calves at 63 percent of their body weight which was 20 percent more efficient than Hereford x Angus crosses. Brown Swiss crosses were 12 percent more efficient than Hereford x Angus cows and Simmental crosses were only slightly more efficient (3.5 percent) than Hereford x Angus cows.

Nutritional requirements to maintain a cow of a particular size is dependent upon the metabolic body size of the animal which can be estimated as the animal's weight taken to the 0.75 power. Since differences in feed requirements between crossbred groups should be estimated with greater precision when based on metabolic cow size, the ratio of calf weight to cow metabolic weight was also considered. On this basis, as compared to Hereford x Angus cows, Jersey cross and Brown Swiss x Angus cows were 17.1 percent more efficient, Brown Swiss x Hereford were 11.1 percent more efficient and Simmental crosses were 5.2 percent more efficient.

These data suggest some relatively large differences in two-year old cow productivity among the various crossbred groups. Some of these may be, at least in part, due to differences in rate of physiological development and maturity. Thus, the relative comparisons in productivity and production efficiency may change as the cows mature.

A Comparison of Profitability of Two- Year-Old Crossbred Cows

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Story in Brief

Profitability of raising a calf of various two-year-old two-breed cross cows was compared. Data on two-year-old two-breed cross cows that have been described in the preceeding paper in this report and information from other sources were used to simulate the production systems of these two-breed cross cows.

Dry matter requirements or nutritional requirements for each type of cow were determined from recommended requirements based on milk production, weight, stage of pregnancy, and stage of lactation of the cow. An average of the market prices of beef for the last five years and current costs of feed were used to provide an economical comparison of systems using two-breed cross cows.

Beef production systems based on different two-breed cross cows were compared using a variety of criteria. Considering only the feedlot stage of the production system, crossbreeding systems using Simmental-Angus cross cows provided calves that showed the highest dollar return per calf in the feedlot with a return of $.40 to $15 advantage over the return from other crossbred cow groups. Looking at dollar return per cow, crossbreeding systems using Jersey-Hereford cross cows showed the highest return with a $2 to $57/cow return higher than that of other crossbred cow groups. Crossbreeding systems with Jersey-Hereford cross cows showed the highest return on each dollar invested with a $.03 to $.46 higher return per dollar invested than that of other crossbred cow groups.

Introduction

Beef cattle producers are interested in ways to improve profit. An extensive research program is presently under way at the Oklahoma Agricultural Experiment Station to compare the lifetime productivity of various two-breed cross cows mated to a bull of a third breed. The use of crossbred cows presents a genetic means for improving production, and it is important to look at differences between various kinds of crossbred cows from an economical standpoint, in order to determine which crossbred cows provide the most profit. The purpose of this study was to compare the profitability of various two-year-old two-breed cross cows under alternative production systems.

Experiment Procedures

Productivity data on the various two-breed cross cows mated to Shorthorn or Red Poll bulls are presented in the preceeding paper and information on the two-breed cross cows used in this study is presented in Table 1. The amount of feed to maintain a cow for a year was estimated based on the weight, stage of pregnancy, milk production during lactation and the stage of lactation utilizing procedures developed by previous research. The amount of feed used in the feedlot can be determined from the data collected on the calves of the two-breed cross cows.

Additional parameters assumed for all systems were:

1. Annual fixed cost per cow of $55, includes labor and non-nutritional costs such as taxes, fees, interest, veterinary expenses and repair on facilities.
2. Sale prices of $37.13/cwt for slaughter grade choice animals, $40.42/cwt for weaned calves. These are average sale prices for heifers and steers for the last five years.
3. Cost of native pasture to maintain the cow herd was $24/ton of dry matter.
4. Cost per day in the feedlot of $5.00 for overhead costs.

Table 1. Data on two-year-old two-breed cross cows

Trait	Crossbred cow groups[1]						
	HxA	SxA	SxH	BxA	BxH	JxA	JxH
Weight of cow	731.5	817	766	782	756	678	687
Average daily milk production (lb)	9.58	14.53	12.35	16.55	16.38	15.27	14.49
Percent pregnant	86.7	81.2	57.8	93.6	78.0	89.8	94.9
Percent live calves	77.1	72.4	55.6	87.2	76.0	88.1	91.5
Percent weaned calves	72.4	72.4	53.3	85.1	72.0	88.1	91.5
Weaning weight of calf[2](lb)	369	423	406	446	419	414	417
Slaughter weight of calf (lb)[2]	812	891	884	900	897	819	828
Days in feedlot for calf[2]	139	135	139	141	141	129	129
Feed efficiency (lb feed/lb gain)[2]	7.66	7.53	7.41	8.12	7.49	8.28	8.11
Gain in feedlot (lb)[2]	365	377	390	377	393	306	321

[1]A=Angus, H=Hereford, S=Simmental, B=Brown Swiss and J=Jersey
[2]Average of steer and heifer calves

5. Cost of the ration fed in the feedlot was $4.31/cwt.
6. Each system started with a 100 cows.

Profitability of the different crossbred cow groups was compared under four alternative management schemes:

1. All 100 cows are kept the full year from weaning to weaning (MS1).
2. Only the pregnant cows are kept for the full year. The number of cows kept for each two-breed cross was estimated as the pregnant percentage times 100. Culling based on pregnancy examination occurs following the breeding season (MS2).
3. All cows are kept until calving time. After calving, only the cows that had a live calf are kept for the rest of the year (MS3).
4. Only pregnant cows are kept following breeding season and after calving only those cows that had a live calf are kept the remainder of the year (MS4).

Using these parameters, expenses and income of the various production systems were simulated. Production systems using different management schemes and two-breed cross cows were compared in terms of total saleable product of slaughter weight calves or weaning weight calves, dollar return per calf in feedlot, dollar return per cow, or dollar return per dollar invested.

Results and Discussion

Before comparing the various production systems, it should be pointed out that a complete cost of maintaining a cow herd was not estimated. The

costs ignored include cost of the pasture consumed by the calves before weaning and capital investment of maintaining the pasture. The gain in weight by open cows during the pregnancy period and non-lactating cows during the lactation period was not evaluated. Therefore, the absolute estimate of profit for any production system is inflated. However, differences in profitability of two-breed cross cows within management schemes should not be affected by the costs ignored.

Comparison of two-breed cross cows

Cost of feed and price of saleable product are listed in Table 2 and fixed costs are listed in Table 3. Crossbreeding systems using Brown Swiss-Angus, Jersey-Hereford, or Jersey-Angus cross cows had a higher amount of total saleable product with an additional gross return of $2,724 to $10,923 above the gross return from other crossbred cow groups. Looking at total saleable product of weaned calves, crossbreeding systems with Jersey-Hereford, Brown Swiss-Angus, or Jersey-Angus cross cows provided higher additional gross return of $2,364 to $6,675 above gross return from other crossbred cow groups.

Using data in Tables 2 and 3, the dollar return per cow can be calculated by subtracting the estimated cost of producing a saleable product from the gross return of the saleable product and dividing the difference by 100. A negative return per cow indicates a loss per cow. Keep in mind that the estimate of return per cow is inflated because all of the cost has not been considered. However, the costs that have not been included are expected to be very similar for all crossbred cow groups. Consequently differences in return per cow should provide a valid estimate of the differences in profitability between different two-breed cross cows under alternative management schemes. Dollar return per cow is listed in Table 4.

When selling weaned calves, crossbreeding systems using Jersey-Hereford, Jersey-Angus, or Brown Swiss-Angus cross cows had a $8 to $50 return per cow advantage over the return per cow from other crossbred cow groups. Whereas, crossbreeding systems using Hereford-Angus or Simmental-Hereford cross cows had a $.21 to $39 return per cow lower than the return per cow from other crossbred cow groups.

Considering feedlot performance, calves of Simmental-Angus, Simmental-Hereford, or Brown Swiss-Hereford cross cows had a $5 to $13 return per calf advantage over the return per calf of other two-breed cross cows. Whereas, calves of Brown Swiss-Angus cross cows had a $6 to $15 return per calf lower than the return per calf of other two-breed cross cows.

When selling slaughter calves, crossbreeding systems using Jersey-Hereford or Jersey-Angus cross cows had a $7 to $55 return per cow advantage over the return per cow from other crossbred cow groups. Whereas, crossbreeding systems using Hereford-Angus or Simmental-Hereford cross cows had a $6 to $41 return per cow lower than the return per cow from other crossbred cow groups.

Table 2. Cost of feed and prices of saleable product in dollars

Trait	Crossbred cow groups[1]						
	HxA	SxA	SxH	BxA	BxH	JxA	JxH
Cost of feed used for cows							
MS1[2]	7001	8073	6932	8481	7823	7746	7763
MS2	6307	6978	4655	8130	6647	7244	7510
MS3	6331	7167	5589	8087	7104	7417	7526
MS4	5889	6699	4519	7868	6368	7197	7415
Cost of feed used in feedlot	8796	8858	6656	11228	9134	9589	10267
Sale price of weaned calves	10798	12379	8747	15341	12194	14743	15422
Sale prices of slaughter calves	21828	23952	17514	28438	24034	26758	28130

[1]A=Angus, H=Hereford, S=Simmental, B=Brown Swiss and J=Jersey
[2]MS1-MS4 - management schemes 1-4

Table 3. Fixed costs per herd in dollars

Trait	Crossbred cow groups[1]						
	HxA	SxA	SxH	BxA	BxH	JxA	JxH
Annual fixed cost							
MS1[2]	5500	5500	5500	5500	5500	5500	5500
MS2	4769	4466	3179	5148	4290	4939	5220
MS3	4791	4645	4125	5104	4757	5131	5237
MS4	4471	4193	3111	4950	4228	4886	5114
Fixed cost for feedlot	695	675	695	705	705	645	645

[1]A=Angus, H=Hereford, S=Simmental, B=Brown Swiss and J=Jersey
[2]MS1-MS4 - management schemes 1-4

Table 4. Dollar return per animal

Trait	Crossbred cow groups[1]						
	HxA	SxA	SxH	BxA	BxH	JxA	JxH
Calves sold at weaning (dollar return/cow)							
MS1[2]	−17.02	−11.65	−36.85	13.61	−11.29	14.96	21.59
MS2	−2.77	9.34	9.13	20.64	12.57	25.60	26.93
MS3	−3.23	5.67	−9.66	21.51	3.34	21.94	26.59
MS4	4.38	14.86	11.17	25.23	14.98	26.59	28.93
Calves sold at slaughter (dollar return/cow)							
MS1	−1.64	8.75	−22.69	25.24	8.71	32.78	39.55
MS2	12.61	29.74	23.30	32.27	32.57	43.41	44.90
MS3	12.15	26.07	4.50	33.14	23.34	39.75	44.56
MS4	19.77	35.36	25.34	36.87	34.98	44.41	46.90
Feedlot performance (dollar return/calf)	21.25	28.18	26.58	13.68	27.78	20.22	19.63

[1]A=Angus, H=Hereford, S=Simmental, B=Brown Swiss and J=Jersey
[2]MS1-MS4 - management schemes 1-4

Table 5. Dollar return per dollar invested

Trait	Crossbred cow groups[1]						
	HxA	SxA	SxH	BxA	BxH	JxA	JxH
Calves sold at weaning							
MS1[2]	.86	.91	.70	1.10	.92	1.11	1.16
MS2	.97	1.08	1.12	1.16	1.11	1.21	1.21
MS3	.97	1.05	.90	1.16	1.03	1.17	1.21
MS4	1.04	1.14	1.15	1.20	1.14	1.22	1.23
Calves sold at slaughter							
MS1	.99	1.04	.89	1.10	1.04	1.14	1.16
MS2	1.06	1.14	1.15	1.13	1.16	1.19	1.19
MS3	1.06	1.12	1.03	1.13	1.11	1.17	1.19
MS4	1.10	1.17	1.17	1.15	1.17	1.20	1.20
Feedlot performance	1.16	1.21	1.19	1.10	1.20	1.17	1.16

[1]A=Angus, H=Hereford, S=Simmental, B=Brown Swiss and J=Jersey
[2]MS1-MS4 - management schemes 1-4

Dollar return per dollar invested for various production systems using two-breed cross cows are listed in Table 5. Dollar return per dollar invested was calculated by dividing the cost of producing a saleable product into the gross return from the saleable product. A ratio less than 1.00 indicates a loss per dollar invested. When selling at slaughter weight, crossbreeding systems using Jersey-Angus or Jersey-Hereford cows had a $.03 to $.27 higher return per dollar invested than the return from other crossbred cow groups. When selling at weaning, crossbreeding systems using Jersey-Angus, Jersey-Hereford, or Brown Swiss-Angus cross cows provided a $.05 to $46 higher return per dollar invested than the return from other crossbred cow groups. For feedlot performance, calves of Simmental-Angus, Simmental-Hereford or Brown Swiss-Hereford cross cows provided a $.03 to $.10 higher return per calf than the return from calves of other two-breed cross cows. However, the differences in dollar return per dollar invested between the crossbreeding systems were not as dramatic as the differences in dollar return per cow. The advantage or disadvantage of crossbreeding systems using Simmental-Hereford cows when compared to other crossbred cow groups varies across management schemes because of the poor reproductive performance of Simmental-Hereford cross cows.

This study has not completely analyzed the profitability of two-year-old two-breed cross cows. Furthermore, differences in profitability may change when the cows are maintained in the herd for several years. However, this study has attempted to indicate which of these two-year-old two-breed cross cows should provide the most profit.