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AEC No. 105

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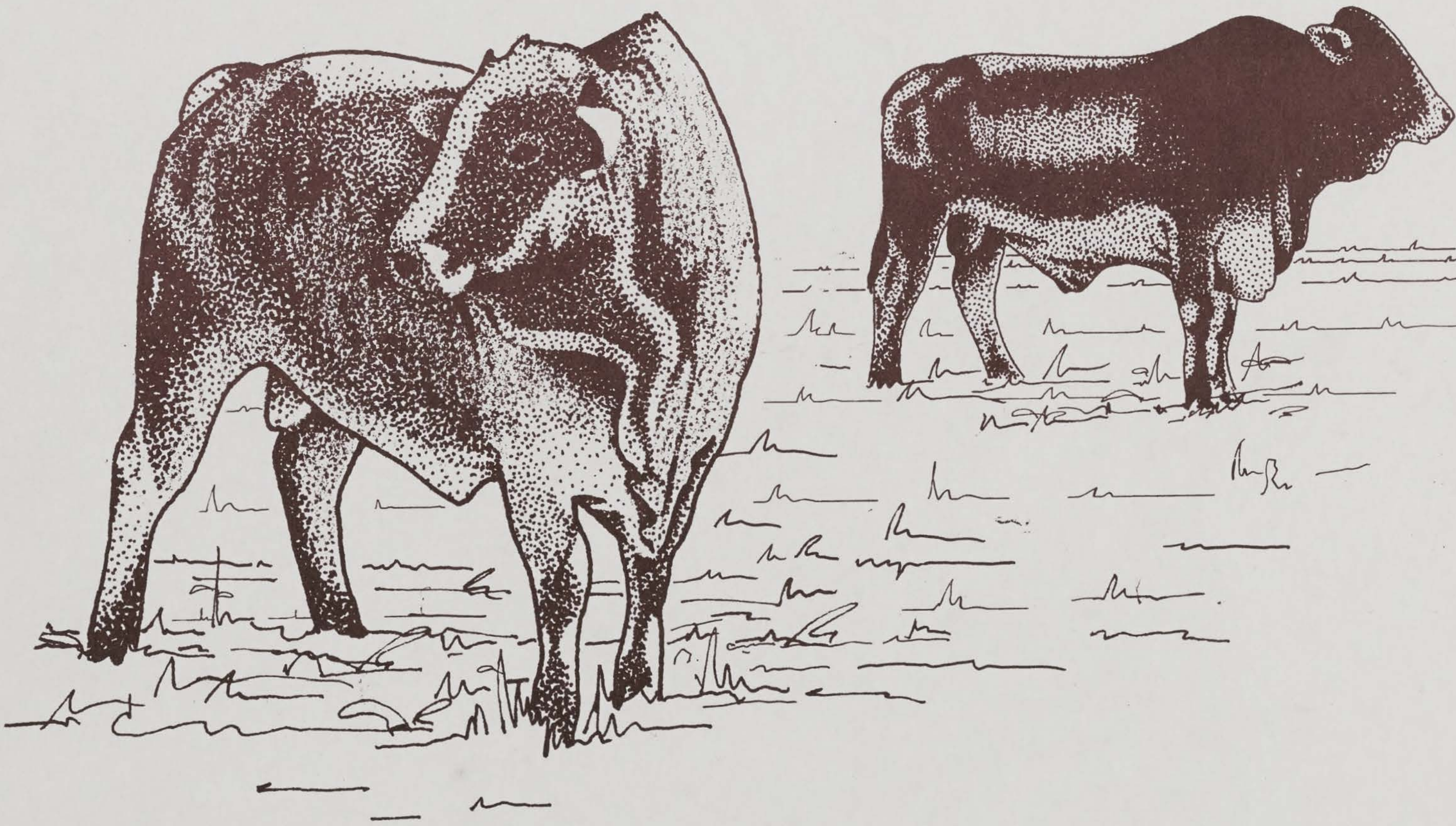

ANALYSIS OF ALTERNATIVE BEEF CATTLE PRODUCTION - MARKETING SYSTEMS FOR SOUTH MISSISSIPPI

Department of Agricultural Economics Research Report

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Analysis of Alternative Beef Cattle Production-Marketing Systems for South Mississippi

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INTRODUCTION

The beef cattle industry is a very important part of the agricultural sector of Mississippi's economy. The traditional system of beef cattle production and marketing in Mississippi is the cow-calf operation, in which calves are raised from brood cows and sold at weaning. The calves are usually transported out-of-state to feedlot operations for feeding to slaughter weight. Unstable prices and low net returns in recent years have caused beef cattle producers to consider alternatives to the cow-calf system.

The primary purpose of this paper is to examine some alternative beef cattle production and marketing systems for South Mississippi (Figure 1). The alternatives considered vary in terms of :

1. Fertilizer prices.
2. Combinations of forage and grain fed slaughter cattle.
3. Weights at which feeder and slaughter cattle are sold.
4. Amount of operating capital available.

The criterion was to find the combination of enterprises which would yield the highest net returns above specified costs--given a set of resources and considering only a short-run decision setting. A linear programming model was developed to consider the following alternatives to the typical cow-calf operation:

1. Produce and sell feeder calves using
   a. grazed forage only
   b. grazed forage plus grain and/or silage and/or hay feeding
   c. silage and/or hay and/or grain feeding
2. Produce and sell slaughter cattle
   a. forage finishing (grazing and/or silage)
   b. forage finishing plus supplemental grain feeding

Figure 1. Counties delineated as South Mississippi.

COW—CALF OPERATION AND ALTERNATIVE ACTIVITIES

The process of comparing alternative production and marketing systems began by specifying the components of a typical cow-calf operation as a representative firm. Beef cattle and forage enterprise resource requirements and costs and returns were based on the CED, ESCS, USDA cost of production survey [16]. The typical cow-calf operation from that study consisted of:

1. 495 acres of owned land available for livestock operations. 210 acres suitable only for perennial forages and 285 acres for either perennial or annual pasture or row crops.

2. Forage crops could only be fed to cattle on the farm. Possible forage crops for production were native pasture and coastal bermuda pasture and hay produced on cropland and pastureland. Wheat-ryegrass could only be produced on cropland. Cultural practices and yields were also adopted from the USDA report.

3. The representative firm was assumed to own a herd composed of 126 beef cows, five herd bulls and yearling and calf heifer replacements (150 head total). The cow herd was assumed to calve in the spring season so that its final product, (i.e., weaned steer and/or heifer calves) could be sold in the fall.

4. The representative firm was assumed to have the machinery and equipment necessary to perform all the specified cultural practices related to forage and cow-calf production activities. No charges were made for available labor, owned land, or fixed cost for equipment, machinery, and livestock investment.

5. Technology and level of management were set at 1976 levels. (i.e., 66 percent calving rate, crop yields, etc.) All cost and prices were projected to 1980 from the 1976 CED, ESCS, USDA survey data using 8 percent inflation compounded annually.

6. The production cycle of the firm represents a typical one-year segment of a continuous operation.

Alternative Feeding and Cattle Activities

Additional sources of nutrients required for alternatives to the cow-calf operation included feeding corn silage (26 percent TDN—computed on an as fed basis) and shelled corn (80 percent TDN—computed on an as fed basis). Corn silage was included as a production possibility on cropland only.

Alternative cattle enterprises are illustrated in Table 1, and include four stocker programs, four pasture feeding programs, and eight feedlot programs. The alternative programs are distinguished from each other by the calving and grazing period, initial weight, selling weight, and rate of gain. It was assumed that the owned cow-calf herd calved only in the spring, but cattle could be bought locally for alternative programs beginning in months other than the fall.

The duration of the stocker and feeding programs depended on the ending weight and the rate of gain. Average daily gains (ADG) of 1.66 pounds for heifers and 1.75 pounds for steers were used for the stocker programs, with the primary source of nutrients assumed to be grazed forages. Pasture feeding programs assumed hay, silage and/or shelled corn were fed with the grazed forages, and ADGs of 2.20 pounds for steers and 2.09 pounds for heifers were assumed. Different combinaions of hay, silage, and corn were used to obtain the low (2.09 and 2.20) and high (2.37 and 2.50) rates of gain used in the feedlot programs. Figures 1 and 2 illustrate the production program for heifers and steers.

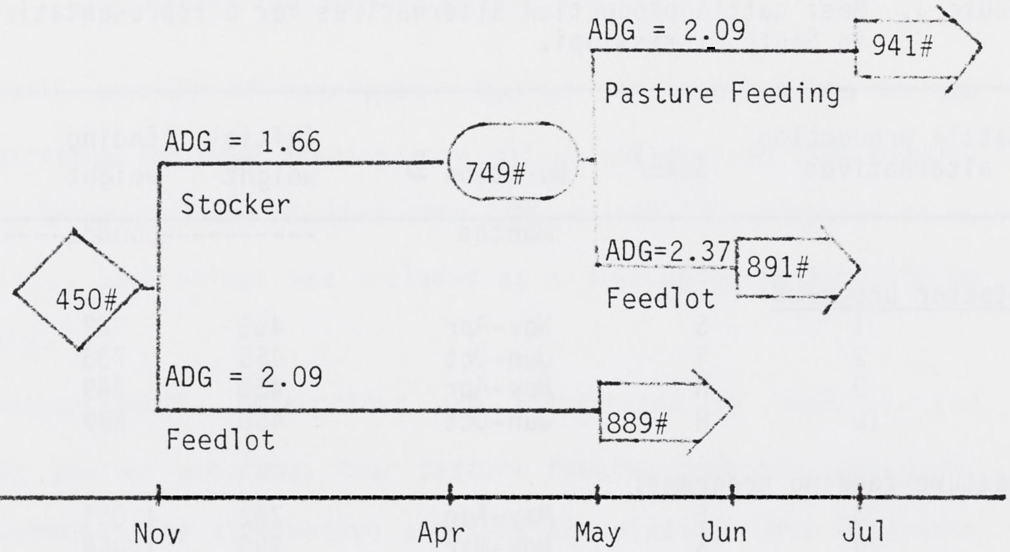
Table 1. Beef cattle production alternatives for a representative firm in South Mississippi.

Cattle production alternatives	Sex[a/]	Duration [b/]	Initial weight	Ending weight	ADG
		Months	-----------	pounds	-----------
Stocker programs:					
1	S	Nov-Apr	465	782	1.75
2	S	Jun-Oct	465	733	1.75
9	H	Nov-Apr	450	749	1.66
10	H	Jun-Oct	450	699	1.66
Pasture feeding programs:					
3	S	May-Aug	782	1,051	2.20
4	S	Nov-Mar	733	1,064	2.20
11	H	May-Jul	749	941	2.09
12	H	Nov-Dec	699	887	2.09
Feedlot programs:					
5	S	Nov-Jul	465	1066	2.20
6	S	Jun-Feb	465	1066	2.20
7	S	May-Aug	782	1088	2.50
8	S	Nov-Feb	733	1032	2.50
13	H	Nov-May	450	889	2.09
14	H	Jun-Dec	450	889	2.09
15	H	May-Jun	749	891	2.37
16	H	Nov-Jan	699	912	2.37

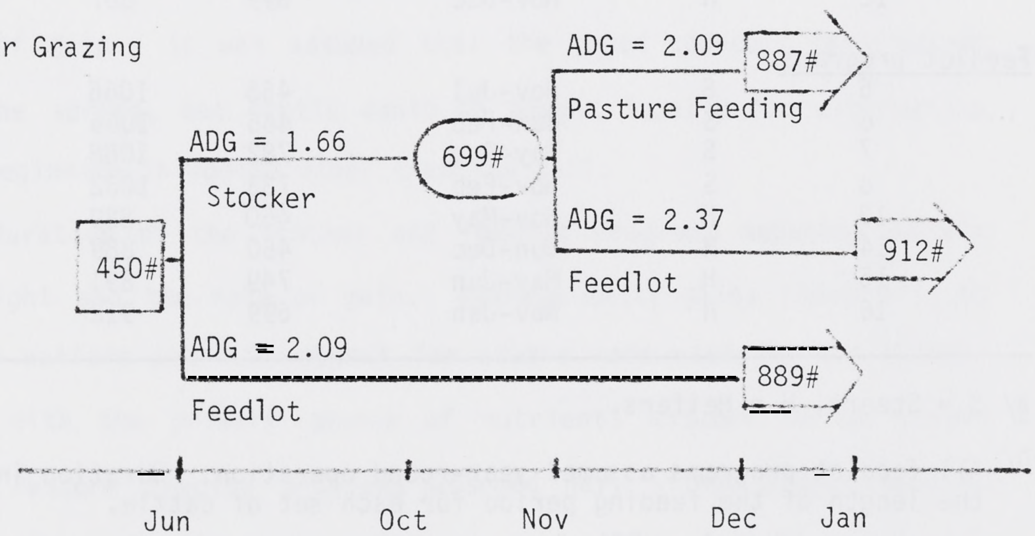
a/ S = Steers, H = Heifers.

b/ All feedlot programs assumed year-round operation. Duration indicates the length of the feeding period for each set of cattle.

A. Winter Grazing



B. Summer Grazing



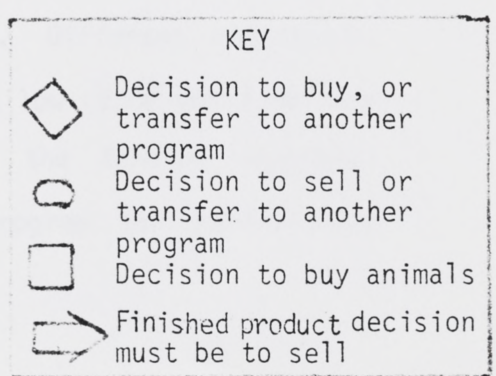


Figure 1. Heifer Cattle Production Programs and Component Activities.

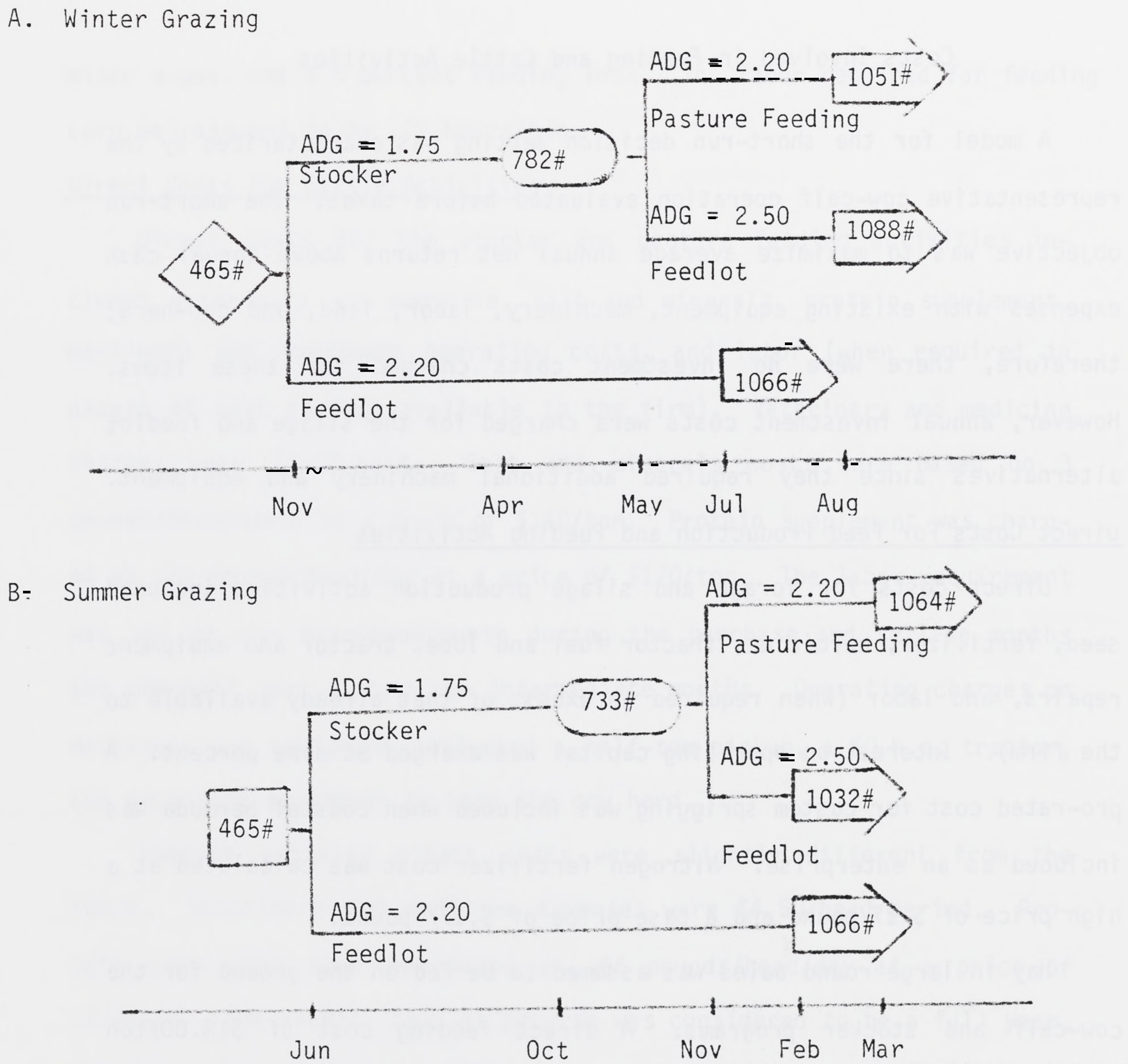
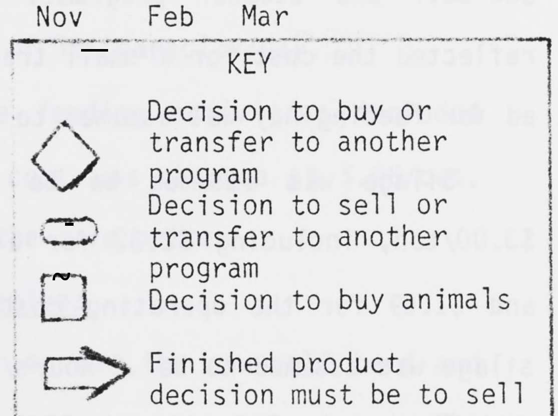


Figure 2. Steer Cattle Production Programs and Component Activities.



Costs Involved In Feeding and Cattle Activities

A model for the short-run decision setting was characterized by the representative cow-calf operation evaluated before taxes. The short-run objective was to maximize average annual net returns above annual cash expenses with existing equipment, machinery, labor, land, and cow-herd; therefore, there were no investment costs charged for these items. However, annual investment costs were charged for the silage and feedlot alternatives since they required additional machinery and equipment.

Direct Costs For Feed Production and Feeding Activities

Direct costs for forage and silage production activities included seed, fertilizer, herbicide, tractor fuel and lube, tractor and equipment repairs, and labor (when required in excess of that already available to the firm). Interest on operating capital was charged at nine percent. A pro-rated cost for custom sprigging was included when coastal bermuda was included as an enterprise. Nitrogen fertilizer cost was calculated at a high price of $.27/pound and a base price of $.17/ pound.

Hay in large round bales was assumed to be fed on the ground for the cow-calf and stocker programs. A direct feeding cost of $18.00/ton reflected the cost for a small tractor and bale mover. The labor required for feeding hay was assumed to be 1.1 hours/ton.

Silage was assumed to be fed in bunks, at a feeding cost of $3.00/ton, including $2.32 for a front end loader and pasture troughs, and $1.69 for the operating cost of a mixer wagon. Labor for feeding silage was assumed to be .2 hours/ton.

The cost of feeding shelled corn was based on a purchase price of $130.73/ton ($3.53/bushel), which included the operating cost of a mixer wagon, and a 5 percent feeding loss. The labor required for feeding corn was assumed to be .22 hours/ton.

Direct Costs For Cattle Activities

Direct costs for the stocker and pasture feeding activities included veterinary and medicine, salt and minerals, protein supplement, machinery and equipment operating costs, and labor (when required in excess of that already available to the firm). Veterinary and medicine charges were $3.00/head. Salt and minerals costs were based on 3 pounds/head/month at a price of $140/ton. Protein supplement was charged at .25 pounds/head/day at a price of $170/ton. The labor requirement was set at one hour/head/month during the purchase and selling months and one-half hour during the intermediate months. Operating charges on machinery and equipment reflected a half-ton pickup, a 60 h.p. tractor, and necessary equipment to keep the cow herd.

Feedlot activity direct costs were slightly different from the above. Veterinary and medicine expenses were $4.50/head/period. Protein supplement cost was based on .66 pounds/head/day at a price of $170/ton. The overall feedlot program was considered to be a full year, and labor was required at .014 hours/head of lot capacity/day.

Miscellaneous costs for the cattle feeding activities included hauling and sales commissions. Hauling cost was charged at $.08/cwt. Sales commission cost was 2.4 percent of the sale price.

Fixed Costs For Feeding and Cattle Alternatives

The representative firm was assumed to own the cow-calf herd and the necessary machinery and equipment for its operation. As the stocker and pasture feeding enterprises were assumed to use the same equipment and machinery as the cow-calf herd, no ownership fixed costs were charged these activities. However, annual ownership costs were charged for facilities and equipment required for the silage and feedlot activities. (Although the long run decison setting is appropriate for this evaluation, the results from the long run model did not differ, see reference 12). For instance, machinery and equipment charges for silage were set at $1.90/ton. Equipment ownership cost for the feedlot activities in dollars/head/month were obtained from Tyner, Conner, and Laughlin [14]. Calf ownership costs were obtained by multiplying the calf initial total cost (price/ cwt x average weight in cwt) by the annual rate of interest (9 percent)—adjusted for the time the animal spent in the feedlot or stocker programs.

ANALYSIS

Qualifying Assumptions and Model Variations

In order to provide a realistic working model of a representative firm for a linear programming analysis, assumptions and constraints imposed must be clearly specified. The assumptions for the cow-calf operation were stated earlier. Other assumptions are listed below.

1. Two cattle prices representing different phases of the cattle-cycle were used: average stable-high and average stable-low. The stocker programs used good grade prices for the buying and selling activities. In the finishing programs good grade prices were used for cattle being bought, and an average of good-choice prices were used for all finished slaughter animals.

2. Capital resources available to the firm for investment and operating expenses were restricted to 30 and 70 percent of equity in land and other assets owned by the representative firm.

3. Feeding activities were evaluated using a $3.53 per bushel price for corn in combination with high and base prices ($.27 and $.17 per pound, respectively) for nitrogen fertilizer applied to the forages.

4. Two man-years/year of operator labor were assumed to be available to the firm free of charge. Additional labor was charged at $3.16/hr.

5. It was assumed that government commodity programs would not directly affect forage production activities.

The data developed in the preceeding pages were used in a linear programming model to analyze alternative beef cattle production and marketing systems under conditions of average management and technology and different resource cost-product price relationships. Alternative runs of the model were made for stable-high and stable-low cattle prices; capital borrowing limited to 30 and 70 percent of equity; 16 cattle alternatives to the cow-calf operation; three forage grazing programs; and with hay, silage, and shelled corn as allowable feeding activities.

Solutions of the basic model described above included corn silage as an alternative feeding activity in almost every solution. Since corn silage is not common to this area, the model was rerun with corn silage deleted to compare the effects on the optimal solution.

Alternatives to the typical cow-calf operation had the highest net returns in every situation. Since the cow-calf herd is the prominent type of operation in this area, the model was run to show the effects of forcing the cow-calf enterprise to enter the solution at 75 head.

Stable-High Cattle Prices

Capital Limited to 30 and 70 Percent of Equity

Non-Restricted Program. When the model was evaluated using stable-high cattle prices, optimal solutions for the 30 and 70 percent of equity models did not differ from each other because capital was not an effective constraint in the 30 percent of equity models.

When the high fertilizer price was used the optimal alternatives to the cow-calf operation included stocker programs 1 and 2 (Tables 2 and

Table 2. Optimal cattle alternatives and sources of nutrients for subregion seven representative firm with capital restricted to 30 and 70 percent of equity; short run decision setting, stable-high cattle prices.

		SOURCES OF NUTRIENTS																	
		Coastal Bermuda Pasture			Native Pasture			Wheat-Ryegrass Pasture			Coastal Bermuda Hay			Corn Silage			Corn Grain		
Program Constraints[a]		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cattle Activities																			
	Cow-Calf			x									x						
High	Stocker 1	"x"[b]	x	x					x			x		x		x	x	x	x
Fertilizer	Stocker 2	x	x	x								x		x		x	x	x	x
Price	Pasture 12		x						x			x						x	
Base	Cow-Calf			x									x						
Fertilizer	Stocker 1	x	x	x				x	x	x		x		x		x	x	x	x
Price	Stocker 2	x	x	x								x		x		x	x	x	x

[a] Program constraints: 1 = non-restricted programs
2 = corn silage restricted programs
3 = 75 cow-calf-unit restricted programs

[b] (X) denotes usage of the respective nutrient source by the respective livestock activity.

3). Stocker program 1 consisted of fall-purchased steer calves weighing 465 pounds which gained 1.75 pounds/day on corn grain, corn silage and coastal bermuda pasture, and were sold as yearlings in May at a weight of 782 pounds. Stocker program 2 consisted of June purchased steer calves weighing 465 pounds which gained 1.75 pounds/day on coastal bermuda pasture, some corn grain and silage, and were sold as yearlings at 733 pounds in the fall.

When the base fertilizer price was used, the optimal solutions remained approximately the same as above, with the exception that 104 acres formerly in coastal bermuda pasture were used as wheat-ryegrass pasture for stocker program 1.

Corn Silage Restricted Program. When silage was not allowed as an alternative feeding activity the high fertilizer price solution included wheat-ryegrass and hay, with a decrease in coastal bermuda pasture (Tables 2 and 3). The exclusion of silage and decrease in coastal bermuda pasture resulted in a large decrease (372 head) in stocker program 2 from the non-restricted, high fertilizer price program. The exclusion of silage also resulted in a decrease in stocker program 1; however, the decrease was not as significant because of the increase in wheat-ryegrass, hay, and shelled corn. Heifer pasture feeding program 12 was also included as an enterprise. The heifers in this program were fed corn grain and hay while on coastal bermuda and wheat-ryegrass pasture.

Use of the base fertilizer price resulted in a significant increase in the amount of wheat-ryegrass pasture, at the expense of acreage in coastal bermuda pasture and hay as compared to the non-restricted, base fertilizer price program. Stocker program 1 increased, while stocker

Table 3. Optimal beef cattle enterprise combinations for representative firm in South Mississippi with capital restricted to 30 and 70 percent of equity; short run decision setting, stable-high cattle prices.[a/]

Activity	Unit	Non-Restricted Program High Fertilizer	Non-Restricted Program Base Fertilizer	Corn Silage Restricted Program High Fertilizer	Corn Silage Restricted Program Base Fertilizer	75 Cow-Calf Unit Required Program High Fertilizer	75 Cow-Calf Unit Required Program Base Fertilizer
Grazed Forages							
Coastal Bermuda	acre	314	210	284	202	216	210
Wheat-ryegrass	acre	--	104	122	220		42
Hay		--	--	89	73	159	59
Silage		181	181	--	--	120	184
Cow-Calf	head	--	--	--	--	75	75
Stocker 1	head	304	322	277	358	142	178
Stocker 2	head	744	723	372	265	577	663
Pasture 12	head	--	--	24	--	--	--
Corn Grain/mo.							
1	ton	9	9	21	18	4	5
2	ton	9	8	15	16	4	4
3	ton	9	8	13	11	4	5
4	ton	11	9	8	7	6	4
5	ton	--	--	--	--	--	--
6	ton	24	22	16	11	18	19
7	ton	26	24	17	12	20	20
8	ton	28	25	16	11	21	22
9	ton	27	25	17	12	20	21
10	ton	25	24	25	18	19	20
11	ton	10	9	10	8	5	5
12	ton	8	8	19	16	4	5
Labor reqd. over 2-man. mons./mo.							
1	hour	--	--	--	--	--	--
2	hour	--	32	17	85	--	34
3	hour	75	69	--	--	25	74
4	hour	455	416	243	277	312	348
5	hour	--	--	--	--	--	--
6	hour	577	563	174	72	466	541
7	hour	327	284	--	--	252	288
8	hour	711	714	--	--	560	746
9	hour	263	393	245	291	425	407
10	hour	603	587	197	77	481	565
11	hour	137	152	113	171	7	37
12	hour	--	--	--	16	--	--
Net Returns	dol.	46,960	50,937	43,432	45,579	31,783	34,999

a/ Land available was 285 acres of cropland and 210 acres of pastureland program 2 decreased, and pasture feeding program 12 did not enter the solution.

75 Cow-calf Unit Required Program. Optimal solutions using the high fertilizer price resulted in a decrease in the amount of coastal bermuda pasture and silage acreage as compared to the non-restricted models. When the base fertilizer price was used, the optimal solutions showed fewer acres in coastal bermuda and wheat-ryegrass than the non-restricted model. Both solutions resulted in increased hay acreage (Tables 2 and 3). Also, both models (high and base fertilizer price) resulted in both stocker programs being reduced by approximately 160 head (each), from the models with no restrictions.

Stable-Low Cattle Prices

Capital Limited to 30 Percent of Equity

Non-Restricted Program. Optimal cattle alternatives to the cow-calf operation with stable-low cattle prices and capital restricted to 30 percent of equity included stocker programs 1 and 2 and pasture feeding programs 3, 11, and 12 (Tables 4 and 5). There were few differences in the levels of the enterprises between the high and base fertilizer price solutions. Pasture feeding program 3 included spring-purchased yearling steers weighing 782 pounds which were fed hay and corn grain while grazing on wheat-ryegrass, native, and coastal bermuda pastures; gained 2.20 pounds/day; and were sold as finished steers at 1,051 pounds in August. The optimal cattle systems also included pasture feeding program 11 which consisted of purchasing yearling heifers at 749 pounds in May, feeding corn grain, hay and native grass pasture for two months for a 2.09 pound ADG; and selling at 941 pounds in July.

Table 4. Optimal cattle alternatives and sources of nutrients for subregion seven representative firm with capital restricted to 30 percent of equity; short run decision setting, stable-low cattle prices.

		SOURCES OF NUTRIENTS																	
		Coastal Bermuda Pasture			Native Pasture			Wheat-Ryegrass Pasture			Coastal Bermuda Hay			Corn Silage			Corn Grain		
Program Constraints[a]		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cattle Activities																			
High Fertilizer Price	Cow-Calf			x[b]			x			x			x						
	Stocker 1							x	x	x	x	x	x				x	x	x
	Stocker 2	x	x	x	x	x	x										x	x	x
	Pasture 3	x	x	x	x	x	x	x	x	x							x	x	x
	Pasture 11	x	x	x	x	x	x	x	x	x							x	x	x
	Pasture 12	x	x	x				x	x	x	x	x	x				x	x	x
Base Fertilizer Price	Cow-Calf			x			x			x			x						
	Stocker 1			x				x	x	x	x	x	x				x	x	x
	Stocker 2	x	x	x	x	x	x				x	x					x	x	x
	Pasture 3	x	x	x	x	x	x	x	x	x							x	x	x
	Pasture 11	x	x	x	x	x	x	x	x	x							x	x	x
	Pasture 12	x	x	x				x	x	x	x	x	x			x	x	x	x

a/ Program constraints: 1 = non-restricted programs
2 = corn silage restricted programs
3 = 75 cow-calf-unit required programs

b/ (X) denotes usage of the respective nutrient source by the respective livestock activity.

Table 5. Optimal beef cattle enterprise combinations for representative firm in South Mississippi with capital restricted to 30 percent of equity; short run decision setting stable-low cattle prices[a/]

Activity	Unit	Non-Restricted Programs High Fertilizer	Non-Restricted Programs Base Fertilizer	Corn Silage Restricted Programs High Fertilizer	Corn Silage Restricted Programs Base Fertilizer	75 Cow-Calf Unit Required Programs High Fertilizer	75 Cow-Calf Unit Required Programs Base Fertilizer
Grazed Forages							
Coastal Bermuda	acre	118	109	117	142	56	69
Native Pasture	acre	134	124	133	77	142	151
Wheat-ryegrass	acre	85	103	85	118	86	86
Hay	acre	158	159	160	158	211	149
Silage	acre	--	--	--	--	--	40
Cow-Calf	head	--	--	--	--	75	75
Stocker 1	head	78	91	79	103	24	24
Stocker 2	head	143	133	143	128	--	29
Pasture 3	head	78	91	79	103	24	24
Pasture 11	head	61	37	60	34	84	90
Pasture 12	head	762	769	758	755	809	852
Corn Grain/mo.							
1	ton	133	134	133	132	138	143
2	ton	2	2	3	3	3	1
3	ton	2	2	3	3	3	1
4	ton	2	2	2	3	3	1
5	ton	17	15	17	16	14	13
6	ton	27	24	27	25	18	17
7	ton	29	27	29	27	17	18
8	ton	20	21	20	22	6	5
9	ton	7	7	8	7	3	1
10	ton	9	9	10	8	3	1
11	ton	110	113	112	110	118	95
12	ton	125	126	125	125	130	122
Labor reqd. over 2-man-mos./mo.							
1	hour	736	750	732	740	849	897
2	hour	--	--	--	--	--	--
3	hour	--	--	--	--	--	--
4	hour	--	9	--	35	--	--
5	hour	--	--	--	--	--	--
6	hour	17	--	16	--	--	--
7	hour	58	27	56	28	--	22
8	hour	--	5	--	9	--	12
9	hour	169	185	171	201	203	148
10	hour	--	--	--	--	--	--
11	hour	766	786	762	779	811	809
12	hour	369	380	367	376	446	450
Net Returns	dol.	60,308	61,788	60,221	61,684	51,214	52,943

a/ Land available was 285 acres of cropland and 210 acres of pastureland

Corn Silage Restricted Program. Solutions for the 30 percent of equity models, which allowed silage, did not included silage in their optimal solutions; therefore, the forced restriction had no effect (Tables 4 and 5).

75 Cow-calf Unit Required Program. Optimal solutions showed increased concentration in pasture feeding programs 11 and 12 (Tables 4 and 5). Small amounts (less than 30 head) of stocker programs 1 and 2 and pasture feeding program 3 were included in the solutions. Increases in hay production replaced much of the coastal bermuda pasture as compared to the non-restricted programs.

Capital Limited to 70 Percent of Equity

Non-Restricted Program. Optimal solutions included the same enterprises as listed in the 30 percent of equity solutions plus feedlot program 15 (Tables 6 and 7). Feedlot program 15 included heifers purchased at 749 pounds, fed corn silage and corn grain for 60 days while gaining 2.37 pounds/day, and sold at 891 pounds. The major differences in the solutons between the high and low fertilizer price models were the higher levels of wheat-ryegrass pasture and corn silage with the low fertilizer price. Also, the base fertilizer price solution used less corn grain and included higher levels of the pasture feeding programs and lower levels of the feedlot program than the solutions using the high fertilizer price.

Corn Silage Restricted Program. Optimal solutions when silage was excluded showed an increase in hay production as compared to the non-restricted solution (Tables 6 and 7). Consequently, there was a reduction in coastal bermuda and wheat-ryegrass as grazed forages which led to an increase in the level of the feedlot 15 activity and a reduction in the level of pasture feeding programs 3 and 12 and stocker program 1.

Table 6. Optimal cattle alternatives and sources of nutrients for subregion seven representative firm with capital restricted to 70 percent of equity; short run decision setting, stable-low cattle prices.

		SOURCES OF NUTRIENTS																	
		Coastal Bermuda Pasture			Native Pasture			Wheat-Ryegrass Pasture			Coastal Bermuda Hay			Corn Silage			Corn Grain		
Program Constraints[a/]		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Cattle Activities																			
High Fertilizer Price	Cow-Calf						x			x			x						
	Stocker 1							x	x		x	x					x	x	
	Stocker 2	x	x[b/]		x	x											x	x	
	Pasture 3	x	x			x		x	x								x	x	
	Pasture 11	x	x			x	x	x	x	x							x	x	x
	Pasture 12	x	x					x	x	x	x	x	x				x	x	x
	Feedlot 15											x		x		x	x	x	x
Base Fertilizer Price	Cow-Calf			x			x			x			x						
	Stocker 1							x	x			x		x			x	x	
	Stocker 2	x	x		x	x						x					x	x	
	Pasture 3	x	x			x		x	x								x	x	
	Pasture 11		x	x		x	x		x	x								x	x
	Pasture 12	x	x	x		x	x	x	x	x		x		x		x	x	x	x
	Feedlot 15											x		x		x	x	x	x

a/ Program constraints: 1 = non-restricted programs
2 = corn silage restricted programs
3 = 75 cow-calf-unit restricted programs

b/ (X) denotes usage of the respective nutrient source by the respective livestock activity.

Table 7. Optimal beef cattle enterprise combinations for representative firm in South Mississippi with capital restricted to 70 percent of equity; short-run decision setting; stable-low cattle prices.[a/]

Activity		Non-Restricted Program High Fertilizer	Non-Restricted Program Base Fertilizer	Corn Silage Restricted Program High Fertilizer	Corn Silage Restricted Program Base Fertilizer	75 Cow-Calf Unit Required Program High Fertilizer	75 Cow-Calf Unit Required Program Base Fertilizer
Grazed Forages							
Coastal Bermuda	acre	153	162	129	101	--	25
Native Pasture	acre	102	67	129	87	188	195
Wheat-ryegrass	acre	53	130	22	90	67	87
Hay	acre	139	--	215	217	192	46
Silage	acre	48	136	--	--	48	142
Cow-Calf	head	--	--	--	—	75	75
Stocker 1	head	46	114	19	79	--	--
Stocker 2	head	148	135	148	109	--	--
Pasture 3	head	46	114	19	79	--	--
Pasture 11	head	94	--	131	53	104	77
Pasture 12	head	693	835	617	610	746	898
Feedlot 15	set[b/]	133	98	151	150	135	101
Corn Grain/mo.							
1	ton	141	122	135	135	146	129
2	ton	23	18	31	31	23	18
3	ton	23	18	30	30	22	17
4	ton	23	18	31	31	23	18
5	ton	39	27	49	44	34	26
6	ton	48	37	58	47	38	30
7	ton	50	38	59	55	39	31
8	ton	35	39	39	47	23	19
9	ton	28	22	36	34	22	17
10	ton	31	24	39	36	23	18
11	ton	122	110	118	118	128	115
12	ton	135	117	130	130	140	123
Labor reqd. over 2-man-mos./mo.							
1	hour	694	822	594	617	815	935
2	hour	--	--	2	--	--	--
3	hour	--	--	--	--	--	--
4	hour	79	163	33	80	33	77
5	hour	4	1	—	--	--	4
6	hour	77	31	91	41	--	--
7	hour	138	49	166	76	54	34
8	hour	146	400	14	56	69	291
9	hour	176	105	224	291	223	89
10	hour	--	--	--	--	--	--
11	hour	707	881	600	651	771	910
12	hour	363	423	302	328	445	492
Net Returns	dol.	81,762	84,539	79,975	81,288	71,804	74,824

a/ Land available was 285 acres of cropland and 210 acres of pastureland

b/ 1 set = 1.70 head

75 Cow-calf Unit Required Program. Optimal solutions resulted in eliminating pasture feeding program 3 and stocker programs 1 and 2 as compared to the non-restricted solutions (Tables 6 and 7). Native pasture replaced much of the coastal bermuda pasture as compared to the non-restricted programs. Feedlot program 15 was approximately the same in the cow-calf required program as it was in the non-restricted program.

SUMMARY

This study describes a typical cow-calf operation in South Mississippi and estimates returns to land, invested capital, available labor, and management for beef cattle production and marketing alternatives. The representative firm assumed was examined at average levels of management and technology and under different resource cost-product price relationships.

Alternatives to the cow-calf operation included stocker, pasture feeding and feedlot enterprises. Monthly nutritional requirements for the animals were specified in terms of total digestable nutrients and dry matter consumption. Standard feeding activities included three grazed forage activities (coastal bermuda, native, and wheat-ryegrass pasture) and hay. Shelled corn feeding and corn silage production were included as alternatives to the standard practices.

A basic linear programming model designed to maximize net returns in a short run decision setting was defined. Different resource situations were reflected by varying the percentage of assets available as operating capital and varying beef and fertilizer prices. In addition, models were evalutated with silage excluded as a forage alternative and with a required cow-calf herd of at least 75 head.

The optimal combination of enterprises when using the stable-high price for beef cattle was not restricted by the capital constraints specified; consequently, an increase in equity from 30 to 70 percent had no effect on the optimal solutions. Stocker steer programs with a low rate of gain were the most profitable cattle enterprises. Nutrients for the stocker programs were generally provided by coastal bermuda and wheat-ryegrass pastures, corn grain and silage. Restrictions on the model did not bring any other production alternatives into solution at substantial levels. Changing from high to base fertilizer prices generally resulted in increases in wheat-ryegrass pasture acreage, decreases in coastal bermuda pasture acreage and less feeding of corn grain.

The models with stable-low cattle prices included the same steer stocker programs as the model with stable-high cattle prices, but at significantly reduced levels. The solutions with stable-low cattle prices called for significant levels of the pasture feeding programs and, when equity was increased from 30 to 70 percent, heifer feedlot program 15 and corn silage entered the optimal solution as sources of nutrients. Again, changing from high to low fertilizer prices generally resulted in increased acreage in wheat-ryegrass pasture and, in some cases, increased acreage in silage.

Conclusions

Stable-High Cattle Prices

Under the assumptions used in this study, optimal short run enterprise adjustments for a typical cow-calf operation in South Mississippi during a period of cyclical high cattle prices can be characterized as emphasizing winter and summer stocker steer programs instead of the cow-calf operation. The nutrients for these programs can be provided primarily by a combination of coastal bermuda and wheat-ryegrass pasture and corn grain or corn silage or both. Percent of equity available to the firm would have no effect on which enterprises the firm should choose.

A 75 unit cow-calf enterprise would not substantially alter the optimal enterprise mix except that more pasture and hay would be used to furnish nutrients for the cow herd. However, this situation would reduce the net returns to the firm.

Stable-Low Cattle Prices

The optimal adjustments of enterprises by the typical cow-calf firm in a short-run decision setting during a period of cyclical low cattle prices can be characterized as emphasizing cattle finishing (primarily pasture feeding) activities along with relatively low levels of stocker activities. Also, feedlot finishing activities should be considered when ample capital is available. Finishing activities, which this analysis indicated were most profitable, are predominantly those using yearling age cattle as opposed to the calf-to-slaughter activities. Native pasture, wheat-ryegrass pasture, and coastal bermuda hay are profitable feeding alternatives in this situation.

The silage enterprise generally is not as profitable with stable-low cattle prices as when stable-high cattle prices are used. Thus, it could be concluded that the silage enterprise is an appropriate short run adjustment only when relatively high levels of capital are available or during a period of cyclical high cattle prices or both. Requiring a minimum of 75 units of the cow-calf enterprise does not significantly alter the optimal enterprise combinations. An optimal solution in this case would require decreases in the stocker activities and increases in the finishing activities. Also, the inclusion of the cow-calf enterprise would result in substantially lower net returns.

Implications

Several general conclusions seem warranted when the results of all the models are considered.

1. At the level of productivity (66 percent calving rate) of the cow-calf enterprise used in this analysis, cow-calf operations were less profitable than stocker and/or finishing enterprises under all of the specific sets of conditions considered. This fact would seem to indicate a need to evaluate cow-calf enterprises with higher levels of productivity.
2. Nitrogen fertilizer prices had some influence on enterprise choice for beef cattle firms in the study area under the conditions analyzed. The major impact of changes from high to base level fertilizer prices was that wheat-ryegrass pasture and silage were used more frequently and/or at higher levels with base as compared to high level fertilizer prices. The forage production enterprises used in this study assumed average levels of management and productivity and, consequently, relatively low levels of fertilizer usage. Thus, if forage enterprises using higher levels of management, fertilization and productivity were considered, fertilizer prices would be expected to have more impact on the optimal combinations of activities.
3. Beef cattle finishing programs, either on pasture or in feedlots, appeared in the optimal solutions under many of the

specific conditions examined in this analysis. In almost all cases these finishing programs used heifer calves or yearlings as opposed to steers. This fact indicates that heifer finishing is relatively more profitable than steer finishing under the conditions and assumptions of this analysis. Since the feedlot industry does not generally acknowledge this as true, care should be exercised in drawing inferences from this study as to the general relative profitability of feeding steers vs. heifers.

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