grade score	28 Choice 2 Good	25 Choice 5 Good	6 Choice 4 Good	14 Choice 4 Good
Yield grade	3.7	3.4	2.9	3.4
Body fat, percent	22.9	23.2	21.8	25.7
Retail cuts, USDA, actual percent	48.91	49.54	50.74	49.55

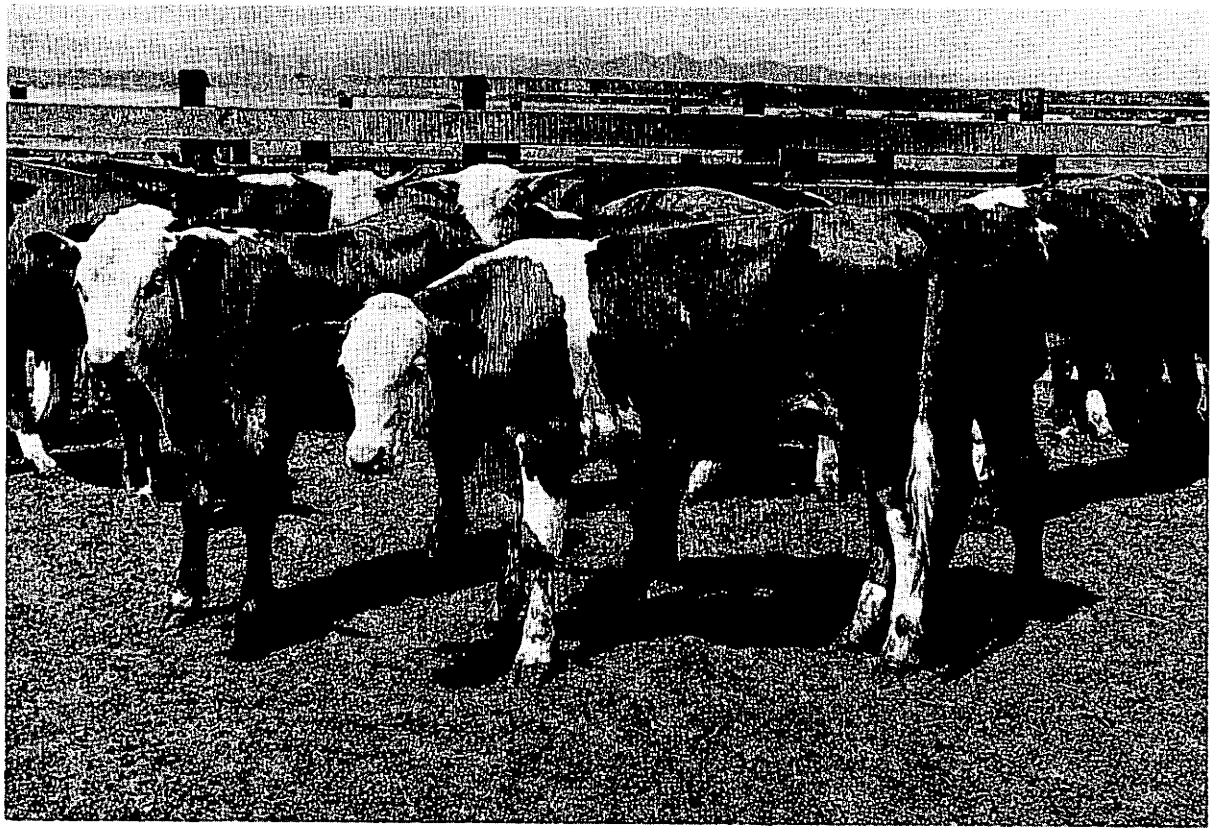
Table 5. UCD Hereford-Okie Experiment, 1964–1965 (Costs & Returns)

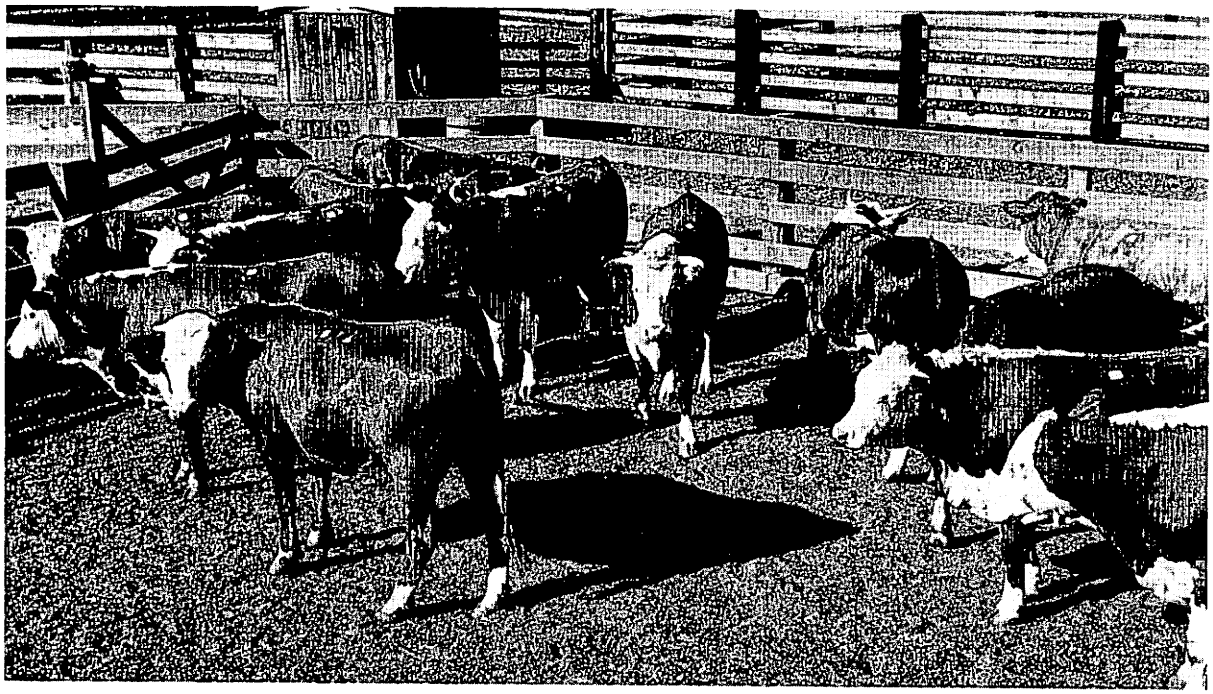
	YEARLINGS			
	Herefords		Okies	
	Siskiyou County	Humboldt County	Fed for same time	Fed to same weight
Cost/cwt	$ 24.00	$ 23.00	$ 20.40	$ 20.40
Purchase price/head	152.54	150.46	108.45	108.31
Feed cost	100.20	97.61	93.07	112.53
Cost/cwt gain	25.76	24.62	23.86	23.49
Break-even price	24.67	23.61	21.87	21.86

Top photo: Choice Herefords (feeders); gained 2.42 pound/head/day; live grade, Choice.
Bottom photo: Same Choice Herefords (finished); carcass grade: 5 Choice, 10 Good. Carcass index 50.44. Fed for 132 days. (Colusa County test.)



Top photo: Holsteins (feeders); gained 2.81 pound/head/day; live grade: 10 Medium, 5 Common.
Bottom Photo: Same Holsteins (finished); carcass grade: 13 Good, 1 Standard. Carcass index 50.21. Fed for 132 days. (Colusa County test.)





Top photo: Okies (feeders); gained 2.73 pound/head/day; live grade: 6 Good, 9 Medium.
Bottom photo: Same Okies (finished); carcass grade: 1 Choice, 11 Good. Carcass index 50.69. Fed for 132 days. (Colusa County test.)

Many California feeders like to feed Okie cattle because these animals usually can be bought cheaper, they perform about as well (rate of gain), and their carcasses bring about as much money on the hooks as do the higher quality cattle. This indicates that carcass quality is similar.

To supplement the work at Davis, a test was conducted in Colusa County, comparing Choice Herefords, Okies, and Holstein cattle.[5] Table 6 shows the rate of gain of these cattle when fed for 132 days on green-chop, barley, and beet pulp. The Holsteins significantly outgained the Herefords, and the Okies gained more than the Herefords.

Table 6. California Feedlot Test – Colusa County

	Choice	Okies	Holsteins
Number head	15	12	14
Days fed	132	132	132
Average initial weight	723	628	734
Average final weight	1041	988	1106
Average daily gain	2.42	2.73	2.81

Table 7. California Feedlot Test – Colusa County

	In price	Out price	Increase
	cents/pound		
Choice	19	20.9	1.9
Okies	17	19.2	2.2
Holsteins	15	18.9	3.9

Table 7 shows the in and out prices of these cattle, and also the increase margins secured in this trial. The differences between the 19, 17, and 15 cents beginning price per pound are due entirely to conformation and quality. Here, again, grades were compared at the beginning and end of this test, and the Okie and Holstein cattle showed a higher increase in grade than did the Choice Herefords (table 8).

As shown in table 8, the Hereford cattle had the most fat in their carcasses; the Holsteins had the least. The cutability of carcasses (after being adjusted to Good-plus grade) was about the same. Wholesale price of carcasses favored the Choice Hereford cattle; Holsteins received the lowest price (table 9). However, since the Holsteins and Okies gained so much more rapidly than the Herefords and were purchased at a lower price, they returned more money over the feeder cost.

Since all of the animals were fed together in this test, there was no way to measure the efficiency of gain. But because the Holsteins gained the fastest, it is assumed their gain was the most economical (fast-gaining animals are usually the most efficient).

An experiment conducted in Tennessee[6] compared Angus, Hereford, Jersey, Holstein, Brahman, and Santa Gertrudis breeds of cattle. In this 5-year study, 154 head were full fed from 4 months of age until they reached 900 pounds.

Again, the Holsteins significantly outgained all the other breeds, yet this breed has not been selected directly for this trait but rather for milk production. Records of performance in dairy cattle indicate that large cows outproduce smaller ones. The Santa Gertrudis and Hereford cattle were second and third, respectively. The Jersey cattle were the lowest gaining

Table 8. California Feedlot Test – Colusa County (Carcass Data)

	Choice	Okies	Holsteins
Hot weight	612	570	631
Cold weight	596	551	612
Initial feeder grade	15 Choice	6 Good 9 Medium	10 Medium 5 Common
Final U.S. grade	5 Choice 10 Good	1 Choice 11 Good	13 Good 1 Stand.
Rib-eye area	10.55	10.49	10.24
Fat thickness	0.37	0.23	0.16
Index	50.44	50.69	50.21

Table 9. California Feedlot Test – Colusa County

	Choice	Okies	Holsteins
Wholesale price/pound	$ 0.365	$ 0.344	$ 0.342
Wholesale carcass value	217.60	189.78	209.37
Feeder value	137.31	106.68	110.14
Return over feeder value	80.29	83.10	99.23

animals. The Angus and Hereford cattle had the highest grading and fattest carcasses. The Holsteins had leaner carcasses (table 10).

The Holsteins had significantly more bone compared to lean than did the British breeds; the Angus cattle had the least bone. The most tender meat, as determined by a taste panel, came from the Jersey carcasses; the least tender meat from the Brahmans. Santa Gertrudis (3/8 Brahman in origin) ranked next to Brahmans in tenderness. When this meat was subjected to a shear test, the Jerseys still ranked first.

This study indicates that no single breed has a corner on all departments of production. It does point out that some dairy breeds have fine beef qualities.

Scientists, through their research, can help beef breeders decide whether to cross with dairy stocks to take advantage of certain characteristics or to select more strongly for these qualities within their own breeds.

Workers at the University of Illinois[7] recently investigated different breed types for rate and efficiency of gain and proportion of lean to fat to bone. This 2-year study involved 64 steer calves per year, weighing approximately 550 pounds and fed for about 150 days. The researchers used four breed types of cattle: dairy (Holsteins), dairy x beef (Angus x Holstein), beef x beef (Charolais x Angus), and beef (Angus). These cattle were fed rations containing various energy levels and treatments of stilbestrol. As indicated by table 11, Angus had the highest final carcass grade, Holsteins the lowest. This also was true for feeder grades.

But the Holsteins outgained all the other breeds in live weight, gain, carcass weight, and salable meat. These dairy cattle also ate less feed per pound of gain than did the other animals (table 12). Information on dressing percentage and carcass grade is shown in table 13. Here, the Angus out-performed the other breeds in dressing percentage, quality grade, and overall carcass grade.

These data are in keeping with the results secured in other stations where different breeds of animals were compared on these performance traits. These and other data continue to indicate the need for greater emphasis on rate of gain compared to conformation in our selection programs.

Another thought provoking experiment was conducted by the Department of Veterinary Anatomy, University of Queensland, Brisbane, Australia.[8] Herefords and Angus, 3/4 Brahman x 1/4 Hereford, 1/2 Brahman x 1/2 Hereford, and unimproved Northern Territory Shorthorn cattle were studied for percentage of muscle-weight distribution in the carcasses. The percentage of expensive muscles (similar to our primal cuts, such as round, rump, rib, loin, and chuck) was almost the same in all of these breeds. This percentage of muscle-weight distribution was not arrived at by the dual grading formula, but by actually dissecting the muscles from bone and fat (table 14).

Table 10. Production and Carcass Characteristics of Various Breeds of Cattle (University of Tennessee)

	Angus	Hereford	Jersey	Holstein	Brahman	Santa Gertrudis
Average daily gain	1.95	2.01	1.76	2.39	1.64	2.02
Off-feed weight	865	885	791	909	835	893
Carcass grade	L. Ch	H. Gd+	Av. Std+	Av. Std+	Av. Std+	L. Gd.+
Lean, percent	52.7	54.5	57.0	60.1	60.1	57.1
Fat, percent	34.3	31.3	26.2	22.1	24.4	27.1
Bone, percent	12.8	14.1	16.2	17.7	15.3	15.7
Preference (loin steaks)	49.6	58.4	74.2	49.0	24.2	30.5
Shear strength	12.7	13.4	12.2	14.4	18.0	16.0

Table 11. Preslaughter Characteristics of Steers of Different Breeds (University of Illinois)

	Holstein	Angus x Holstein	Charolais x Angus	Angus
Number of steers	30	32	31	31
Initial live weight, pound	589	545	544	514
Live weight off-test, pound	947	946	945	934
Initial feeder grade*	13.8	15.7	19.1	20.2
Final slaughter grade*	14.4	15.4	16.4	17.3

* 14 = Average Standard; 16 = Low Good; 18 = High Good; 20 = Average Choice

Table 12. Association of Breed Type with Rate and Efficiency of Gain (University of Illinois)

	Holstein	Angus x Holstein	Charolais x Angus	Angus
Average pound gain/day in:				
Live weight	2.66	2.55	2.13	1.95
Carcass weight	1.62	1.66	1.41	1.40
Total salable meat	0.86	0.82	0.69	0.63
Salable meat (4 major cuts)	0.66	0.63	0.53	0.48
Average pound gain/pound feed in:				
Live weight	0.134	0.126	0.124	0.112
Carcass weight	0.082	0.082	0.082	0.081
Total salable meat	0.043	0.041	0.040	0.036
Salable meat (4 major cuts)	0.033	0.031	0.031	0.028

Table 13. Association of Breed Type with Carcass Weight, Dressing Percentage, and Carcass Grades (University of Illinois)

	Holstein	Angus x Holstein	Charolais x Angus	Angus
Carcass weight, pound	526.3	540.7	538.9	547.1
Dressing percentage	55.30	56.74	56.84	58.20
Marbling score	3.8	4.7	3.6	5.2
Quality grade	15.6	17.5	16.1	18.4
Conformation grade	14.3	16.6	16.9	18.5
Carcass grade, overall	15.1	17.0	15.9	18.0

Table 14. Percent Muscle-Weight Distribution (Brisbane, Australia)

	Polled Hereford	Hereford	Angus	¾ Brahman	½ Brahman	Unimproved Shorthorn
Number of animals	19	8	5	5	9	8
Standard muscle groups						
Prox. hind	32.21	32.61	32.15	33.07	33.76	32.15
Spinal	12.18	11.94	12.20	11.76	12.07	12.30
Prox. fore	11.52	11.04	11.26	11.55	11.01	11.66
Expensive muscles	55.92	55.59	55.61	56.38	56.84	56.11

Unimproved Shorthorn steer from Northern Territory, Australia.

The researcher, an anatomist and trained meats authority, suggests that selection methods used over the past 200 years in beef cattle breeding may have only changed the shape of muscles and added fat to it. The percentage of muscle weight in the expensive muscles of the carcasses has not been altered. Therefore, he advises that, since this percentage has not changed, we should place more attention on growth rate in cattle.

R. M. Butterfield, working with Canadian geneticist R. T. Berg,[9] also studied the muscle:bone ratio in the same cattle used in the muscle-weight distribution trials. The following data have been corrected for weight of carcass.

Polled Hereford	2.96
Hereford	3.31
Angus	3.53
Brahman, 3/4	3.61
Brahman, 1/2	3.52
Unimproved Shorthorn	2.97

The comments made by these scientists regarding ratio of bone to lean are as follows: "As you are well aware, all of the cattle in our series have come from a large range of nutritional conditions, but these would, if anything, favor the British cattle over and above the Brahman, and certainly above the Northern Territory Shorthorns; and so, you can see why we are fairly confident that the muscle:bone ratios of the British cattle (particularly the Polled Herefords) are not better than the Northern Territory Shorthorns.

"The significantly different muscle:bone ratios of these breed groups of cattle have led us to suggest that this characteristic should be studied as a measure of carcass excellence. However, much work is yet to be done before it will be clear if genetic differences of commercially important dimensions exist in the muscle:bone ratios of cattle."

Progeny testing of beef bulls for rate of gain and carcass cutability has been under way in California since 1961.[10] Data on 27 bulls have been assembled. In this study, the progeny of two or more bulls on each ranch are compared. This is the most severe and critical test a bull can undergo. The object of this experiment is to discover bulls that sire fast-gaining animals that have a high carcass cutability.

Table 15 shows there was little difference in actual percentage of closely trimmed retail cuts adjusted for quality in the progeny of these bulls when compared within the ranch and not between ranches.

Remember that all cattle in table 15 had about the same live conformation grade (Choice). The only economic difference in their performance was in rate of gain. Wherever the calves gained rapidly, the amount of money brought in by retail cuts was the highest; where rate of gain was the same, the return for retail cuts was similar (herds A and B).

Rate of gain, carcass merit, and cutability are traits that appear to be compatible.

Performance records on 247 Hereford calves weaned from mature cows sired by 27 bulls in the above study were examined by E. John Pollak, Assistant Professor, Animal Science, University of California, Davis, for correlations among growth and carcass characteristics. Correlations between average daily gain (ADG) on test and other traits of interest are shown in table 16. Carcass cold weight, pounds of retail cut, and rib eye area are all positively correlated with ADG on test. The magnitude of these correlations is significant and indicates effective selection for

Table 15. Summary, California Beef Cattle Progeny Testing Program 1964–1965

Herd		Wean. value $	A.D.G. lb	Gain/ carc. wt.	Final U. S. Grade	Carc. value $	Adj. carc. index * %	Value retail cuts $
A	1	145.28	2.32	1.28	C	202.28	51.58	202.78
	2	152.19	2.28	1.30	C+	209.30	50.41	205.16
B	1	142.18	2.14		G+	211.37	49.88	194.45
	2	134.09	2.33		C−	228.09	50.40	210.94
C	1	145.25	2.32	1.30	C−	223.91	49.46	208.84
	2	148.06	2.44	1.32	C−	231.21	49.55	212.99
D	1	143.59	2.01	1.18	C−	217.95	49.00	196.01
	2	146.00	2.27	1.27	C−	233.18	48.35	206.86
E	1	110.72	2.01	1.11	G+	186.21	49.13	165.97
	2	117.22	2.50	1.27	G+	216.89	49.40	189.33
F	1	110.93	3.30	1.21	C−	233.06	49.25	196.22
	2	111.54	3.27	1.21	C−	227.71	49.05	194.19
	3	106.08	3.33	1.21	C−	231.46	50.16	197.28
H	1	110.47	2.45	1.18	C	226.98	50.12	204.09
	2	120.04	2.63	1.28	C	248.87	49.79	222.45
J	1	120.68	1.95	1.26	C+	215.70	51.16	206.13
	2	118.03	1.91	1.20	C	209.17	51.34	197.78
K	1	93.19	2.31	1.37	C−	207.36	50.07	201.57
	2	97.49	2.20	1.26	C	202.11	50.33	197.67
	3	100.71	2.28	1.40	C	226.91	49.82	219.60
L	1	117.44	2.69	1.34	C−	267.36	51.10	233.12
	2	105.10	2.45	1.17	C	234.31	49.96	198.07
N	1	107.14	2.84	1.19	C−	242.36	50.47	203.04
	2	108.20	2.82	1.14	C−	234.02	50.89	198.49
	3	110.26	2.79	1.18	C−	248.03	51.45	208.06
P	1	136.47	2.27	1.32	C−	216.44	50.47	193.36
	2	139.95	2.11	1.31	C−	205.25	50.19	188.50

* Adjusted to low Choice grade.

growth rate will be accompanied by an increase in the amount of salable product. Faster gaining animals do have a tendency to deposit more fat as verified by the smaller but still positive correlations of ADG with fat thickness and fat percent in the carcass. ADG on test was negatively correlated with both rib eye area per hundred pounds of carcass and yield percentage. These correlations reflect the higher fat to muscle ratio of faster gaining animals as compared to those gaining at a slower rate. All grade scores (yield, composition, quality and live grade) were positively correlated with ADG. The amount of shrink was essentially independent of the animals' performance on test.

The above results lend support to the concept of selecting herd sires who excel in growth performance on test. Bulls can be accurately compared at central feeding tests which has the advantage of evaluating animals between herds, or with bulls that have been ranch performance tested. The heritability of ADG on test has been estimated at .40 to .60. The performance of a sire will be substantially reflected in the performance of his offspring. Results from this study show faster gaining animals result in a greater quantity of salable product of better quality.

Table 17 shows a 14-year average price per head of 3,729 Hereford bulls sold at the Red Bluff bull sale.[11]

During those 14 years there was quite a spread in the price commercial cattlemen paid for various grades of bulls. These differences are due mainly to conformation and quality, although rate of gain was a small factor in these results. For example, the University of California cattle grading system emphasizes weight per day of age; therefore, animals that were small for their age usually were penalized by being graded lower. Consequently, we feel that this sale placed more emphasis on larger animals; thus, the Red Bluff type became known as large, rugged cattle.

The Modoc bull sale, although smaller, tends to show the same general trend of prices that cattlemen will pay for different grades of bulls.

TABLE 16. CORRELATIONS OF CARCASS CHARACTERISTICS WITH ADG ON TEST

	ADG on Test
Live Grade	.49
Conformation Grade	.31
Yield Grade	.15
Quality Grade	.08
Cold Weight	.56
Rib Eye Area	.29
Lbs. Retail Cut	.54
Rib Eye Area/100 lbs. Carcass	-.31
% Yield	-.16
% Shrink	-.03
% Fat	.13
Fat Thickness	.16

TABLE 17. RED BLUFF BULL SALE – HEREFORD BULLS SOLD BY GRADE (1951–1964)

Grade	Number consigned	Percent by grade	Average price	Difference
1	1		$6,000	
				$3,588
1-	84	2.3	2,412	
				1,244
2+	629	16.9	1,168	
				330
2	1,768	47.3	838	
				260
2-	860	23.1	578	
Sifted	387	10.4		
	3,729	100.0	$875	

TABLE 18. MODOC COUNTY BULL SALE (18-YEAR SUMMARY)

Grade	Number animals	Average price	Difference
1-	2	$1,900	
			$1,139
2+	90	761	
			221
2	599	540	
			107
2-	375	433	
			184
3+	92	249	
	1,158		

POINTS TO REMEMBER IN SELECTING BEEF CATTLE

Rate of gain is economically more important than conformation.

Daily gains and carcass merit of low-grading Okies are similar to those of high-quality British breeds.

Tests show that Holsteins on full feed outgain high-quality British breeds.

In Australian experiments muscle-weight distribution in the primal cuts showed no significant difference among the six breeds studied. This work suggests that cattlemen should emphasize rate of gain over conformation in their selection programs.

Commercial cattlemen still pay a premium for high-grading breeding animals, as shown by prices paid at Red Bluff and Modoc bull sales.

Bulls selected on growth performance (i.e., ADG on test) will produce faster-gaining offspring yielding more pounds of retail cuts with a tendency towards better quality grading.

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