



An Economic Analysis
of Two Confinement Systems

vs.

a Conventional System
of Beef Cow-Calf Production



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This is a companion report to Agricultural Experiment Station Bulletin 411 "Confined Feeding of Beef Brood Cows." Bulletin 411 presented primarily the physical data from the experimental work while this report deals chiefly with the economic aspects of the different production systems. Bulletin 411 is available upon request from the Department of Publications, Agricultural Experiment Station, Auburn University, Auburn, Alabama 36830.

An Economic Analysis of Two Confinement Systems vs. a Conventional System of Beef Cow-Calf Production

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INTRODUCTION

IMPROVEMENTS IN FORAGE CROPS and beef cattle genetics have offered cattlemen the opportunity to produce more and heavier calves. However, efficient utilization of some of the new high-yielding forages decreases when high stocking rates are used. Also, the full potential offered by genetic improvements and crossbreeding cannot be realized because of inadequate and seasonal feed supplies. As a result of this situation, new interest in research on the management of beef cows in confinement has been generated.

OBJECTIVES

This study was designed to compare costs and returns involved in the production of beef under two confinement systems and a conventional system. A primary reason for conducting this study was to determine if crops grown by intensive production systems could be used to economically produce beef calves. Specific objectives were: (1) To determine costs and returns involved in the production of beef calves. Three systems were considered: a confined feeding system using sorghum silage; a confined feeding system using Coastal bermudagrass hay; and a conventional system using Coastal bermudagrass for

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grazing and hay. (2) To compare the feasibility of these systems when changes occur in land price and crop yields.

METHOD OF STUDY

This experiment was initiated November 1, 1963, at the Auburn University Agricultural Experiment Station's Lower Coastal Plain Substation and continued for 5 years.

Forty-five Hereford cows, divided into three comparable groups, were used initially. After 3 years these cows were replaced with Angus-Hereford cows.

Group I. Conventional System. The 15 cows of this group were allowed to graze on 15 acres of Coastal bermudagrass pasture from early spring until November. From November 1 until grazing was adequate in spring, these cows received Coastal bermudagrass hay plus 2 pounds of cottonseed meal per day. Calves in this group did not receive creep feed.

Group II. Confined silage. The 15 cows of this group were confined to a 3-acre paddock. Their feedstuff consisted of NK-300 sorghum silage year-round, supplemented with 1.5 pounds per day of 65 per cent protein supplement during the first 180 days of lactation and 1 pound per day during the balance of the year. Creep feed was supplied on a free choice basis for the calves.

Group III. Confined hay. This group of 15 cows was confined to a 3-acre paddock on a year-round basis and was fed Coastal bermudagrass hay daily. These cows received 1 pound per day per cow of 65 per cent protein supplement only during the first 180 days of lactation. These calves received creep feed on a free choice basis.

Forage yields and animal input-output data from the experiment were used in this economic analysis. Prices of resources employed in production were obtained from experimental data, equipment dealers, and previous publications. These prices were used to develop costs and returns for the three different feeding systems.

MANAGEMENT PRACTICES, FORAGE YIELDS, FEED CONSUMPTION, AND REPRODUCTIVE RESULTS

The assumption was made that high forage and crop yields combined with better cattle management could be more ad-

vantageous in confinement systems than in the conventional production system.

Crop Management

The total acreage planted was based on the following assumptions:

1. One acre of sorghum, cut for silage, or 1 acre of Coastal bermudagrass for hay would provide enough forage to support two cows and their calves (two cow-calf units) per year.

2. One acre of Coastal bermudagrass would furnish sufficient grazing and hay for one-cow-calf unit per year.

Based on these assumptions, the following acreages were assumed to be adequate: 15 acres of Coastal bermudagrass for the conventional system (grazing and hay), 12 acres of forage sorghum NK-300 for the silage system, and 8 acres of Coastal bermudagrass for the confined hay system. Extra acreage was planted for the confinement systems to ensure adequate feed supplies.

The Coastal bermudagrass pasture for the conventional system was divided into three approximately equal parts. This procedure allowed rotation of grazing and harvesting. During the summer months, this pasture was fertilized with ammonium nitrate and 0-14-14. The total amount of nitrogen applied was approximately 200 pounds per acre, Appendix Table 1.

The Coastal bermudagrass used strictly for hay was fertilized with 400 pounds of nitrogen per acre in split applications. The hay crop was harvested in successive 5-6 week intervals depending on moisture conditions.

The silage crop was produced on a fertile river-terrace soil and rotated to prevent possible soil-borne diseases such as red rot. The amount of fertilizer needed was determined the first year from soil tests and the maximum recommended rate for each crop was used. The same fertilizer rate was used each year of the experiment.

Forage Yields

Records of total forage production for each system are shown in Table 1. The 5-year average yield for silage was 17.15 tons per acre. Silage yields in 1965 and 1966 were reduced by drought during the growing season. Coastal bermudagrass exhibited more drought tolerance since yields remained fairly consistent.

TABLE 1. ANNUAL FORAGE PRODUCTION PER ACRE BY TYPE OF FEEDING SYSTEMS, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Tons/acre</i>	<i>Tons/acre</i>	<i>Tons/acre</i>
1963.....	16.38	7.50	2.82
1964.....	18.40	7.96	1.37
1965.....	12.30	6.92	.79
1966.....	14.50	6.84	1.36
1967.....	24.18	8.24	2.07
Average.....	17.15	7.49	1.68

When comparing the amount of forage produced on 1 acre with the total consumption for 2 cows, it was found that silage yields had an annual deficit of 8.53 tons per acre and Coastal bermudagrass hay about 1.11 tons per acre, Tables 2 and 3. Lower than expected yields were attributed to drought.

TABLE 2. ANNUAL FORAGE CONSUMPTION, BY TYPE OF FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>
1963-64.....	178.47	58.16	22.12
1964-65.....	188.53	63.56	22.96
1965-66.....	178.95	65.50	23.51
1966-67.....	208.35	67.86	24.48
1967-68.....	208.35	67.80	24.45
Average.....	192.53	64.57	23.50
Av. tons/cow/yr.....	12.84	4.30	1.57

TABLE 3. ANNUAL NET DIFFERENCE BETWEEN PRODUCTION AND CONSUMPTION, BY TYPE OF FEEDING SYSTEM, CONFINED BEEF STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage ¹	Confined hay	Conventional
	<i>Tons</i>	<i>Tons</i>	<i>Tons</i>
1963-64.....	-47.44	1.84	20.18
1964-65.....	-41.34	.12	- 2.41
1965-66.....	-80.55	-10.15	-11.66
1966-67.....	-92.35	-13.14	- 4.08
1967-68.....	-14.91	- 1.88	6.60
Average.....	-55.31	- 4.64	1.73
Per acre.....	- 8.53	- 1.11	.11

¹ Data for the confined silage system are based on the production from 7½ acres, which was assumed to be adequate, and the actual consumption by 15 cows.

Based on the 5-year average production, either 1.50 acres of silage or 1.15 acres of Coastal bermudagrass were needed to provide sufficient forage for two cow-calf units per year. The conventional system of Coastal bermudagrass (grazing and hay) provided more than enough forage per annum. Actually, .93 acre per cow-calf unit was sufficient for this group.

Supplemental Feed

In addition to the forage produced, the cows and calves on both confinement systems received Auburn 65 feed supplement and creep feed as indicated earlier.

Formula for Auburn 65 supplement

	<i>Per cent</i>
Cottonseed meal (41%).....	59
Urea.....	15
Ground snapped corn.....	13
Dicalcium phosphate.....	13
Vitamin A (10,000 IU/lb.)	

Creep mixture supplied to all confined calves

	<i>Per cent</i>
Ground shelled corn.....	65
Ground Coastal bermudagrass hay.....	15
Cottonseed meal (41%).....	8
Urea.....	1
Cane molasses.....	10
Salt.....	0.5
Minerals.....	0.5

Consumption data for protein supplement are shown in Table 4.

The reproductive data for the three systems are shown in Table 5. Results for 1963 through 1966 were from the original cows and those for 1966 through 1968 were from the Angus-

TABLE 4. TOTAL ANNUAL CONSUMPTION OF PROTEIN SUPPLEMENT, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Lb.</i>	<i>Lb.</i>	<i>Lb.</i>
1963-64.....	6,855	2,895	4,395
1964-65.....	6,510	2,085	4,335
1965-66.....	5,835	2,220	4,065
1966-67.....	7,050	3,300	4,410
1967-68.....	7,050	3,300	2,910
5-yr. av.....	6,660	2,760	4,023
5-yr. av. per cow.....	440	184	268

TABLE 5. NUMBER OF CALVES WEANED, PER YEAR BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, 1963-68

Year	Feeding system					
	Confined silage		Confined hay		Conventional	
	No.	Pct.	No.	Pct.	No.	Pct.
1963-64.....	15	100	13	87	15	100
1964-65.....	12	80	11 ¹	73	13	87
1965-66.....	13	87	9	60	14	93
1966-67.....	12	80	14	93	15	100
1967-68.....	14	93	14	93	12	80

¹ There were 12 calves in this group but one calf did not eat creep feed and was considered atypical.

Hereford cows. Two systems had a fairly high per cent calf crop weaned. The silage group averaged 88 per cent calf crop and the conventional 92 per cent. But the confined hay cows averaged only 84 per cent calf crop.

Cows on the confined hay system had very poor reproductive results the third year. In 1965-66 the per cent calf crop weaned was only 60 per cent.² This same tendency was noticed in 1969 in the Angus-Hereford cows, which had a calf crop of only 60 per cent.

Calf Results

An important evaluation of cows on test was the weaning weights of calves. Calves were weighed at 250 ± 3 days of age and actual weaning weights recorded, Appendix Table 2. All weaning weights were corrected for age-of-dam and sex-of-calf according to factors listed in Appendix Table 3.

The adjusted weaning weights in Table 6 were used for economic analysis purposes. Cows on the confined systems consistently weaned heavier calves than cows on the conventional system. The major reason for this was probably that calves on the confined systems received creep feed, Table 7.

Since the Hereford cows were replaced with Angus-Hereford crosses in 1966, weaning weights of the calves were averaged for two separate periods, Appendix Table 4. The Angus \times Hereford cows weaned calves that averaged 32-53 pounds heavier than calves weaned by straight Hereford cows.

Calves from each group were sold through auction markets. Most calves graded Choice as stockers. The value of the calves

² Data on the Angus-Hereford cows for 1969 were not included in this study. Calving data were the only data recorded.

TABLE 6. ANNUAL ADJUSTED CALF WEANING WEIGHTS, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Lb.</i>	<i>Lb.</i>	<i>Lb.</i>
1963-64.....	554	510	431
1964-65.....	521	454	426
1965-66.....	513	524	453
1966-67.....	574	565	474
1967-68.....	590	490	484
5-yr. av.....	550	509	454

TABLE 7. AVERAGE ANNUAL CONSUMPTION OF CALF CREEP FEED, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system	
	Confined silage	Confined hay
	<i>Lb.</i>	<i>Lb.</i>
1963-64.....	1,355	1,266
1964-65.....	1,255	1,343
1965-66.....	1,268	1,119
1966-67.....	1,583	1,564
1967-68.....	1,522	1,633
5-yr. av.....	1,397	1,385

TABLE 8. ANNUAL AVERAGE ADJUSTED MARKET VALUE PER CALF, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
1963-64.....	109.54	103.46	83.21
1964-65.....	124.60	102.99	95.80
1965-66.....	128.24	123.38	115.62
1966-67.....	142.24	139.32	115.83
1967-68.....	146.39	122.50	116.09
5-yr. av.....	130.20	118.31	105.31

was calculated from the adjusted weaning weights and market prices. This allowed a more accurate comparison among the three groups. The average market value by year is in Table 8.

Calves from the silage system brought approximately \$25.00 per head more than calves from the conventional system and \$12.00 more than the calves from the confined hay system. This difference in value was primarily a result of heavier weights of the calves in the silage system.

ESTIMATED COSTS AND RETURNS

Tests results, along with projected prices, were used to compare costs and returns of the three feeding systems.

Prices Paid and Received

Prices paid for items used in producing calves were projected to 1971, Appendix Table 5. Costs of roughages were based on costs of production for all items that could be produced on the farm. Cost of calf creep mixture, Appendix Table 6, was based on purchase of inputs and custom mixing.

Machinery and Power Costs

Estimates of fixed and variable costs of machinery and power are shown in Appendix Tables 7-10. Fixed costs included taxes, insurance, housing, depreciation, and interest on investment. Variable costs were primarily operating costs and included fuel, repairs, and lubrication. The variable costs per hour and the annual hours of labor were based on previously published data.³ Prices paid for equipment were representative of dealer prices in the area.

Depreciation was based primarily on the number of hours the item was used. Heavier equipment was depreciated over a 10-year period while lighter equipment was depreciated over an 8-year period. Depreciation per hour of use was found by dividing the depreciation per year by the average number of hours used per year. Insurance, housing, and taxes were estimated to be 2 per cent of the average value of the equipment. The rate of interest was assumed to be 7 per cent of the average value of the machinery. Machinery requirements per acre for silage and Coastal bermudagrass production were obtained from the test, Appendix Tables 8-12.

Cost of Forage Production

Determination of costs associated with the production of roughages used as feed was necessary to make an economic analysis. Appendix Tables 13-16 show the costs of establishing Coastal bermudagrass, annual maintenance for pasture and hay, and the cost of silage production. Establishment cost for Coastal bermudagrass per acre was computed using estimated prices for

³ SMITH, EASLEY S., AND JAMES D. OLIVER. 1965. Estimating Farm Machinery Costs. Virginia Polytechnic Institute Agr. Ext. Ser. Bull. 290.

1971 and present prices. This initial cost was prorated for a period of 15 years at a charge of \$3.80 per acre per year. These costs were used to determine the cost per ton of roughage produced.

Production cost of Coastal hay used for the confined feeding system included a high rate of fertilization along with the machinery cost for two cuttings per year. This accounted for the major cost difference between the two Coastal fields.

5-Year Test Results

When determining the costs and returns for three feeding systems during the years on test, some costs were held constant because there was very little change in the price of these inputs during the test. These items were tractor and equipment operating costs, fertilizer, labor, veterinary expense, and noncash machinery costs. Interest was charged at 7 per cent for a period of 6 months. Detailed lists of expenses and receipts by each system are shown in Appendix Tables 17-22. These tables show costs and returns for respective feeding systems for each year on the test. Prices used for forages and calf creep feed were derived from the costs of production. All other prices used were the average price paid and received by farmers in the State during these respective years.

Noncash expenses included fixed machinery costs for forage production and fixed costs of the cow-calf enterprise, Appendix Tables 23-25. Returns to land, labor, and management were calculated by subtracting the total cash and noncash expenses from the total cash receipts. Based on these results, a summary table comparing the 5-year average receipts and expenses for each feeding system was prepared, Table 9.

A comparison of the value of calf receipts was made among feeding systems. With one exception, results indicated the silage calves had more total receipts than the other feeding systems. This higher value was because these calves were heavier and averaged \$.01 per pound more than calves in the other systems.

Based on consumption data of cows in the conventional system, 15 acres of Coastal bermudagrass for grazing and hay was more than enough to furnish grazing and hay for the 15-cow unit. The excess forage was credited to the conventional system. Variations of excess forage that occurred in the two confinement systems were attributed to fluctuations in yield.

TABLE 9. FIVE-YEAR AVERAGE SUMMARY OF TOTAL RECEIPTS AND EXPENSES BY TYPE OF FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA 1963-68

Item	Type of feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Receipts			
Calves.....	1,712.35	1,471.17	1,448.55
Excess forage.....	58.57	5.41	72.53
¼ bull @ 1,600 lb.....	60.00	60.00	60.00
Average total receipts.....	1,830.92	1,536.58	1,581.08
Cash expenses			
Protein supplement.....	314.95	131.05	169.32
Forage purchased.....	46.21	75.07	53.68
Calf creep feed.....	506.95	473.33	0
Veterinary expense.....	15.00	15.00	15.00
Building and fence repair.....	16.50	16.50	16.50
Tractor and operating expense.....	167.88	170.00	159.30
Fertilizer, lime, and seed.....	222.24	352.48	417.30
Labor.....	106.80	80.00	75.00
Interest on operating capital.....	48.88	45.97	31.71
Commission and yardage fee (3% of gross receipts).....	53.17	45.94	45.26
Average total cash expenses.....	1,498.58	1,405.34	983.07
Noncash expenses			
Noncash machinery cost.....	253.68	127.12	119.10
¼ bull.....	105.00	105.00	105.00
Fixed expenses.....	256.00	400.65	295.91
Establishment cost.....	0	30.40	57.00
Average total cost of production.....	2,113.26	2,068.51	1,560.08
Average returns to operator's land, labor, and management.....	-282.34	-531.93	21.00

Differences in the cost of protein supplement resulted largely from the controlled feeding methods. Each feeding system had a different rate of protein supplement provided to the cows. The major difference among years (within the same feeding system) was the result of price fluctuations occurring in the cost of protein supplement.

A calf creep feed was supplied to those calves on the two confined feeding systems. The cost difference between the two confined feeding systems was a result primarily of the difference in number of calves eating creep feed. This also accounted for the cost variations among years that occurred within the same feeding systems.

When 5-year average net returns of the three feeding systems were compared, only the conventional system showed a positive return to land, labor, or management. Therefore, the conven-

tional feeding system was more economical than either confinement system. Cows in the confinement feeding systems had a lower per cent calf crop and an additional cost of calf creep feed. These two factors along with the higher noncash expenses of the confinement systems accounted for the lower net returns.

For a more detailed comparison between feeding systems, the variable feed cost for maintaining the cows was tabulated. The cost of forage consumption was assumed to be the variable costs of production minus the value of excess forage. This was added to the cost of protein supplement to obtain the variable feed costs for maintaining the respective 15-cow herds for each year. Interest was charged at 7 per cent annual rate for 6 months. The results indicated there was little difference between the variable feed costs incurred in the two confinement systems and the conventional feeding system, Table 10.

TABLE 10. VARIABLE COW FEEDING COST, BY FEEDING SYSTEM PER YEAR, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
1963-64.....	794.06	743.74	516.22
1964-65.....	739.11	721.56	885.94
1965-66.....	908.21	874.43	1,035.82
1966-67.....	984.12	994.50	945.24
1967-68.....	711.97	817.32	668.16
Average.....	827.49	830.31	810.27
Average per cow.....	55.17	55.35	54.02

To determine total maintenance cost of the respective cow herds the following costs were added to the variable feed cost: veterinary expense, fence repair, and the noncash expenses. The total cow maintenance cost figures showed that the confined hay was the most expensive feeding system, while the conventional and confined silage were about the same, Table 11. The lower cost of storing silage and the higher cost of storing hay were reflected in these figures.

To compare the three feeding systems with respect to efficiency of beef production, variable costs and total cost per pound of beef were determined. Variable costs included all annual expenses of cows and bull plus the cost of calf creep feed, Table 12. The most economical system based on variable cost per

TABLE 11. TOTAL COW MAINTENANCE COST, BY TYPE OF FEEDING SYSTEM PER YEAR, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
1963-64.....	1,457.33	1,455.50	1,141.82
1964-65.....	1,402.38	1,433.32	1,511.54
1965-66.....	1,571.48	1,586.19	1,661.42
1966-67.....	1,647.39	1,706.26	1,570.84
1967-68.....	1,400.24	1,554.08	1,318.76
Average.....	1,495.76	1,547.07	1,440.88
Average per cow.....	99.72	103.14	96.06

TABLE 12. VARIABLE COST PER POUND OF BEEF PRODUCED BY TYPE OF FEEDING SYSTEM PER YEAR, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
1963-64.....	.18	.20	.16
1964-65.....	.21	.24	.17
1965-66.....	.22	.26	.18
1966-67.....	.23	.22	.15
1967-68.....	.19	.23	.15
Average.....	.21	.23	.16

pound of beef produced was the conventional feeding system. The silage feeding system had the next lowest cost per pound of beef produced.

The total cost per pound of beef produced is shown in Table 13. Fixed expenses (interest, annual depreciation, insurance, and taxes) are included in the total cost. The conventional system of feeding was again the most economical followed by the silage feeding system.

The variable cost per pound indicated the price per pound that must be received by a producer to stay in business in the short run. On the other hand, it is the total cost per pound of beef produced that must be recovered if a producer is to stay in business over a long period of time.

The average price per pound received was compared with variable and total costs associated with the production of a pound of beef, Table 14. On the average, the price received covered variable costs of all three systems. When fixed costs were added,

TABLE 13. TOTAL COST PER POUND OF BEEF PRODUCED BY TYPE OF FEEDING SYSTEM PER YEAR, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
1963-64.....	.26	.30	.24
1964-65.....	.31	.38	.28
1965-66.....	.31	.41	.27
1966-67.....	.33	.30	.23
1967-68.....	.27	.33	.26
Average.....	.30	.34	.26

TABLE 14. AVERAGE VARIABLE AND TOTAL COSTS, AND PRICE RECEIVED PER POUND OF BEEF, BY TYPE OF FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Feeding system	Variable cost	Total cost	Price received
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Confined silage.....	.21	.30	.24
Confined hay.....	.23	.34	.23
Conventional.....	.16	.26	.23

however, the cost per pound received was not sufficient to cover total costs of any system. However, when value of excess forage was credited to receipts, the conventional system had a positive return to land, labor, and management during the years of the test.

PROJECTED ENTERPRISE BUDGETS AND CAPITALIZED LAND VALUE

The projected enterprise budgets for three feeding systems are presented in this section. Using the experimental data, a statistical analysis was employed to determine any important differences among feeding systems. The effect of land prices on the three systems and the economic aspect of the use of calf creep feed were also considered.

The projected enterprise budgets, Tables 15-17, were calculated using the averages obtained on test for feed consumption, weaning weights, calf crop, and forage yields. The number of acres planted for each system was the number required to carry the cows 1 year. Interest was charged at a rate of 7 per cent on operating capital and 6 per cent on real estate. Taxes and insurance were considered to be 1 per cent of the average value of the items on which these costs were applicable.

TABLE 15. ESTIMATED COSTS AND RETURNS FOR CONFINED SILAGE SYSTEM
(ESTIMATED PRICES 1971), CONFINED BEEF COW STUDY, LOWER
COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Amount	Price	Total
		<i>Dol.</i>	<i>Dol.</i>
Cash receipts			
Calves, 13.2 @ 550 lb., cwt.....	72.60	31.97	2,321.02
Bull, ¼ @ 1,800 lb., cwt.....	4.50	18.00	81.00
Total cash receipts.....	-----	-----	2,402.02
Cash expenses			
Protein supplement, cwt.....	66.60	5.14	342.32
Silage NK-300, ton.....	192.50	4.07	783.48
Calf creep, ton.....	9.22	54.96	506.73
Bull cost, ¼ @ \$700.....	-----	-----	175.00
Vet expense @ \$1.10 per cow unit.....	-----	-----	16.50
Building and fence repairs @ \$1.26 per cow.....	-----	-----	18.90
Commission and yardage fee (3% of gross receipts).....	-----	-----	72.06
Interest on operating capital @ 7% of cash expense minus yardage fee for 6 months.....	-----	-----	58.38
Total cash expenses.....	-----	-----	1,973.37
Fixed expenses (See Appendix Table 26).....	-----	-----	345.78
Returns to operator's land, labor, and management.....	-----	-----	82.87

TABLE 16. ESTIMATED COSTS AND RETURNS FOR CONFINED COASTAL
BERMUDAGRASS HAY (ESTIMATED PRICES 1971), CONFINED BEEF
COW STUDY, LOWER COASTAL PLAIN SUBSTATION,
ALABAMA, 1963-68

Item	Amount	Price	Total
		<i>Dol.</i>	<i>Dol.</i>
Cash receipts			
Calves, 12.6 @ 509 lb., cwt.....	63.13	31.97	2,050.24
Bull, ¼ @ 1,800 lb., cwt.....	4.50	18.00	81.00
Total cash receipts.....	-----	-----	2,131.24
Cash expenses			
Protein supplement, cwt.....	27.60	5.14	141.86
Coastal bermudagrass hay, ton.....	64.50	13.86	893.97
Calf creep, ton.....	8.73	54.96	479.80
Bull cost, ¼ bull @ \$700.....	-----	-----	175.00
Vet expenses @ \$1.10 per cow unit.....	-----	-----	16.50
Building and fence repair @ \$1.26 per cow.....	-----	-----	18.90
Commission and yardage fee (3% of gross receipts).....	-----	-----	63.94
Interest on operating capital @ 7% of cash expenses minus yardage fee for 6 months.....	-----	-----	54.29
Total cash operating expenses.....	-----	-----	1,844.26
Fixed expenses (See Appendix Table 27).....	-----	-----	574.86
Returns to operator's land, labor, and management.....	-----	-----	-287.88

TABLE 17. ESTIMATED COSTS AND RETURNS FOR CONVENTIONAL BEEF COW SYSTEM (ESTIMATED PRICES 1971), CONFINED BEEF COW SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Amount	Price	Total
		<i>Dol.</i>	<i>Dol.</i>
Cash receipts			
Calves, 13.8 @ 454 lb., cwt.....	62.65	31.97	2,002.92
Bull, ¼ @ 1,800 lb., cwt.....	4.50	18.00	81.00
Total cash receipts.....	-----	-----	2,083.92
Cash expenses			
Protein supplement 41% CSM, cwt.....	40.23	5.54	222.87
Coastal bermudagrass hay and pasture, acre.....	13.95	59.81	834.35
Bull cost, ¼ bull @ \$700.....	-----	-----	175.00
Vet expenses @ \$1.10 per cow unit.....	-----	-----	16.50
Building and fence repair @ \$1.26 per cow.....	-----	-----	18.90
Commission and yardage fee (3% of gross receipts).....	-----	-----	62.38
Interest on operating capital @ 7% of cash expenses minus yardage fee and hay for 6 months.....	-----	-----	32.89
Total cash expenses.....	-----	-----	1,362.89
Fixed expenses (See Appendix Table 28).....	-----	-----	424.63
Return to operator's land, labor, and management.....	-----	-----	296.40

The conventional feeding system showed the highest net return to land, labor, and management. The major variable cost difference between this feeding system and the two confinement systems was the cost of the calf creep feed.

The fixed costs incurred varied among systems. The silage system had much less capital investment than either the Coastal hay confined or Coastal conventional system. The lower cost of the trench silo as compared with a pole barn to store the roughages was the main reason for the cost difference between the two confined systems.

Statistical Tests

For a statistical comparison of the three feeding systems, an analysis of variance was made for variable cow feed costs, total cow maintenance costs, and variable costs per pound of beef produced. The analysis of variance involved data for the respective feeding systems and indicated the amount of variation that could be expected among the three feeding systems. The following hypotheses were tested:

1. There was no difference among the three feeding systems with respect to variable beef cow feed costs.

2. There was no difference among the three feeding systems with respect to total cow maintenance costs.

3. There was no difference among the three feeding systems with respect to the cost per pound of beef produced.

Tests of the first and second hypotheses indicated that at the 5 per cent level of significance there were no differences among the three feeding systems. Testing of the third hypothesis indicated a significant difference existed among the feeding systems at the 1 per cent level.

Land Values

For some practical use of the results of this research work, the following question was posed: What effect does the increased value of land have on the economic feasibility of these three systems?

With the problem of higher land value, most beef producers are interested in the effect of land price on the method of raising beef calves. If the price of land were high enough, it would become economical to use a confinement feeding system. A break-even price of land was needed to determine the point above which use of a confined feeding system would become more economical than the conventional system. This estimated value of land (break-even price) was determined by a comparison between the conventional system and each confinement system. Projected net returns to land, labor, and management, Tables 15-17, were used for these estimates. The difference in net returns between the conventional system and each of the confined systems was divided by the difference in the respective land requirements. The resulting value (\$79.08 per acre comparing the conventional with the silage system) represented the annual return to land. With a 7 per cent interest rate, the capitalized land value would be \$1,430. If a beef producer had to purchase land above this price, it would be more economical for him to use the confined silage as opposed to a conventional system. As the forage yields on confinement systems are allowed to increase, the capitalized land value decreases, Table 18. This means that the two confinement systems are becoming more competitive with the conventional system. With increased yields relative to the conventional system, consideration of changing from a conventional to a confined feeding system would occur at a lower land value.

TABLE 18. THE BREAK-EVEN PRICE OF LAND¹ WITH CHANGES IN YIELD OF TWO BEEF CONFINEMENT FEEDING SYSTEMS COMPARED TO THE CONVENTIONAL FEEDING SYSTEM

System	Yield per acre		Break-even value of land per acre
	Tons	Dol.	
Silage.....	17.15	1,130	
Silage.....	20.00	703	
Silage.....	25.00	488	
Silage.....	30.00	405	
Confined hay.....	7.49	1,566	
Confined hay.....	8.00	1,417	
Confined hay.....	8.50	1,312	
Confined hay.....	9.00	1,231	

¹ The difference in net returns capitalized at 7 per cent interest rate.

SUMMARY AND CONCLUSIONS

This study was undertaken to determine if the present intensive production of crops could be utilized to produce beef calves economically. Data for three systems of feeding beef cows, (two confinement and one conventional) for a 5-year period were used. In the confinement systems, one group of cows was fed sorghum silage all year and the other group fed Coastal bermudagrass hay, with both groups using some protein supplement. Calves from both confined systems had free access to creep feed. The conventional system had Coastal bermudagrass grazing from April to November and Coastal bermudagrass hay plus protein supplement during the winter months with no calf creep.

The acreage required for the systems was determined by dividing the average consumption per year by the average production obtained. Results indicated that 11.25 acres of silage, 8.62 acres of Coastal hay, and 13.95 acres of Coastal for grazing and hay were required to support the 15 cows in each group.

Records were kept on cow-calf performance and forage production for the 5-year period. Based on the results, the costs and returns for the respective feeding systems were determined.

The costs and returns showed, on an average, that both confinement feeding systems had a negative return to land, labor, and management. When projected prices were used, the confined hay system was the only system that had a negative return to land, labor, and management:

Item	Silage	Conf. hay	Conv.
Average net returns on test.....	\$-282.34	\$-531.91	\$21.00
Net returns, estimated prices for 1971....	82.87	-287.88	296.40

Analysis of variance was run on variable cow maintenance, total cow maintenance, and cost per pound of beef produced. No difference among the feeding systems with respect to total and variable cow maintenance costs was indicated. There was, however, a significant difference among the three systems when comparing the cost per pound of beef produced. The conventional system was more economical than either confinement system.

The net returns and land requirements of the respective feeding systems were compared. Use of an estimated break-even value of land indicated that at present production the price of land had to be exceedingly high before any consideration would be given to a confinement feeding system. As the yield on silage and Coastal bermudagrass hay varied, the break-even value of land decreased. With an increase in yield from 20 to 30 tons of silage per acre, the break-even value of land decreased from \$703 to \$405. A 1-ton per acre increase in Coastal bermudagrass hay in the confined Coastal bermudagrass hay system resulted in a decrease in the break-even value of land from \$1,417 to \$1,231. This depicts the increased competitiveness of the confinement systems with the conventional system as forage yields increase. However, as increases in yield occur in the confinement systems, fixing of the Coastal bermudagrass yield for the conventional system is not very realistic. Any increase of yield in the conventional system would result in a higher break-even value of land than indicated.

The main advantage of the confinement systems was the lower amount of land required to furnish sufficient forage for the cows. As the price of land increases, the lower acreages required for confinement feeding become increasingly more important.

APPENDIX

APPENDIX TABLE 1. FERTILIZER TYPE AND RATE OF APPLICATION BY TYPE OF FORAGE, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Type of forage	Type of fertilizer	Rate per acre
		<i>Lb.</i>
Silage.....	4-12-12	400
	Am. nitrate	225
Coastal bermudagrass hay.....	0-14-14	400
	Am. nitrate	1,212
Coastal bermudagrass pasture.....	0-14-14	400
	Am. nitrate	634

APPENDIX TABLE 2. ACTUAL CALF WEANING WEIGHTS PER YEAR, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Year	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Lb.</i>	<i>Lb.</i>	<i>Lb.</i>
1963-64.....	485	434	375
1964-65.....	485	431	395
1965-66.....	496	473	437
1966-67.....	562	547	466
1967-68.....	569	479	469
5-yr. av.....	519	473	428

APPENDIX TABLE 3. CORRECTION FACTORS FOR ADJUSTED WEANING WEIGHTS, CONFINED COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Age of dam	Sex of calf	
	Female	Male
<i>Years</i>		
2.....	1.24	1.17
3.....	1.17	1.10
4.....	1.11	1.05
5-9.....	1.06	1.00
10-12.....	1.11	1.05
13.....	1.14	1.08

APPENDIX TABLE 4. TWO AND 3-YEAR AVERAGE CALF WEANING WEIGHTS, BY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Feeding system		
	Confined silage	Confined hay	Conventional
	<i>Lb.</i>	<i>Lb.</i>	<i>Lb.</i>
3-year average 1964-66 ¹	529	496	437
2-year average 1966-68 ²	582	528	479
Net difference	+53	+32	+42

¹ Hereford cows.

² Angus-Hereford cows.

APPENDIX TABLE 5. PRICES USED IN BUDGETS ESTIMATED IN 1971

Item	Unit	Price
		<i>Dol.</i>
Prices received		
Calves.....	cwt.	31.97
Bulls.....	cwt.	17.00
Prices paid		
Coastal grazing.....	acre	59.81
Coastal bermuda hay (confined) ¹	ton	13.86
Silage.....	ton	4.07
Protein supplement.....	cwt.	5.14
Cottonseed meal.....	cwt.	5.54
Fertilizer		
0-14-14.....	cwt.	2.00
4-12-12.....	cwt.	2.15
Ammonium nitrate.....	cwt.	2.81
Lime (custom spread).....	cwt.	8.00
Bull.....	head	700.00
Cows.....	head	200.00
Labor.....	hour	1.60
Establishment costs of coastal ²	acre	3.80
Veterinary expenses.....	cow/unit	1.10
Building and fence repair ³	cow/unit	1.26

¹ Cost of production cost does not include noncash expense.

² Prorated over 15 years of life.

³ James G. Hamill and Willard F. Wolf. 1968. Data for Farm Planning in the Quachita River Valley Area of Louisiana. Louisiana State University Department of Agricultural Economics Research Report No. 374.

APPENDIX TABLE 6. COST OF PURCHASING AND CUSTOM MIXING 1 TON OF CALF CREEP FEED, 1970 PRICES, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	Price per pound		Total
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Corn, 1,300 lb. ....	.022		28.60
Ground coastal hay, 300 lb. ....	.016		4.80
Cottonseed meal 41%, 160 lb. ....	.055		8.80
Molasses, 200 lb. ....	.016		3.20
Salt and mineral, 20 lb. ....	.033		.66
Urea 1%, 20 lb. ....	.045		.90
Custom mix			8.00
Total cost			54.96

APPENDIX TABLE 7. ESTIMATED NEW, AVERAGE, AND ANNUAL FIXED COSTS FOR SILAGE EQUIPMENT

Item	New	Average value	Interest	Housing, taxes, and insurance
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Tractor, large	9,740.00	6,425.00	449.75	128.50
Tractor, small	5,970.00	3,940.00	275.80	78.80
Offset disk	1,450.00	906.25	67.22	18.12
Tandem disk	300.00	187.50	13.12	3.75
Fertilizer spreader, 10 ft.	411.58	263.41	18.44	5.27
Planter, 4-row	1,165.38	728.36	50.98	14.57
Cultivator	223.00	139.38	9.75	2.78
Side dressing rig	267.25	167.03	11.69	5.01
Silage cutter	3,635.00	2,217.35	155.21	44.34
Self unloading wagon	2,204.12	1,377.58	96.43	27.55

APPENDIX TABLE 8. ESTIMATED HOURS OF ANNUAL USE AND FIXED COSTS PER HOUR OF USE FOR SILAGE EQUIPMENT

Item	Average hours used per year	Housing, taxes, and insurance per hour use	Interest per hour use	Dep. per hour use	Total fixed cost per hour use
	<i>Hours</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Tractor, large	800	.16	.56	.83	1.53
Tractor, small	800	.10	.34	.51	.95
Offset disk	133	.13	.50	.89	1.52
Tandem disk	133	.03	.10	.18	.31
Fertilizer spreader, 10 ft.	120	.06	.15	.31	.52
Planter, 4-row	60	.24	.85	1.82	2.91
Cultivator	208	.01	.05	.10	.16
Side dressing rig	147	.04	.09	.19	.32
Silage cutter	125	.35	1.24	3.63	5.22
Self unloading wagon	125	.22	.77	1.65	2.64

APPENDIX TABLE 9. ESTIMATED NEW, AVERAGE, AND ANNUAL FIXED COSTS FOR HAY EQUIPMENT

Item	New	Average value	Interest	Housing, taxes, and insurance
	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Tractor, 4-row.....	9,740.00	6,425.00	449.75	128.50
Tractor, 2-row.....	5,970.00	3,940.00	275.80	78.80
Mower.....	627.67	379.74	26.58	7.59
Side delivery rake.....	650.00	406.25	28.43	8.12
Fertilizer spreader, 10 ft..	411.58	263.41	18.44	5.27
Baler.....	2,696.67	1,631.48	114.20	32.63
Hay liner.....	5,740.00	3,404.43	238.31	68.09

APPENDIX TABLE 10. ESTIMATED HOURS OF ANNUAL USE AND FIXED COSTS PER HOUR OF USE FOR HAY EQUIPMENT

Item	Average hours used per year	Housing, taxes, and insurance per hour use	Interest per hour use	Dep. per hour use	Total fixed cost per hour use
	<i>Hours</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Tractor, 4-row.....	800	.16	.56	.83	1.53
Tractor, 2-row.....	800	.10	.34	.51	.95
Mower.....	167	.04	.16	.30	.50
Side delivery rake.....	130	.06	.19	.26	.51
Fertilizer spreader.....	120	.06	.15	.31	.52
Baler.....	208	.16	.55	1.02	1.72
Hay liner.....	208	.32	1.15	2.18	3.65

APPENDIX TABLE 11. MACHINERY AND LABOR REQUIREMENTS PER ACRE OF COASTAL BERMUDA TWO CUTTINGS PER YEAR, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68¹

Operation	Tractor size	Times over	Machine hours	Man hours
			<i>Hr.</i>	<i>Hr.</i>
Fertilize.....	small	3	1.2	1.2
Mow.....	small	2	1.4	1.4
Rake.....	small	2	1.0	1.0
Bale.....	large	2	1.4	1.4
Haul and stack.....	small	2	5.0	5.0
Total.....	-----	--	---	10.0
Tractor hours				
Large.....	1.4			
Small.....	8.6			

¹ Machine hours from original test data used on confined beef cow study, Lower Coastal Plain Substation, Alabama, 1963-68.

APPENDIX TABLE 12. MACHINERY AND LABOR REQUIREMENTS PER ACRE OF
 SORGHUM SILAGE, CONFINED BEEF COW STUDY, LOWER COASTAL
 PLAIN SUBSTATION, ALABAMA, 1963-1968¹

Operation	Tractor size	Times over	Machine	Man
			hours	hours
			<i>Hr.</i>	<i>Hr.</i>
Break (offset disk).....	large	2	.8	.8
Disk.....	small	1	.4	.4
Fertilize.....	small	1	.4	.4
Plant.....	large	1	.7	1.4
Cultivate.....	small	1	.7	.7
Cultivate and side dress.....	small	1	.8	1.6
Cutting silage.....	large	1	.7	.7
Hauling silage with self unloading wagon.....	small	2	1.8	1.8
Packing.....	large	1	.9	.9
Covering.....	-----	-----	-----	.2
Total.....	-----	-----	-----	8.9
Tractor hours				
Large.....	3.1			
Small.....	4.1			

¹ Machine hours from original test data based on confined beef cow study, Lower Coastal Plain Substation, Alabama, 1963-68.

 APPENDIX TABLE 13. ESTIMATED SORGHUM SILAGE COSTS PER ACRE
 (PROJECTED PRICES), CONFINED BEEF COW STUDY, LOWER
 COASTAL PLAIN SUBSTATION, ALABAMA

Item	Quantity	Price	Amount
		<i>Dol.</i>	<i>Dol.</i>
Cash expenses			
Seed, NK-300, lb.....	8.00	.20	1.60
Lime ¹ , ton.....	.25	8.00	2.00
Fertilizer			
4-12-12, cwt.....	4.00	2.15	8.60
Ammonium nitrate, cwt.....	2.25	2.81	6.32
Tractor operating expense			
Large tractor, hour.....	3.1	1.77	5.49
Small tractor, hour.....	4.1	1.44	4.67
Equipment operating expense, hour.....	-----	-----	3.83
Labor, hour.....	8.9	1.60	14.24
Cover, plastic sheeting.....	-----	-----	.25
Total cash expenses.....	-----	-----	47.00
Noncash expenses			
Interest on operating capital			
7% for 6 mo.....	-----	-----	1.64
Noncash machinery expenses.....	-----	-----	21.14
Total noncash expenses.....	-----	-----	22.78
Total cost of production	-----	-----	69.78

¹ Lime required every 4 years, one-fourth of the cost charged per year.

APPENDIX TABLE 14. ESTIMATED COST OF COASTAL BERMUDA HAY PER ACRE, (ESTIMATED PRICES 1971), CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	Quantity	Price		Total
		<i>Dol.</i>	<i>Dol.</i>	
Cash expenses				
Lime ¹ , ton.....	.25	8.00		2.00
Fertilizer				
0-14-14, cwt.....	4.00	2.00		8.00
Ammonium nitrate, cwt.....	12.12	2.81		34.06
Tractor operating expense				
Large tractor, hour.....	1.40	1.77		2.48
Small tractor, hour.....	8.60	1.44		9.80
Equipment operating expense.....				8.97
Labor, hour.....	10.00	1.60		16.00
Total cash expenses.....				81.31
Noncash expenses				
Interest on operating capital				
7% for 6 mo.....				2.85
Establishment cost ²				3.80
Noncash machinery costs.....				15.89
Total noncash expenses.....				22.54
Total cost of production.....				103.85

¹ Lime required every 4 years, one-fourth of the cost charged per year.

² Prorated for period of 15 years.

APPENDIX TABLE 15. ESTIMATED COSTS OF COASTAL BERMUDA PASTURE AND HAY PER ACRE, ONE CUTTING PER YEAR, (ESTIMATED PRICES 1971), CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	Quantity	Price		Amount
		<i>Dol.</i>	<i>Dol.</i>	
Cash expenses				
Lime ¹ , ton.....	.25	8.00		2.00
Fertilizer				
0-14-14, cwt.....	4.00	2.00		8.00
Ammonium nitrate, cwt.....	6.34	2.81		17.82
Tractor operating expense				
Large tractor, hour.....	1.70	1.77		1.24
Small tractor, hour.....	4.30	1.14		4.90
Equipment operating expense.....				4.48
Labor, hour.....	5.00	1.60		8.00
Total cash expenses.....				46.44
Noncash expenses				
Interest on operating capital				
7% for 6 mo.....				1.63
Establishment cost ²				3.80
Noncash machinery costs.....				7.94
Total noncash costs.....				13.37
Total cost of production.....				59.81

¹ Lime required every 4 years, one-fourth of the cost charged per year.

² Prorated for period of 15 years.

APPENDIX TABLE 16. ESTIMATED COASTAL BERMUDAGRASS ESTABLISHMENT COST PER ACRE FOR ALABAMA, 1971

Item	Quantity	Price	Amount
		<i>Dol.</i>	<i>Dol.</i>
Cash expenses			
Lime ¹ , ton	1.00	8.00	8.00
Fertilizer			
0-14-14, cwt.....	2.00	2.00	4.00
Ammonium nitrate, cwt.....	4.00	2.81	11.24
Sprigs and custom planting	1.00	20.00	20.00
Tractor operating expense			
Large tractor, hour.....	.80	1.77	1.42
Small tractor, hour.....	2.00	1.14	2.28
Equipment operating expense, hour.....			1.03
Labor, hour.....	2.80	1.60	4.48
Total cash expenses			52.45
Noncash expenses			
Interest on operating capital			
7% for 6 mo.....			1.84
Noncash machinery costs.....			2.69
Total noncash expenses.....			4.53
Establishment costs per acre			56.98

¹ Lime required every 4 years, one-fourth of the cost charged per year.

APPENDIX TABLE 17. COSTS AND RETURNS FOR CONFINED SILAGE FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Year				
	63-64	64-65	65-66	66-67	67-68
Receipts					
Number of calves (head).....	15.00	12.00	13.00	12.00	14.00
Price of calves (dol./hd.).....	109.54	124.60	128.24	142.24	146.39
Value of calves (dol.).....	1,643.10	1,495.20	1,667.12	1,706.88	2,049.46
Excess forage (ton).....	18.08	32.26	0	0	81.81
Price of forage (dol./ton).....	2.87	2.55	0	0	1.94
Value of forage (dol.).....	51.89	82.26	0	0	158.71
¼ bull (dol.).....	60.00	60.00	60.00	60.00	60.00
Total cash receipts.....	1,754.99	1,637.46	1,727.12	1,766.88	2,268.17
Variable cash expenses					
Protein supplement (cwt.).....	68.55	65.10	58.35	70.50	70.50
Price protein sup. (dol./cwt.).....	4.70	4.60	4.47	4.86	4.96
Cost of protein sup. (dol.).....	322.18	299.46	260.82	342.63	349.68
Forage feed (ton).....	0	0	31.35	34.35	0
Price of forage (dol./ton).....	0	0	3.82	3.24	0
Cost of forage (dol.).....	0	0	119.76	111.29	0
Calf creep feed (cwt.).....	203.25	150.60	164.84	189.96	213.08
Price of creep feed (dol./cwt.).....	2.75	2.75	2.75	2.75	2.75
Cost of creep feed (dol.).....	558.94	414.15	453.31	522.39	585.97
Interest on oper. cap. (dol.).....	49.33	43.47	47.68	52.67	51.24
Sales expense (dol.).....	51.09	46.66	51.81	53.01	63.28
Total variable cash exp. (dol.).....	981.54	803.74	933.38	1,081.99	1,050.17
Total constant cost (dol.) ²	1,138.10	1,138.10	1,138.10	1,138.10	1,163.10 ²
Total cost of production (dol.).....	2,119.64	1,941.84	2,071.48	2,220.09	2,213.27
Returns to operator's land, labor, and management.....	-364.65	-304.38	-344.36	-453.21	54.90

¹ See Appendix Table 18.

² Price of bull increased to \$500 per head.

APPENDIX TABLE 18. CONSTANT COSTS FOR CONFINED SILAGE FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Price	
	Dol.	Dol.
Cash expenses		
Veterinary expense, head, 15.....	1.00	15.00
Building and fence repair, head, 15.....	1.10	16.50
Tractor and equipment operating expense, acre, 12.....	13.99	167.88
Fertilizer, lime, and seed expense, acre, 12.....	18.52	222.24
Labor, hour, 106.8.....	1.00	106.80
Noncash expenses		
Noncash machinery costs, acre, 12.....	21.14	253.68
¼ bull @ \$400.....	-----	100.00
Fixed expenses (Appendix Table 23).....	-----	256.00
Total constant expenses.....	-----	1,138.10

APPENDIX TABLE 19. COSTS AND RETURNS FOR CONFINED HAY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Year				
	63-64	64-65	65-66	66-67	67-68
Receipts					
Number of calves (head).....	13.00	12.00	9.00	14.00	14.00
Price of calves (dol./hd.).....	103.45	102.99	123.28	139.32	122.50
Value of calves (dol.).....	1,344.98	1,235.88	1,109.52	1,950.48	1,715.00
Excess forage (ton).....	1.84	.12	0	0	0
Price of forage (dol./ton).....	13.85	13.05	0	0	0
Value of forage (dol.).....	25.48	1.57	0	0	0
¼ bull (dol.).....	60.00	60.00	60.00	60.00	60.00
Total cash receipts (dol.).....	1,430.46	1,297.45	1,169.52	2,010.48	1,775.00
Variable cash expenses					
Protein supplement (cwt.).....	28.95	20.85	22.00	33.00	33.00
Price protein sup. (dol./cwt.).....	4.70	4.60	4.47	4.86	4.96
Cost of protein sup. (dol.).....	136.06	95.91	99.23	160.38	163.68
Forage purchased (ton).....	0	0	10.14	13.14	1.88
Price of forage (dol./ton).....	0	0	15.01	15.18	12.60
Cost of forage (dol.).....	0	0	152.20	199.47	23.69
Calf creep feed (cwt.).....	164.58	147.73	100.71	218.96	228.62
Price of creep feed (dol./cwt.).....	2.75	2.75	2.75	2.75	2.75
Cost of creep feed (dol.).....	452.60	406.26	276.95	602.14	628.71
Interest on oper. cap. (dol.).....	42.79	39.77	40.67	55.86	50.75
Sales expense (dol.).....	42.15	38.88	35.09	60.31	53.25
Total variable cash exp. (dol.).....	673.60	580.82	604.14	1,078.16	920.08
Total constant cost (dol.) ¹	1,292.15	1,292.15	1,292.15	1,292.15	1,317.15 ²
Total cost of production (dol.).....	1,965.75	1,872.97	1,896.29	2,370.31	2,237.23
Returns to operator's land, labor, and management.....	-535.29	-575.52	-726.77	-359.83	-462.23

¹ See Appendix Table 20.

² Price of bull increased to \$500.

APPENDIX TABLE 20. CONSTANT COSTS FOR CONFINED HAY FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Price	Total
	Dol.	Dol.
Cash expenses		
Veterinary expense, head, 15.....	1.00	15.00
Building and fence repair, head, 15.....	1.10	16.50
Tractor and equipment operating expense, acre, 8.....	21.25	170.00
Fertilizer and lime expense, acre, 8.....	44.06	352.48
Labor, hour, 80.....	1.00	80.00
Noncash expenses		
Establishment cost, acre, 8.....	3.80	30.40
Noncash machinery cost, acre, 8.....	15.89	127.12
¼ bull @ \$400.....	-----	100.00
Fixed expenses (Appendix Table 24).....	-----	400.65
Total constant expenses.....	-----	1,292.15

APPENDIX TABLE 21. COSTS AND RETURNS FOR CONVENTIONAL FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Year				
	63-64	64-65	65-66	66-67	67-68
Receipts					
Number of calves (head).....	15.00	13.00	14.00	15.00	12.00
Price of calves (dol./hd.).....	83.21	95.80	115.62	115.83	116.09
Value of calves (dol.).....	1,248.15	1,245.40	1,618.68	1,737.45	1,393.08
Excess forage (ton).....	20.18	0	0	0	6.60
Price of forage (dol./ton).....	13.85	0	0	0	12.60
Value of forage (dol.).....	279.49	0	0	0	83.16
¼ bull (dol.).....	60.00	60.00	60.00	60.00	60.00
Total cash receipts (dol.).....	1,587.64	1,305.40	1,678.68	1,797.45	1,536.24
Variable cash expenses					
Cottonseed meal (cwt.).....	43.95	43.35	40.65	44.00	29.10
Price cottonseed meal (dol./cwt.).....	4.08	3.95	3.86	4.47	4.88
Cost of cottonseed meal (dol.).....	179.32	171.23	156.91	197.13	142.01
Forage purchased (ton).....	0	2.41	11.66	4.08	0
Price of forage (dol./ton).....	0	13.05	15.01	15.18	0
Cost of forage (dol.).....	0	31.45	175.02	61.93	0
Interest on oper. cap. (dol.).....	30.18	31.00	35.53	32.98	28.88
Sales expense (dol.).....	47.63	39.16	50.36	53.92	46.08
Total variable cash exp. (dol.).....	257.13	272.84	417.82	345.96	216.97
Total constant cost (dol.) ²	1,255.11	1,255.11	1,255.11	1,255.11	1,280.11 ²
Total cost of production (dol.).....	1,512.24	1,527.95	1,672.93	1,601.07	1,497.08
Returns to operator's land, labor, and management.....	75.40	-222.55	5.75	196.38	39.16

¹ See Appendix Table 22.

² Price of bull increased to \$500.

APPENDIX TABLE 22. CONSTANT COSTS FOR CONVENTIONAL FEEDING SYSTEM, CONFINED BEEF COW STUDY, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963-68

Item	Price	Total
	Dol.	Dol.
Cash expenses		
Veterinary expense, head, 15.....	1.00	15.00
Building and fence repair, head, 15.....	1.10	16.50
Tractor and equipment operating expense, acre, 15.....	10.62	159.30
Fertilizer and lime expense, acre, 15.....	27.82	417.30
Labor, hour, 75.....	1.00	75.00
Noncash expenses		
Establishment cost, acre, 15.....	3.80	57.00
Noncash machinery costs, acre, 15.....	7.94	119.10
¼ bull @ \$400.....	-----	100.00
Fixed expenses (Appendix Table 25).....	-----	295.91
Total constant expenses.....	-----	1,255.11

APPENDIX TABLE 23. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, SILAGE CONFINEMENT SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	2,250.00	2,137.50	149.62	28.12	0	177.74
Bull.....	¼	100.00	72.50	5.08	0	0	5.08
Fences, ft.....	7,051	64.57	32.28	1.94	6.46	.32	8.72
Front end loader.....	1	750.00	375.00	1.97	5.62	.28	7.87
Trench silo.....	1	360.00	180.00	10.80	36.00	1.80	48.60
Feeding trough and shed.....	1	57.14	28.57	1.71	5.71	.57	7.99
Total.....	---	2,581.71	2,825.85	171.12	81.91	2.97	256.00

APPENDIX TABLE 24. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, COASTAL BERMUDAGRASS CONFINEMENT SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	2,250.00	2,137.50	149.62	28.12	0	177.74
Bull.....	¼	100.00	72.50	5.08	0	0	5.08
Fences, ft.....	7,051	64.57	32.28	1.94	6.46	.32	8.72
Pole barn.....	1	1,549.87	774.94	46.49	154.87	7.75	209.11
Total.....	---	3,964.44	3,017.22	203.13	189.45	8.07	400.65

APPENDIX TABLE 25. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, COASTAL BERMUDAGRASS CONVENTIONAL SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA, 1963

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	2,250.00	2,137.50	149.62	28.12	0	177.74
Bull.....	¼	100.00	72.50	5.08	0	0	5.08
Fences, ft.....	7,051	273.58	136.79	8.21	27.36	1.36	36.93
Pole barn.....	1	564.17	282.08	16.92	56.42	2.82	76.16
Total.....	---	3,187.75	2,628.87	179.83	111.90	4.18	295.91

APPENDIX TABLE 26. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, CONFINED SILAGE SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	3,000.00	2,512.50	175.88	60.93	0	236.81
Bull.....	¼	175.00	128.00	8.96	0	0	8.96
Fences, ft.....	1,664	113.00	56.50	3.39	11.30	.56	15.25
Front end loader.....	1	1,000.00	500.00	2.63	7.50 ¹	.38	10.51
Trench silo.....	1	450.00	225.00	13.50	45.00	2.25	60.75
Feeding trough and shed.....	1	100.00	50.00	3.00	10.00	.50	13.50
Total.....		4,838.00	3,472.00	207.36	134.73	3.69	345.78

¹ Depreciated over 200 head for a period of 10 years.

APPENDIX TABLE 27. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, CONFINED HAY SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	3,000.00	2,512.50	175.88	60.93	0	236.81
Bull.....	¼	175.00	128.00	8.96	0	0	8.96
Fences, ft.....	1,664	113.00	56.50	3.39	11.30	.56	15.25
Pole barn.....	1	2,324.80	1,162.40	69.74	232.48	11.62	313.84
Total.....		5,612.80	3,859.40	257.97	304.71	12.18	574.86

APPENDIX TABLE 28. INVESTMENT COMPONENTS AND ANNUAL FIXED COSTS FOR 15-BEEF COW HERD, CONVENTIONAL SYSTEM, LOWER COASTAL PLAIN SUBSTATION, ALABAMA

Item	No.	Value		Annual fixed costs			Total
		New	Average	Interest	Depre- ciation	Taxes & insur.	
		<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>	<i>Dol.</i>
Cows.....	15	3,000.00	2,512.50	175.88	60.93	0	236.81
Bull.....	¼	175.00	128.00	8.96	0	0	8.96
Fences, ft.....	7,051	478.78	239.39	14.36	47.88	2.39	64.63
Pole barn.....	1	846.26	423.08	25.38	84.62	4.23	114.23
Total.....		4,500.04	3,302.97	224.58	193.43	6.62	424.63