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CONTENT

SUMMARY AND CONCLUSIONS

Numbers of beef cattle finished in feedlots in Mississippi are low relative to feeding enterprises throughout the nation, and investment per animal unit in confinement feeding in Mississippi is high. Individuals presently find it difficult to justify to themselves (or to their lender) entrance into this type of enterprise alternative.

Some positive factors relating to such an investment decision include the availability of feeder cattle in Mississippi and the demonstrated performance of feedlot cattle on high quality corn silage. Slaughter facilities in Mississippi and adjoining states currently obtain most of their fed cattle from the High Plains but are amenable to purchasing quality fed cattle from local producers.

The abundant supply of feeder cattle in Mississippi, their feedlot performance on corn silage, the available capacity for slaughtering additional finished cattle and the likelihood of increased transportation cost for shipping cattle to the traditional feeding areas suggest the need for examination of the costs and returns that could be expected for confinement feeding operations in Mississippi.

Costs of owning and operating two different sizes (500- and 1000-head one-time capacity) of slatted-floor feedlots were estimated. Primary data were obtained from a survey of existing feedlots in Mississippi and from firms that supply materials and other inputs to cattle-feeding operations.

Initial investment was $504,000 for the 500-head lot and $894,000 for the 1000-head lot. Feed cost and length of feeding period were determined by a feedlot simulation model that incorporated a least-cost feedmix subroutine. Steers were assumed to enter the feedlot at 656 pounds and to gain an average of 2.4 lbs daily on a corn silage-based ration before being sold at 1,046 pounds after 161 days in the feedlot. Total costs per pound of gain (facility, other non-feed and feed) were $.649 for the 500-head feedlot and $.651 for the 1,000-head feedlot, assuming each was used to finish two groups of cattle per year.

Profitability (above non-feed and feed costs) for the two enterprises also was evaluated. Returns for both systems were calculated for ranges of feeder cattle buying prices and finished cattle selling prices to determine break-even price relations.

Success in a feeding operation depends most heavily on capable (or outstanding) management to (1) select a facility design complementary to management and the existing farming operation, (2) choose the proper time for entry, (3) make sound cattle purchase and marketing decisions and (4) operate the feeding phase to obtain a good rate of gain, minimize death loss and make efficient use of labor, utilities, fuel and equipment.

The potential for confinement feeding in Mississippi appears limited if viewed only in terms of the number of facilities currently operating in Mississippi and the large capital investment requirements. However, confinement finishing appears to be a viable beef alternative and a secure investment in view of its ability to integrate with existing farm operations, provide an alternative market for beef and row crops and generate a profit when bolstered by "good management"---the essential factor in successful feeding.

The abundant supply of feeder cattle in Mississippi and the in-state capacity for slaughtering finished cattle, coupled with the higher transportation costs associated with rising fuel prices, suggest that finishing cattle on a high-quality corn silage diet may be an economically feasible alternative for Mississippi producers.

Investment, Operating Costs and Estimated Returns for 00- and 1000-Head Beef Cattle Feedlots, Mississippi, 1979

onfinement feeding of cattle as alternative that might increase rns to beef producers in the theast has been of considerable rest during recent years. One or problem of potential feedlot rators is the lack of information the managerial and capital estment requirements of con- ment feeding enterprises, ential advantages from confine- nt feeding and economic returns arious feeding systems.

he current production- rketing-processing system con- s of shipping most Mississippi- duced weanling and feeder ves to southwestern and western pastures and feedlots, some of this beef shipped back resale and consumption after sh and slaughter. The higher nsportation costs associated rising fuel prices make this m questionable if cattle can be shed profitably in Mississippi rations of high quality corn ge [1,7]. Mississippi has the slaughter-processing capacity necessary to handle additional fed beef cattle.

One problem confronting potential confinement feeding operations in the Southeast is the lack of knowledge of factors that determine the success of a feedlot operation, including detailed descriptions of managerial requirements (or sources of such information), alternative facility and equipment requirements and the necessary technical assistance. Such information, along with investment and operating cost data, is needed to provide guidance to potential beef cattle finishers and to the financial institutions that might be called on to finance investments in confinement feeding operations. Thus, specific objectives of this study were to:

1. Survey current confinement feeding operations in Mississippi and identify and describe the alternative operational techniques and types of facilities and equipment used.
2. Use an engineering approach to develop two synthesized systems for confinement feeding of beef cattle and to develop the resource requirements for
   - feed production
   - feed storage
   - feed processing and movement (ration formulation and feeding)
   - feeding containers (bunks, waterers and mineral boxes)
   - feeding floor
   - facility cover
   - cattle containment and control (equipment, health, purchase and sale)
   - manure disposal
3. Use combined non-feed and feed costs to calculate returns for both systems for different combinations of cattle buying and selling prices.

SPECIFICATION OF TWO SYNTHESIZED FEEDLOT SYSTEMS[1]

/o alternative systems for hing beef cattle were hesized---a 500-head feedlot ity and a 1000-head feedlot ity. Both synthesized facilities have slatted floors since they appear to be more appropriate for confinement feeding of cattle in Mississippi. Pens within each facility are designed to accommodate 50 head, with 18.4 sq ft per animal. Other common features are pen fencing, lane fencing and type of roof structure. Both facilities have the potential to

7 *The current status of confinement beef cattle feeding in Mississippi, based on results of an August survey and a detailed discussion of feeding alternatives, is presented in Appendix A.*

finish the same type cattle with essentially the same ration, but their operational characteristics are different.

The 500-Head Feedlot

A facility of this size, compared with the majority of feeding facilities in the United States (Gee, et al. [4]) would be considered a "farmer feedlot." The facility includes tower feed storage, a stationary mixer and a belt line feeder, combined with a deep pit manure pump-out system and a cattle working facility of low capacity. (Figure 1). The design and its operational requirements make it complementary to an existing rowcrop, cow-calf and/or backgrounding operation. Further description of the system follows:

1. Feed harvest uses conventional two-row pull-type silage cutters and silage wagons for transporting forage to the tower silo. Silage is fed from the unloader system on the silage wagon to a blower and is blown directly into the silo. This harvesting and storage system uses existing row crop tractors as its power source.

2. Feed storage consists of two 30- by 112-ft concrete tower top-unloading units with a combined capacity of about 3,000 tons. A 20- by 80-ft (20,000 bushel capacity) bottom-unloading sealed-unit silo is included for corn storage. A 14-ton bulk tank is provided for storing supplemental feed.

3. Feed processing and movement are accomplished by a stationary feeding system. Five conveyors and augers of varied lengths and types move corn to a roller mill and move silage, rolled corn and other feed components into the stationary mixer (that is equipped with electronic scales for ration blending). The conveying system deposits the feed on a 136-ft long belt feeder that can be manipulated to supply different rations to each of the ten confinement pens.

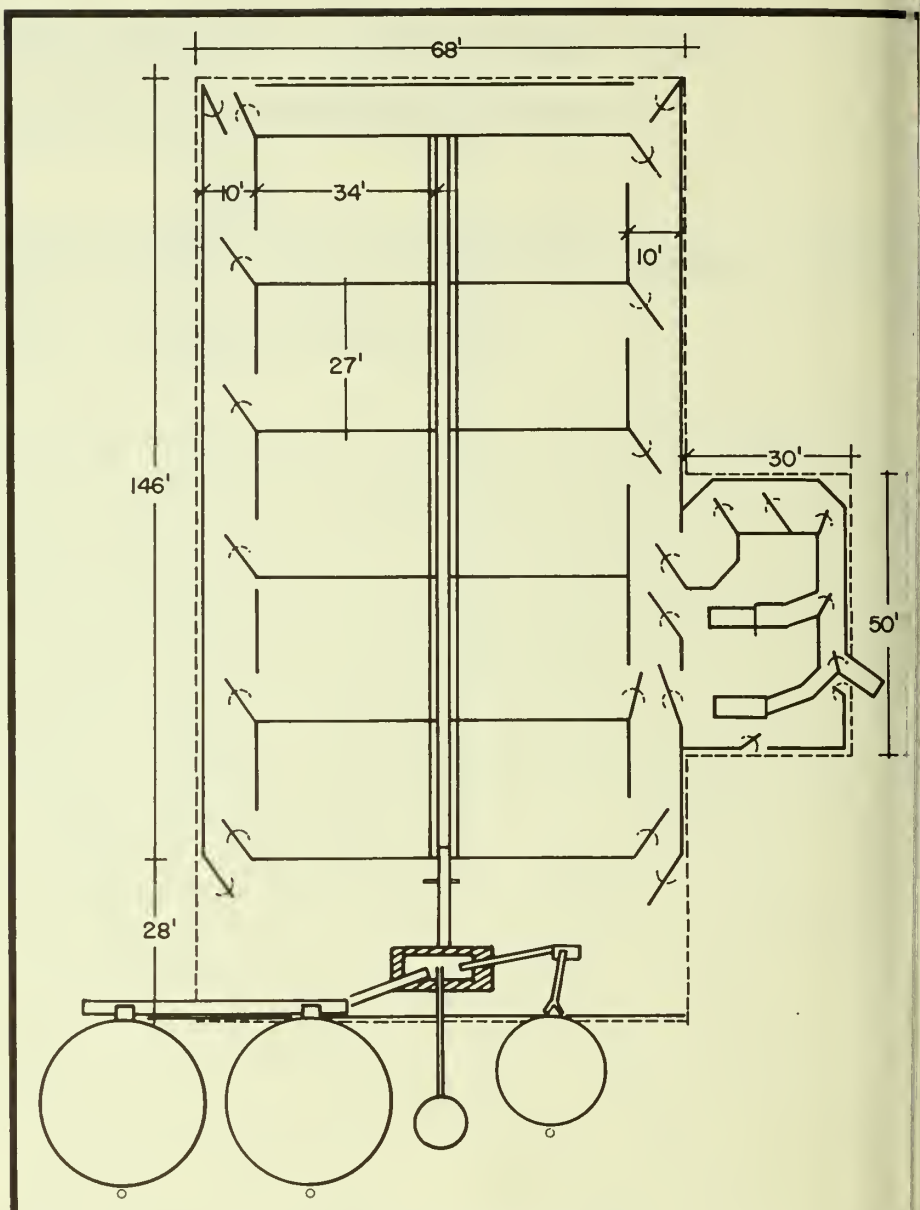

Figure 1. Design of the 500-head slatted-floor feedlot.

4. The feeding area has a 136-ft long concrete-bottom bunk with boarded sides, six heated waterers and ten mineral boxes. The limited bunk space (.54 ft/hd) requires that feeding be done at least twice each day. A 200-ft deep water well with pump and pressure tank is included.

5. The facility floor is constructed of concrete slats set into a prenotched beam that is supported by the walls and the center pier of an 8-ft deep manure pit. The slatted floor provides 9,248 sq ft of floor space, and 11,000 sq ft of formed concrete are provided for lanes, feed processing and working pen surfaces.

6. Facility cover is a single-span metal building with open sides. It covers 15,750 sq ft of the main facility, and a she

extension of 1,500 sq ft is included to cover the cattle working facility.

7. Cattle containment and control include 1,513 ft of pen fencing and gates, plus cattle-working equipment. Working equipment includes crowd alleys, scale, squeeze chute and loading chute.

8. Manure disposal equipment includes a power take off powered manure pump to stir and pump slurry through a 30-ft long hose to a liquid manure spreader for transporting and disposal.

This system uses existing row crop tractors as power units.

The 1000-head feedlot

A facility of this size is characteristic of the larger operations in Mississippi, and would classify as a "commercial feedlot" if compared with the majority of confinement feedlot facilities in the United States (Gee, et al [4]). A combination of bunker and tower feed storage is used, from which a feed-mixing truck collects feed ingredients from different locations, mixes the ration and delivers the ration to in-line bunks. A manure scraper system allows daily removal of manure for disposal in a two-stage lagoon system. The working facility is the same as for the 500-head lot. The design is shown in Figure 2. Even though the size of this operation dictates the need for a fulltime manager, it probably is too small to exist as an independent enterprise. Further description of the system follows:

1. The feed harvest system consists of a self-propelled three-row silage cutter with a towed hydraulically controlled side dump trailer. The silage is dumped into hydraulic dump body bobtrucks when the trailer is filled. The bobtrucks transport the silage to the silo,

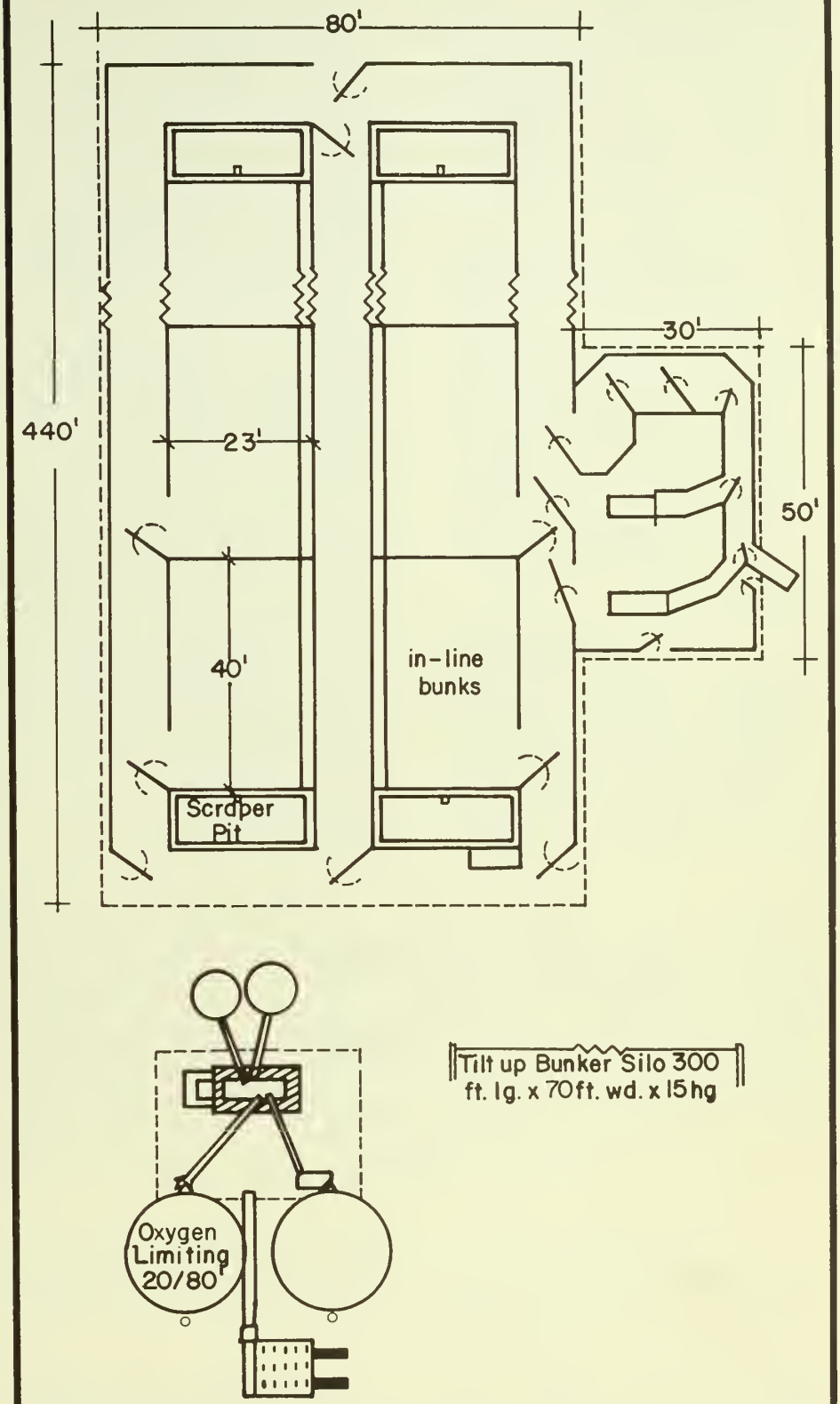

Figure 2. Design of the 1000-head slatted-floor feedlot.

where it is dumped and graded and then packed into the bunk silos by available farm tractors. Additional equipment needs are a forage blower powered by a 75-horsepower electric motor and a platform feeder or conveyor table unit to store corn grain in an upright silo.

2. Feed storage consists of a 15-ft-deep by 70-ft-wide by 300-ft-long tilt-up, bunker silo with a concrete bottom. Maintaining forage quality in this 6,000 ton storage unit requires covering by weighted-down plastic after filling. The facility also has two 20,000-bu-capacity oxygen-limiting silos with bottom unloaders for corn and two 14-ton bulk tanks with bottom augers for supplemental feeds.

3. Feed processing and movement uses a 90-horsepower tractor to operate a "cliff face" silage loader. This unit loads silage from the bunk silo into a mixer truck equipped with electronic scales. The mixer truck obtains other ration components (rolled corn augered from the roller mill and supplements augered from the bulk tanks), mixes the ration and delivers it to in-line bunks. Also included in this equipment is a flight conveyor that can be used to tie the platform feeder into the system for loading or moving silage or other feed components.

4. The feeding area has 400 ft of prefabricated feed bunks, 10 heated waterers and 10 mineral boxes. Multiple daily feedings are required due to the limited feed bunk space. A 200-ft-deep water well with pump and pressure tank is included.

5. The facility has four 3-ft-deep manure scrape pits that run the length of the facility and cover 13,320 sq ft. The 18,400 sq ft of floor over these pits is made of slats fitting into pre-notched beams. Additional facility flooring consists of 15,615 sq ft of formed concrete for lane, alley, working pen, feed processing and supply shed surfaces.

6. Facility cover consists of a single-span metal building for 35,200 sq ft of the main facility, 1,500 sq ft for the working pen and 875 sq ft for the feed processing area.

7. Cattle containment and control include pen fencing for 18,400 sq ft of slatted floor, 1,420 ft of lane- and working-pen fencing and the mechanical equipment for cattle holding, handling, weighing and loading.

8. Manure disposal is accomplished by scraping daily under the slats with drag blades hooked to cables that run the length of the manure pits. The blades pile the manure at one end of the pit over large cross augers that move it to one side of the facility. A sump pump then pushes the slurry through 200 ft of sewer pipe to a two-stage lagoon system. The aerobic and anaerobic lagoons are 6- and 9-ft deep, respectively, and have a combined surface area of 153,000 sq ft.

INITIAL AND ANNUAL INVESTMENT COSTS

Purchase prices (1979) for equipment and facility items were obtained from equipment manufacturers whose products were being used in the state at the time of the survey and from specialty contractors who have built silos, slatted-floor lots and other feedlot components in the state. The detailed list of equipment items and facility characteristics---plus estimated life, annual repair cost and amortized fixed cost---for the 500- and 1000-head facilities are presented in Tables 1 and 2, respectively. The 10% amortized fixed cost, combined with average annual repair cost, indicates the total cost per year of owning and maintaining the facility and its equipment.

ANNUAL OWNERSHIP AND OPERATING COSTS

500-Head Feedlot

Repair and ownership cost of the facility and equipment was determined to be $.215/lb of gain (Table 3). Feed cost is $103.08/hd or $.264/lb of gain.[2] Veterinarian and medical expense is $5.43/hd and $.014/lb of gain. Labor requirements total 4,242 hours, and labor cost/hd is $12.30 ($2.90/hr wage rate). Labor cost/lb of gain is $.031.

Death loss is $14.95/hd or $.038/lb of gain.[3] Cost of hauling cattle reflects a transportation charge of $2.28/hd or $.006/lb of gain and is based on recommendations of a large Mississippi cattle marketing firm.

Interest on $59,540 of purchased feed calculated at 12% for 161 days

[2] *Totals for each of the feed components were calculated from the feeding summary in Appendix Table A-8 and the ingredient costs shown in Appendix Table A-6.*

[3] *Calculated as 3% of the purchase price of 656-lb cattle at 76¢/lb.*

Table 1. Initial investment and annual cost, 500-head slatted-floor confinement feedlot, Mississippi, 1979.

Stage	Item	Description	Price/ unit	No. of units	Amount	Expected life	Repair cost	Average annual repair cost	Amortized fixed cost 10%
			($)		($)	(yrs)	(% new cost)	($)	($)
Feed harvest:									
	1. Silage cutter	2 row pull-type	11,911.25	1	11,911.25	10	100	1,191.12	1,937.96
	2. Forage box and wagon	10 ton capacity	6,277.00	4	25,108.00	15	100	1,673.86	3,301.70
	3. Forage blower		1,961.25	1	1,961.25	10	100	196.12	319.09
Feed storage:									
	1. Upright silo	30' diameter x 112' high including blower pipe, top unloader and chute	64,800/ut	2	129,600.00	15	25	2,160.00	17,042.40
	2. Sealed unit silo	20' diameter x 80' high including blower pipe and bottom unloader (20,000 bu capacity for 15% shelled corn)	48,350/ut	1	48,350.00	15	25	805.83	6,358.02
	3. Bulk supplement tank	14 ton capacity including a 30' auger (2 h.p. elec. motor)	1,942.00	1	1,942.00	10	25	48.55	315.96
Feed processing and movement:									
	1. Level conveyor	48 ft. (2 h.p. elec. motor) (covered)	3,560.00	1	3,560.00	5	100	712.00	939.12
	2. Flight conveyor	20 ft. (2 h.p. elec. motor)	1,782.00	1	1,782.00	5	100	356.40	470.09
	3. Auger	21 ft. (2 h.p. elec. motor)	724.00	2	1,448.00	5	100	289.60	381.98
	4. Roller mill	(3 h.p. elec. motor)	3,024.00	1	3,024.00	10	50	151.20	492.00
	5. Feed mixer w/scales		19,937.50	1					
		(75 h.p. elec. motor)	3,000.00	1	22,937.50	10	50	1,146.87	3,731.93
	6. Flight conveyor	23 ft. w/swivel carriage (2 h.p. electric motor)	2,833.00	1	2,833.00	5	100	566.60	747.34
	7. Belt feeder	136' (3 h.p. electric motor)	78.21/l.f.	136	10,636.56	5	100	2,127.31	2,805.92
Feeding containers:									
	1. "H" bunks	concrete w/board sides (installed)	33.06/l.f.	136	4,496.16	20	50	112.40	528.29
	2. Waterers	Automatic & heated *Does not include installation	320.85	6	1,925.10	10	50	96.25	313.21
	3. Mineral boxes	*Does not include installation	40.00	10	400.00	10	100	40.00	65.08
	4. Water well	200 ft. w/pump and pressure tank plus electrical	2,250.00	1	2,250.00	10	50	112.50	366.07
Facility floor:									
	1. Pit	consisting of foundation, walls, floor and piers (68' wide x 136' long x 8' deep)	7.26/s.f.	9,248	67,140.48	20	25	839.25	7,889.00
	2. Slats and beams	9,248 sq. ft. (in place)	4.45/s.f.	9,248	41,153.60	20	25	514.42	4,835.54
	3. Lane surface	2 (10' wide by 136' long)	1.25/s.f.	2,720	3,400.00	20	15	25.50	399.50
		(10' wide by 90' long)	1.25/s.f.	900	1,125.00	20	15	8.43	132.18
	4. Feed processing area	27' wide by 90' long[1/]	1.25/s.f.	2,430	3,037.50	20	15	22.78	356.90
	5. Cattle working area	30' wide by 50' long	1.25/s.f.	1,500	1,875.00	20	15	14.06	220.31
Facility cover:									
	1. Main roof	90' wide by 175' long w/16' eave	4.35/s.f.	15,750	68,512.50	20	25	856.40	8,050.21
	2. Working facility	30' wide by 80' long shed roof	4.35/s.f.	1,500	6,525.00	20	25	81.56	766.68
Cattle containment and control: [2/]									
	1. Pen fencing	10 pens (50 head/pen)	1.34/s.f.	9,248	12,392.32	20	50	309.80	1,456.09
	2. Lane fencing		7.50/l.f.	400'	3,000.00	20	50	75.00	352.50
	3. Working pen fencing		7.50/l.f.	161'	1,207.50	20	50	30.18	141.88
	4. Working pen equipment	squeeze chute w/palpation cage	1,345.00	1	1,345.00	20	50	33.62	158.03
		scales (w/rack)	1,578.00	1	1,578.00	20	50	39.45	185.41
		crowd alley	795.00	3	2,385.00	20	50	59.62	280.23
		loading chute (20' single deck)	880.00	1	880.00	20	50	22.00	103.40
Manure disposal:									
	1. Slurry pump	PTO driven (including 30 ft. of pipe)	3,867.00	1	3,867.00	10	100	386.70	629.16
	2. Liquid manure Spreader	Tractor pull (PTO) (2,200 gal. capacity)	10,229.00	1	10,229.00	10	100	1,022.90	1,664.25
				TOTAL	$503,817.72			$16,128.28	$67,737.43

[1/] Space allowance for sack feed storage.

[2/] Outside pens for fresh cattle entering the lot not included.

is $3.15/hd or $.008/lb of gain. Interest on the $498,560 investment in cattle calculated at 12% for 161 days is $26.39/hd or $.067/lb of gain. Utility and fuel costs are $2.31/hd or $.006/lb of gain.

Total cost of producing 390 pounds of gain/hd in 161 days is $253.75, or $.649/lb of gain.

Table 2. Initial investment and annual cost, 1,000-head slatted-floor confinement feedlot, Mississippi, 1979.[1/]

Stage	Item	Description	Price/ unit	No. of units	Amount	Expected life	Repair cost	Average annual repair cost	Amortized fixed cost 10%
			($)		($)	(yrs)	(% new cost)	($)	($)
Feed harvest:									
	1. Silage cutter	self propelled w/three row header	52,038.00	1	52,038.00	10	100	5,203.80	8,466.58
	2. Oump wagon	hydraulic side dump (tons)	6,400.00	1	6,400.00	15	100	426.67	841.60
	3. Oump truck	truck w/dump body	14,000.00	2	28,000.00	10	100	2,800.00	4,555.60
		forage gate	178.00	2	356.00	10	100	35.60	57.92
	4. Truck ramp	(custom made)	500.00	1	500.00	20	25	6.25	58.75
	5. Platform feeder	10 ft. x 14 ft. (3 h.p. electric motor)	6,895.00	1	6,895.00	15	100	459.66	906.69
	6. Forage blower		1,961.25	1	1,961.25	10	100	196.12	319.09
	7. Electric motor	portable (75 h.p.)	3,000.00	1	3,000.00	10	50	150.00	488.10
	8. Grader blade	10 ft. (heavy duty)[2/]	2,465.00	1	2,465.00	15	50	82.16	324.14
Feed storage:									
	1. Bunker silo	tilt-up 15 ft. side	58.00/ft	670					
		flat surface 70 ft. wide x 300 ft. long	1.25/s.f.	21000					
		6000 ton capacity			65,110.00	20	25	813.87	7,650.42
	2. Tower silo	Oxygen limiting 20' wide 80' high (in-cluding blower pipe and bottom unloader)	54,806.00	2	109,612.00	20	50	2,740.30	12,879.41
	3. Bulk supplement tank	14 ton capacity (2 h.p. elec. motor)	1,942.00	2	3,884.00	10	25	97.10	631.92
Feed processing and movement:									
	1. Mixer truck	diesel w/twin screw axle	37,000.00	1	37,000.00	10	100	3,700.00	6,019.90
		ensile mixer w/electronic scales	19,112.50	1	19,112.50	10	100	1,911.25	3,109.60
	2. Ensiloader	clifface (1 ton/min)	7,500.00	1	7,500.00	10	100	750.00	1,220.25
	Tractor	(90 h.p.)	15,000.00	1	15,000.00	10	100	1,500.00	2,440.50
	3. Level conveyor	25 ft (covered) (2 h.p. elec. motor)	1,854.00	1	1,854.00	5	100	370.80	489.08
	4. Flight conveyor	23 ft w/swivel carriage (2 h.p. elec. motor)	2,833.00	1	2,833.00	5	100	566.60	747.34
	5. Roller mill	(3 h.p. elec. motor)	3,024.00	1	3,024.00	10	50	151.20	492.00
	6. Auger	23 ft. (2 h.p. elec. motor)	792.95	1	792.95	5	100	158.59	209.18
Feeding containers:									
	1. Fence line bunks	400 ft.	20.04/l.f.	400	8,016.00	20	50	200.40	941.88
	2. Waterers	Automatic & heated	320.85	10	3,208.50	10	50	160.42	522.01
		*Ooes not include installation							
	3. Mineral boxes	*Ooes not include installation	40.00	10	400.00	10	100	40.00	65.08
	4. Water well	200 ft. w/pump and pressure tank plus electrical	2,500.00	1	2,250.00	10	50	112.50	366.07
Facility floor:									
	1. Pit	2 - 23' x 420 x 3' Oeep pits foundations, walls, floors, and piers	8.16/s.f.	19,320	157,651.20	20	25	1,970.64	18,524.01
	2. Slats and beams	2 - 23' x 400 (in place)	4.45/s.f.	18,400	81,880.00	20	25	1,023.50	9,620.90
	3. Lane surface	center: 12' x 420'	1.25/s.f.	5,040	6,300.00	20	15	47.25	740.25
		side: 10' x 420'	1.25/s.f.	4,200	5,250.00	20	15	39.37	616.87
		end: 2-10' x 80'	1.25/s.f.	1,600	2,000.00	20	15	15.00	235.00
		outside: 10' x 50'[3/]	1.25/s.f.	500	625.00	20	15	4.68	73.43
	4. Working pen	40' x 80'	1.25/s.f.	3,200	4,000.00	20	15	30.00	470.00
	5. Feed processing area	25' x 35'	1.25/s.f.	875	1,093.75	20	15	8.20	128.51
	6. Supply shed	10' x 20'	1.25/s.f.	200	250.00	20	15	1.87	29.37
Facility cover:									
	1. Main roof	80' wide by 440' long w/16' eave	4.35/s.f.	35,200	153,120.00	20	25	1,914.00	17,991.60
	2. Working facility	30' wide by 50' long	4.35/s.f.	1,500	6,525.00	20	25	81.56	766.69
	3. Feed processing area	25' wide by 35' long	4.35/s.f.	875	3,806.25	20	25	47.57	447.23
Cattle containment and control:[4/]									
	1. Pen fencing	20 pens (50 head/pen)	1.88/s.f.	18,400	34,592.00	20	50	864.80	4,064.56
	2. Lane fencing		7.50/l.f.	980	7,350.00	20	50	183.75	863.63
	3. Working pen fencing		7.50/l.f.	161	1,207.50	20	50	30.18	141.88
	4. Working pen equipment	squeeze chute w/palpation cage	1,345.00	1	1,345.00	20	50	33.62	158.03
		scales (w/rack)	1,578.00	1	1,578.00	20	50	39.45	185.41
		crowd alley	795.00	3	2,385.00	20	50	59.62	280.23
		loading chute (20' single deck)	880.00	1	880.00	20	50	22.00	103.40
Manure disposal:									
	1. Scrapers	drive cable and blades	6,000.00	2	12,000.00	5	50	1,200.00	3,156.60
	2. Cross auger	63'	4,725.00	1	4,725.00	5	50	472.50	1,246.45
	3. Sump pump	electric motor	7,250.00	1	7,250.00	5	50	725.00	1,912.55
	4. Pipe	facility to lagoon 200'	.85/ft	200	170.00	20	25	2.12	19.97
		between ponds 15'	1.36/ft	15	20.40	20	25	.25	2.39
	5. Aeration pump		1,675.00	2	3,350.00	10	50	167.50	545.04
	6. Lagoons	1 - 9' deep 300' long 285' wide	9,991.80	1	9,991.80	25	25	99.91	1,101.10
		1 - 6' deep 300' long 225' wide	3,220.00	1	3,220.00	25	25	32.20	354.84
			13,211.80	1	13,211.80	25	25	132.11	1,455.94
				TOTAL	$893,778.10			$31,749.83	117,583.05

[1/] Assume this enterprise to be intergrated with an existing operation. It is commercial due to the management and labor requirements.

[2/] Requires one tractor for pushing and another for packing silage

[3/] Oistance varies with working pen location.

[4/] Outside pens for fresh cattle entering the lot not included.

Table 3. Expected costs, 500-head one-time capacity slatted floor feedlot, two turns per year, Mississippi, 1979.

Expenses	Unit	Quantity	Price/ unit	Total amount/year	Amount/ head	Amount/ lb. gain[a]
			----------Dollars----------			
A. Facility and equipment (including interest)	each	1	83,865.71	83,865.71	83.86	.215
B. Feed costs-Total	head	1,000	--	103,084.86	103.08	.264
(1) Corn silage	tons	(2,942)	(14.80)	(43,544.14)	(43.54)	(.111)
(2) Corn	tons	(370)	(146.00)	(54,070.56)	(54.07)	(.139)
(3) Other	--	--	--	(5,470.16)	(5.47)	(.014)
C. Veterinarian and medicine	head	1,000	5.43	5,430.00	5.43*	.014
D. Labor	hours	4,242	2.90	12,311.80	12.30**	.031
E. Death loss (3% of purchase)[b]	cwt.	196.8	76	14,956.80	14.95	.038
F. Hauling[c]	head	1,000	2.28	2,280.00	2.28	.006
G. Interest on purchased feed[d]	dollars	59,540	12%/yr	3,151.58	3.15	.008
H. Interest on livestock purchase[b] [d]	dollars	498,560	12%/yr	26,389.53	26.39	.067
I. Utility and fuel	days	322	7.17	2,308.74	2.31***	.006
Total					(253.75)	.649

(Breakeven selling price = $71.92/cwt)

[a] Total amount of gain (389.99 pounds).

[b] Varies with purchase price. Figures shown are for $76/cwt.

[c] Assume cattle to be purchased at the lot.

[d] Based on number of days on feed (161 days).

* See Table A-1 of Appendix A for itemized expenses.

** See Table A-2 of Appendix A for itemized expenses.

*** See Table A-3 of Appendix A for itemized expenses.

1000-Head Feedlot

Repair and ownership cost of the facility and equipment is $.191/lb of gain (Table 4). Feed cost is the same as for the 500-head feedlot---$103.08/hd and $.264/lb of gain. Veterinarian and medicine expense is the same as for the 500-head lot---$5.43/hd and $.014/lb of gain. Cost of labor and management is $19.74/hd and $.051/lb of gain.[4]

Death loss is $14.95/hd and $.038/lb of gain. Hauling is $2.28/hd and $.006/lb of gain.

Interest on purchased feed is $3.15/hd and $.008/lb of gain. Interest on investment in livestock is $26.39/hd and $.067/lb of gain

Utility and fuel costs (feed truck and silage loader costs, energy needs for storing shelled corn and daily operation of the manure scraper system and the water well) are $4.74/hd and $.012/lb of gain.

Total cost of producing 390 pounds of gain/hd in 161 days is $254.42, or $.651/lb of gain.

[4] *A salaried manager, two full-time men, and part-time labor (Appendix A, Table A-4).*

RETURNS ABOVE SPECIFIED COSTS FOR THE SYNTHESIZED SYSTEMS

Break-even selling prices for animals purchased at $76/cwt (Tables 3 and 4) were used to compile Tables 5 and 6 for the 500- and 1,000-head facilities, respectively. The cost components from Tables 5 and 6 were used to calculate returns above specified costs at different combinations o cattle buying and selling price (Tables 7 and 8).

Table 4. Expected costs, 1,000 head one time capacity slatted floor feedlot, two turns per year, Mississippi, 1979.

Expenses	Unit	Quantity	Price/ unit	Total amount/year	Amount/ head	Amount/ lb. gain[a/]
			dollars			
A. Facility and equipment (including interest)	each	1	149,332.88	149,332.88	74.66	.191
B. Feed cost-Total	head	2,000	--	206,169.72	103.08	.264
(1) Corn silage	tons	(5,884)	(14.80)	(87,088.28)	(43.54)	(.111)
(2) Corn	tons	(740)	(146.00)	(108,140:32)	(54.07)	(.139)
(3) Other	--	--	--	(10,941.12)	(5.47)	(.014)
C. Veterinarian and medicine	head	2,000	5.43	10,860.00	5.43*	.014
D. Labor and management	--	--	--	39,487.60	19.74**	.051
E. Death loss (3% of purchase)[b/]	cwt.	393.6	76	29,913.60	14.95	.038
F. Hauling[c/]	head	2,000	2.28	4,560.00	2.28	.006
G. Interest on purchased feed[d/]	dollars	119,081	12%/yr	6,303.12	3.15	.008
H. Interest on livestock purchase[b/d/]	dollars	997,120	12%/yr	52,779.06	26.39	.067
1. Utility and fuel	day	322	29.47	9,490.31	4.74***	.012
Total					(254.42)	.651

(Breakeven selling price = $71.98/cwt)

[a/] Total amount of gain (389.99 pounds).

[b/] Varies with purchase price. Figures shown are for $76/cwt.

[c/] Assume cattle to be purchased at the lot.

[d/] Based on number of days on feed.

* See Table A-1 of Appendix A for itemized expenses.

** See Table A-4 of Appendix A for itemized expenses.

*** See Table A-5 of Appendix A for itemized expenses.

Table 5. Assumptions used in calculating total net returns at ranges of buying and selling price for two full turns of the 500-head feedlot.

Component	Unit	Amount
Selling weight	cwt	10.46
Selling price	$/cwt	56.00 to 90.00
Buying weight	cwt	6.56
Buying price	$/cwt	60.00 to 92.00
Purchased feed cost	$/hd	59.54
Produced feed cost	$/hd	43.53
Death loss	3% of purchase cost	--[a/]
Interest on purchased feed @12%	$/hd	3.15
Interest on cattle purchase	12% for 161 days (each turn)	--[a/]
Utilities and fuel	$/hd	2.31
Labor (4.2 hrs @2.90/hr)	$/hd	12.30
Veterinarian and medicine	$/hd	5.43
Marketing cost	$/hd	2.28
Facility cost	$/hd	83.86

[a/] Varies according to purchase price used.

Table 6. Assumptions used in calculating total net returns at ranges of buying and selling prices for two full turns of the 1,000-head feedlot.

Component	Unit	Amount
Selling weight	cwt	10.46
Selling price	$/cwt	56.00 to 90.00
Buying weight	cwt	6.56
Buying price	$/cwt	60.00 to 92.00
Purchased feed cost	$/hd	59.54
Produced feed cost	$/hd	43.53
Death loss	3% of purchase cost	--[a/]
Interest on purchased feed @12%	$/hd	3.15
Interest on cattle purchase	12% for 161 days (each turn)	--[a/]
Utilities and fuel	$/hd	4.74
Labor and management	$/hd	19.74
Veterinarian and medicine	$/hd	5.43
Marketing cost	$/hd	2.28
Facility cost	$/hd	74.66

[a/] Varies according to purchase price used.

Table 7. Returns per head above specified costs for ranges of buying and selling prices, 500-head feedlot.

Selling price	Buying price									
	60.00	64.00	68.00	72.00	76.00	80.00	84.00	88.00	92.00	96.00
56.00	-52.83	-81.24	-109.66	-138.07	-166.48	-194.89	-223.31	-251.72	-280.13	-308.54
60.00	-10.99	-39.40	-67.82	-96.23	-124.64	-153.05	-181.47	-209.29	-238.29	-266.70
64.00	30.85	2.44	-25.98	-54.39	-82.80	-111.21	-139.63	-168.04	-196.45	-224.86
68.00	72.69	44.28	15.86	-12.55	-40.96	-69.37	-97.79	-126.20	-154.61	-183.02
72.00	114.53	86.12	57.70	29.29	.88	-27.53	-55.95	-84.36	-112.77	-141.18
76.00	156.37	127.96	99.54	71.13	42.72	14.31	-14.11	-42.52	-70.93	-99.34
80.00	198.21	169.80	141.38	112.97	84.56	56.15	27.73	-.68	-29.09	-57.50
84.00	240.05	211.64	183.22	154.81	126.40	97.99	69.57	41.16	12.75	-15.66
88.00	281.89	253.48	225.06	196.65	168.24	139.83	111.41	83.00	54.59	26.18

Table 8. Returns per head above specified costs for ranges of buying and selling prices, 1,000-head feedlot.

Selling price	Buying price									
	60.00	64.00	68.00	72.00	76.00	80.00	84.00	88.00	92.00	96.00
56.00	-53.50	-81.91	-110.33	-138.74	-167.15	-195.56	-223.98	-252.39	-280.80	-309.21
60.00	-11.66	-40.07	-68.49	-96.90	-125.31	-153.72	-182.14	-210.55	-238.96	-267.37
64.00	30.18	1.77	-26.65	-55.06	-83.47	-111.88	-140.30	-168.71	-197.12	-225.53
68.00	72.02	43.61	15.19	-13.22	-41.63	-70.04	-98.46	-126.87	-155.28	-183.69
72.00	113.86	85.45	57.03	28.62	.21	-28.20	-56.62	-85.03	-113.44	-141.85
76.00	155.70	127.29	98.87	70.46	42.05	13.64	-14.78	-43.19	-71.60	-100.01
80.00	197.54	169.13	140.71	112.30	83.89	55.48	27.06	-1.35	-29.76	-58.17
84.00	239.38	210.97	182.55	154.14	125.73	97.32	68.90	40.49	12.08	-16.33
88.00	281.22	252.81	224.39	195.98	167.57	139.16	110.74	82.33	53.92	25.51

APPENDIX A
Current Status of Confinement Feeding in Mississippi

TABLES

APPENDIX A

CURRENT STATUS OF CONFINEMENT FEEDING IN MISSISSIPPI

A description of the resource base and the practices used in confinement finishing of beef cattle in Mississippi was obtained through a producer survey conducted during the summer of 1978. The survey provided data on facilities in use and on current practices followed, including a general description of the feeding operation, capacity, number fed annually, cattle type, ration components, gain, origin and destination of animals, feedlot design, equipment, annual repair, labor requirements, silage crop production capabilities, purchased feed needs and descriptions of other beef cattle and row crop enterprises on the farm.

The survey located 27 facilities, 23 in Mississippi and four just across the Mississippi River (Figure A-1). Average capacity of the 12 Mississippi facilities with slatted concrete floors was 540 head. The 11 Mississippi facilities with solid concrete floors had an average capacity of 549 head.[5]

Total one-time capacity of the lots surveyed was 11,000 head and a total of 8,750 head were fed in 1978. Nine of the Mississippi facilities were visited---seven slatted-floor facilities with one-time capacity ranging from 200 to 1,050 head and two solid-floor facilities with one-time capacity of 400 and 1,000 head.

No specific type or breed of cattle dominated the preferences of confinement feeders. However, crossbred calves of good quality were most numerous, and most crossbred animals reflected some English breed characteristics (Hereford or Angus). Heifers and steers were fed in four lots, only steers were fed in five lots. Average weight of steers entering the lots was 656 pounds, and initial weights of heifers ranged from 500 to 550 pounds. Steers left the lots at an average weight of 1,077 pounds, and heifers left at 825 to 950 pounds. The majority of the feedlot operators attempted to feed two turns of cattle each year, keeping cattle in the lot an average of 176 days for each turn.

Most producers obtained cattle through auction barns and private-treaty trading. Feeder calves for the larger feedlots were acquired through order buyers. Feeding of contracted or custom-fed cattle was reported by only one operator.

The basic ration was corn silage from the feedlot operator's farm (some corn was irrigated). Some farm-grown high moisture corn was fed, and two operations used poultry waste as a feed additive. Other feed additives were purchased.

Specific information was collected on facility design and equipment. Some measurable characteristics of the slatted floor facilities were---77-head average pen capacity (average width of 32.8 ft and average length of 46.5 ft), .59 linear ft/head of bunk space and 18.05 sq ft/hd of pen space. The 400-head-capacity solid-floor feedlot had a pen capacity of 200 head, allowed 35 sq ft/hd and had 17.5 sq ft of covered area/head. The 1000-head-capacity lot had a pen capacity of 250, allowed 45 sq ft/head and had 12.8 sq ft of covered area/head. The average bunk space for both solid-floor lots was .6 linear ft/hd.

Additional survey results pertaining to the production, purchase, storage and processing of feed; facility and equipment alternatives; manure disposal; labor requirements and marketing are introduced later when needed to explain selection of the alternatives used in developing the synthesized systems.

[5] *The operations with solid concrete floors were older, and only three were in operation at the time of the survey.*

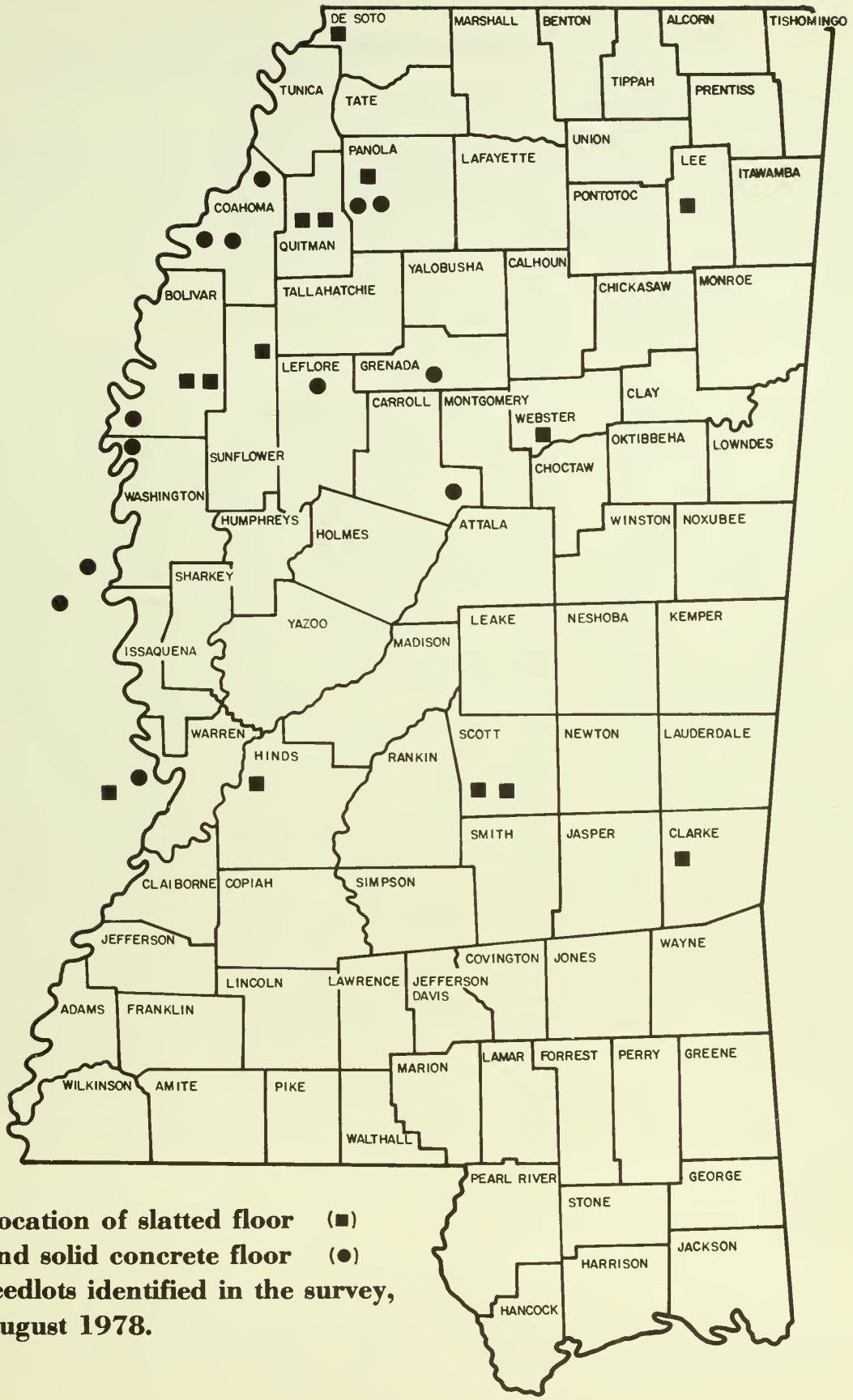

Figure A-1. Location of slatted floor (■) and solid concrete floor (●) feedlots identified in the survey, August 1978.

STAGES IN A CONFINEMENT FEEDING SYSTEM

The survey of confinement feeding facilities provided insight into the diversity of the physical and managerial alternatives for carrying beef animals to finish. Eight alternative stages were defined as follow:

1. Feed production---the production of corn silage and movement of silage to the storage facility.
2. Feed storage---the different systems used to store forage, grain and purchased feed (including liquid feeds).
3. Feed processing and movement---all equipment used to move feed from storage through processing (or mixing) to the feeding point.
4. Feeding containers---bunk line (if feeding is done with a portable feed mixer) or inline troughs (if feeding is done by belt line or auger), plus containers for minerals and water.
5. Feeding floor---slatted concrete floor in feeding area and solid concrete floor for lanes, working pens and feed processing area.
6. Facility cover---metal single span or center support structure to protect the feeding floor, alleys, lanes, cattle handling facilities, bunks, open work areas and feed processing equipment from the weather.
7. Cattle handling equipment---chutes, scales and fencing of lanes and pens.
8. Manure disposal---either slurry pumped into a two-lagoon system or into tank wagons and spread on cropland.

The flow chart (Figure A-2) shows how these component stages are linked in a confinement feeding enterprise.

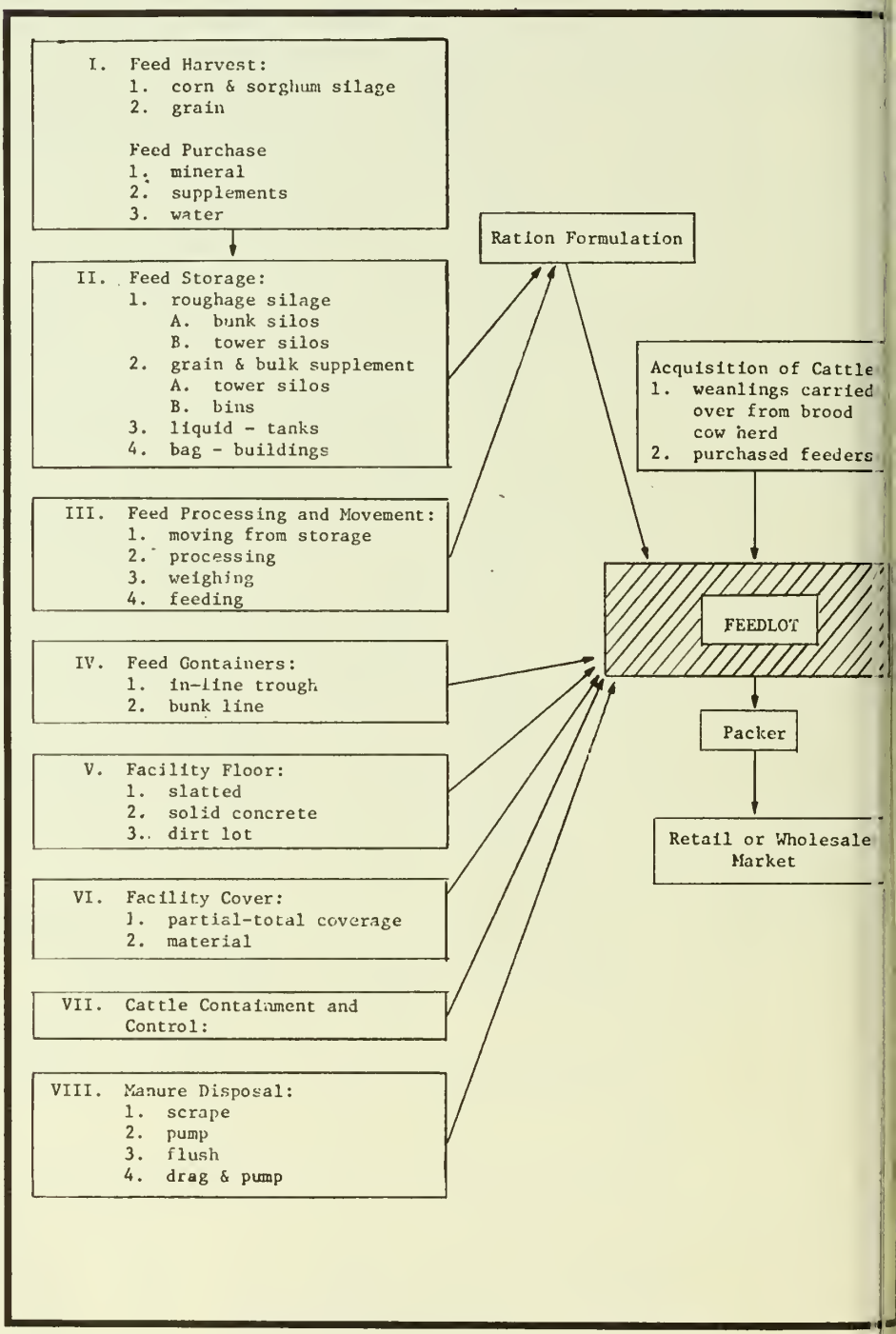

Figure A-2. Flow chart representing the component stages of a cattle feeding operation.

ALTERNATIVES WITHIN STAGES

Variations in practices within each stage were identified, and appropriate practices were combined to describe (synthesize) the two sizes of feedlot operations. Pertinent information and assumptions employed in this synthesis are provided below.

Feeding

Feed production, harvest, and purchase

The most costly single item in the confinement finishing process is feed. Feed components come from on-farm production (silage, high moisture grain and animal waste products) and off-farm purchase (low moisture corn, cottonseed meal and soybean meal---all of which contain high levels of nutrients not economically obtainable by on-farm production). Corn silage was used as the base of the ration, and the cost of producing corn silage was estimated on the basis of conventional input practices. The total specified cost (including interest on operating capital) of producing an acre of corn silage in the Black Belt area [6] of Mississippi in 1979 was $158.14. Purchased feed components allowed in the least cost ration were corn grain, soybean meal, cottonseed meal, mineral mixes and feed additives. The remaining requirement is a plentiful supply of fresh, clean water---a 1,000-pound animal on full feed consumes from 7.7 to 16.5 gal of water per day, depending on the temperature [6].

Feed storage

The resource survey revealed three basic types of silo units---conventional concrete tower (continuous-pour or concrete-stave construction), oxygen-limited tower unit (sealed continuous-pour concrete or metal with sealed glass-lining construction) and bunker (pit dug out of a hill with a concrete floor or a concrete floor with tilt-up concrete side construction). Additional storage units, such as conventional metal grain bins, were used for storing supplemental feeds. Space under the confinement feeding building was used for storing sacked feed.

Type of storage differed by size of operation and by feeding method. Operations with belt and auger feeders normally had the feed storage units close to the facility to permit handling feed through the mechanized feeding system. Where feed trucks and in-line bunks were used the bunker silo was preferred because of its greater capacity and lower construction cost per storage unit.

Some factors important to the choice of type of storage are the limited capacity of most tower silos and the associated high maintenance cost for top- or bottom-unloading equipment, the high investment cost of the oxygen-limiting metal silo, the increased labor and strict attention required for ensiling in a bunker silo and the labor and expense of sealing bunker silos for protection against weather. Determining which storage choice is best for a particular operation also depends on the number of cattle to be fed per year. Storage capacity of well-packed bunker or tower silos averages 38 lbs of silage per cu ft. High moisture corn requires about 1.76 cu ft/bu and shelled corn requires 1.25 cu ft/bu [3].

One turn in a 500-head confinement facility requires 77,425 cu ft of storage space for about 1,500 tons of corn silage.[7] A 30-ft-wide by 112-ft-tall silo has 79,125 cubic feet.[8] Two tower units of this size are required for finishing two turns of cattle (1,000 head) per year in the 500-head feedlot.

Capacity calculation for a trench silo requires allowance for higher spoilage losses and uncertainty in compaction. Feeding 2,000 head of cattle in a 1,000-head capacity feedlot requires about 5,900 tons of silage (309,702 cu ft of storage space). A 300-ft-long, 70-ft-wide, and 15-ft-deep horizontal silo is sufficient if expected loss from the open end is compensated for by mounding or topping-off the facility.[9]

Required capacity of other storage units (e.g., bins and tanks) depends largely on the type of feed stored and the quantity being purchased at one time. A full year of storage often is not maintained for these components.

Feed processing and movement

Operations not set up for ration mixing usually feed straight corn silage and may add grain to the silage at ensiling time. The mechanized components include

[6] *The Black Belt area was selected as an example. Costs would differ slightly in other soils areas of the state.*

[7] *Based on the least-cost feed ration calculated in the feedlot simulation program.*

[8] *The extra capacity could be considered insurance for carrying cattle further or not having a well packed silo.*

[9] *Capacity calculations for both the upright and horizontal silos are supported by data obtained in the survey.*

dropping silage from the silo unloader to a conveyor that deposits the product on a belt feeder to individual pens. Good judgment is needed to feed cattle adequately because these systems do not monitor the amount of feed delivered.

An alternative is to feed a mixed ration by using electronic scales in line with the conveyor units. These units monitor the amount of each feed ingredient in a ration and usually include a mineral monitor that drops a specified amount of supplemental mineral mix into the feeding ration. All components are dropped into an auger and conveyed to a beltline feeder.[10]

Another system alternative is to use the same conveyor and milling components, with mixing and weighing accomplished by depositing all feed in a stationary feed mixer equipped with scales. The mixer is powered by a large electric motor and mixes feed in large batches.

The two feed processing and movement systems just described are generally designed for use with tower storage units located near the confinement facility. Another system alternative is to use a feed mix truck to collect ration components from more than one supply point. These trucks usually are equipped with electronic scales and powerful motors to blend the feed ingredients into a homogeneous ration. The ration is dispensed from the truck into an in-line bunk on one side of the confinement pen.

Labor is always a concern in confinement feeding, and facility design and size are the major determinants of labor requirements. Competent labor seven days each week is a must in confinement feeding. The feed processing and movement system is the stage of the confinement process that requires the largest amount of attention when planning. An efficient and well-planned system will affect the management and labor demands each day an animal is in the feedlot.

Feed bunks and waterers

Two types of feeding bunks normally are used for confinement feeding---the H-type and the in-line type. Both types of construction are used in Mississippi feedlots. The H-type bunk is used with belt conveyor, auger and shuttle-type feeders. Construction of these units varies from a pre-cast unit to the poured-in-place bunk with wood sides. These bunks are placed between two confinement pens and the feeder deposits feed on either side of the bunk. In-line trough units are nearly all pre-cast. These bunks are placed along one side of a confinement pen and feed is deposited in them by a feed truck. A small (8- to 12-inch-wide by 4-inch-high) slab of concrete is placed in front of the feed bunk to prevent confined animals from backing to and excreting manure into the bunks.

Two more containers required by the confined animal are mineral boxes and waterers. A number of companies manufacture such units. Waterers constructed by the producer should be designed to minimize water waste by the confined animals.

Facility

Floor

Slatted floor facilities have pits covered with reinforced concrete beams that form a slatted surface. The poured-in-place slats (usually found in older facilities) lack the strength of pre-cast construction. They are subject to severe weather damage and broken poured-in-place slats are difficult to replace. The newer pre-cast slats come in two basic designs---individual slats that fit into a notched beam or the gang slat (a concrete unit with five slatted openings). These gang units often are used over manure drag pits because of their structural strength and easy installation. Cattle perform well on slatted floors and become rather docile when closely confined. The common space allowance is 18 sq ft per animal.

Solid concrete floors are by far the cheapest to build but often are covered only partially by a roof. The pen must be large because of the manure disposal requirements, with space allowances running 35 sq ft or more per animal. Cattle tend to be more active on a solid concrete lot than on a slatted floor.

Feeding in open dirt lots has been practiced in the past; however, the practice is not recommended for large groups of cattle. Economical gain is difficult to achieve in open lots during periods of weather stress because much of the feed is used for maintenance and not for weight gain.

Cover

Facilities with solid concrete floors had traditional pole buildings with tin roofs and provided 12 to 17 sq ft of cover per animal. These buildings require a high level of maintenance.

Facilities with slatted floors generally had a metal single span or center support building. Some were constructed from salvaged oil well material, but most were constructed by a company specializing in metal buildings.

These beltline feeders allow the feedlot operator to feed different pens of cattle different rations (for example, feeding lighter as opposed to heavier animals or heifers and steers in the same lot).

'attle containment and control quipment

Many ways of handling cattle vere demonstrated by the diversity n size, type and design of the vorking facilities found in the urvey. One major determinant of vorking pen size, design and loca- ion is the frequency of use and the olume of cattle handled each time. A plentiful supply of part-time abor and little other demand for se of the feedlot's working pen ermit a lower investment in work- ng facilities. The less mechanized he system the more time it takes to andle each individual animal and he more stress the animal will xperience.

Some small working pens permit fficient handling of small umbers of cattle. Facilities of arger capacity may be required if n operator receives and processes arge groups of cattle for the feedlot nd a winter grazing program. nvestment in additional handling quipment enables a producer to do more efficient job of cattle sorting nd grouping when additional abor is not available. Sturdily onstructed lane and pen fences in he confinement facility will ensure afety and provide better control of animals.

Animal health also is an impor- ant management consideration. Proper management and early detection minimize the effort and expense of controlling many health problems. The most important considerations for herd health are minimizing stress in handling, getting cattle on feed as soon as possible, immunizing, controlling parasites and castrating and dehorning as needed. Operators who lack the experience or time for such attention will be wise to obtain professional advice. A veterinarian should be employed for regular checks of animals.

Manure disposal alternatives

Manure can be beneficial if handled properly. Manure as a slurry or solid is excellent fertilizer for row-crops and pasture,[11] and several producers reported the use of no additional nitrogen for crop production when generous applications of feedlot manure were made. Manure also can be recycled as an animal feed or fermented to form methane gas for energy production, but these processes are new and relatively untested.

Handling solid manure generally occurs when an accumulation is scraped from a solid concrete floor facility, and the labor requirement generally is higher than for most slurry systems. Handling manure slurry requires higher levels of mechanization and investment in equipment. Three of the most common methods are the deep pit pumpout system, the drag scraper with auger and pumpout and the flush system. Distributing manure over pasture or row crop acreage is becoming more restricted because of environmental protection regulations. Disposal regulations restrict the amount of allowable run-off from surface-applied feedlot waste, and inability to plow the manure under promptly because of adverse weather may cause problems for feedlot operators who use this method.[12]

Deep pit systems have large storage pits beneath a slatted floor and require only one pumping for each batch of animals confined in the lot. Pits are pumped by a high capacity pump into a slurry trailer that can distribute manure on the surface or can be equipped with knives to inject the liquid into the ground.

The manure scraper system removes manure from the shallow pits beneath a slatted floor each day by dragging manure to one end of the confinement facility with a scraper blade. The manure is then augered across and pumped out of the confinement facility and can be deposited into a lagoon system where the waste is degraded by microbiological processes. It also can be recycled as cattle feed or can be hauled away in a slurry wagon.

The flush system has a sloping shallow pit that is flushed periodically with water. The waste and water run into a lagoon system for microbiological degrading. Problems occur when manure is flushed for long distances, but these systems are common to lots of smaller capacity.

[11] *One thousand gallons of liquid beef manure (from pit) contain about 40 pounds of nitrogen, 27 pounds of phosphorous and 34 pounds of potassium (6).*

[12] *Waste disposal regulations are available from the Bureau of Pollution Control, Oxford, Mississippi.*

Table A-1. Veterinary and medical expenses per head for the 500- and 1,000-head feedlots.[1/]

Item	Unit	Quantity	Price	Amount
			($)	($)
Veterinary expense:				
Consultation & treatment	hrs.	.04	25.00[2/]	1.00
Medical expense:				
Electrode 7	no.	1	.41	.41
Lep (5)	no.	1	.315	.315
Nasalgen (IBR/PI3)	no.	1	.425	.425
Benzapen	no.	1	.90	.90
Pasturella	no.	2	.075	.15
Ralgro	no.	2	.72	1.44
Pyrethrium insecticide[3/]	no.	150	.003	.45
Equipment	--	--	--	.34
Total				5.43

[1/] Recommended by College of Veterinary Medicine, Mississippi State University.

[2/] Does not include travel expense. Veterinarian cost would vary with location and availability of practicing veterinarians.

[3/] Insecticide charge should not be included for cattle fed in the winter months.

Table A-2. Labor charges, 500-head feedlot (two full turns).[1/]

Type	No.	Hrs/wk	Wks/yr	Total hours	Amount/yr	Amount/head
					$	$
Full time[2/]	1	70	52	3,640	10,556.00	10.56
Part time						
A. Repair	1	6	52	312	904.80	.90
B. Cattle handling	2	15	6	180	522.00	.52
C. Manure disposal	1	55	2	110	319.00	.319
Total				4,242	12,301.80	12.30

[1/] All labor charged at $2.90 per hour.

[2/] Labor for feeding, routine maintenance, as well as assistance to management or veterinarian for treating sick animals.

able A-3. Estimated daily utility and fuel requirements, 500-head feedlot.

Operation	Horsepower	No. of units	Average use/day	Consumption/day	$/unit	Total
			(minutes)	(kwh)[1]	(kwh)[4]	($)
op unloader	10	1	30	6.7	.06	.402
ottom unloader	10	1	30	6.7	.06	.402
uger	2	1	30	1.34	.06	.080
elt conveyor	2	3	30	4.02	.06	.241
uger	2	2	30	2.68	.06	.161
oller mill	3	1	30	2.01	.06	.121
eed mill	75	1	30	50.29	.06	3.017
elt feeder	3	1	45	3.01	.06	.181
ater well	2	1	150	6.70	.06	.402
				(gallons)	(/gal)	
lurry pump and wagon tractors	125	1	.31	1.70[3]	.90[5]	1.53
lower tractor[2]	125	1	1.6	.148 (kwh)	.90 (kwh)	.133
iscellaneous				8.30	.06	.50
otal						$7.17

[1] Conversion: (Horsepower/.7457 h.p./kwh) (Time) (Cost/kwh). Recommendations by the Department of Electrical Engineering, Mississippi State University.

[2] For shelled corn storage.

[3] Manufacturers recommendation.

[4] Recommendation of Mississippi Power and Light, Inc.

[5] MAFES Budget Recommendation.

able A-4. Labor and management charges, 1,000-head feedlot (two full turns).[1]

Type	No.	Hrs/wk	Wks/yr	Total hours	Amount/yr	Amount/head
					$	$
anagement	1	--	--	--	15,000.00	7.50
ull time labor[2]	2	70	52	7,280	21,112.00	10.56
art time						
A. Repair	1	12	52	624	1,809.60	0.90
B. Cattle handling	3	30	6	540	1,566.00	.52
Total					39,487.60	19.74

[1] All labor charged at $2.90 per hour.

[2] Labor for feeding, manure disposal operation and routine maintenance, as well as assistance to management or veterinarian for treating sick animals.

Table A-5. Estimated daily utility and fuel requirements, 1,000-head feedlot.

Operation	Horsepower	No. of units	Average/day[2]	Consumption/day	Price	Total
			(minutes)	(kwh)[3]	($/kwh)[4]	($)
Botton unloader	10	1	60	13.41	.06	.805
Unloading augers	2	1	60	2.68	.06	.161
Roller mill	3	1	60	4.02	.06	.241
Auger	2	1	60	2.68	.06	.161
Conveyor table[1]	3	1	3.3	.22	.06	.013
Blower motor[1]	75	1	3.3	5.46	.06	.328
				(gallons)[5]	($/gal)[6]	
Ensiloader tractor	90	1	30	7 gal/hr	.90	3.15
Mixer truck		1	120	6 gal/hr	.90	10.80
				(Kwh)	($/Kwh)	
Manure scraper and pump	75	2	60	201.15	.06	12.10
Aeration pump	1	2	60	2.6	.06	.16
Water wells	2	1	300	13.41	.06	.804
Miscellaneous						.75
Total						29.47

[1] For shelled corn storage.

[2] Based on length of feeding period (161 days).

[3] Conversion (horsepower/.7457 h.p./kwh) (Time) (Cost/kwh). Recommended by the Department of Electrical Engineering, Mississippi State University.

[4] Recommended by Mississippi Power and Light, Inc.

[5] Manufacturers recommendations.

[6] MAFES budget recommendations.

Table A-6. Feed ingredient prices used in the least-cost ration formulation model.

Ingredient	Cost/ton
	($)
Corn silage	14.84
Corn	146.00
Cotton seed meal (41)	222.00
Soybean meal	245.00
Dicalcium phosphate	256.00
Ground limestone	50.00
Salt	66.00

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation.

CONFINEMENT RATION SEP DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH	RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
1621.626	CORN	8.295	7.300		2.814	13.850	WEIGHT	EQU	100.000	100.000	********
226.803	SBM	13.764	12.250		6.587	14.880	DRY MATTER	MIN	.000	60.582	********
10.227	GRND LIMESTONE	2.500	2.500		-21.597	38.021	C PROTEIN	MIN	13.358	13.358	8.093
17.262	SALT	3.300	3.300		**********		DIG. ENERGY	MIN	158.310	158.310	95.908
5131.347	CORN SILAGE(35)	2.114	.740		*******	2.171	CALCIUM	MAX	.600	.300	.182
	CSM	11.809	11.100	8.656			CALCIUM	MIN	.300	.300	.182
	DICAL	12.800	12.800	-7.694			PHOS.	MAX	.600	.320	.194
							PHOS.	MIN	.300	.320	.194
							FAT	MAX	5.000	3.444	2.086
							FIBER	MAX	25.000	14.291	8.658
							CORN	MIN	.000	41.335	23.142
							CORN SILAGE(35)	MIN	.000	52.022	73.229
							CSM	MIN	.000	.000	.000
							GRND LIMESTONE	MAX	1.000	.296	.196
							DICAL	MAX	1.480	.000	.000
							SALT	EQU	.500	.500	.246
							SBM	MIN	.000	5.847	3.037

FEED DATA

BATCH WEIGHT(LBS)	7007.264
COST PER BATCH-$	184.959
NUMBER OF BATCHES PER DAY	2
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	656.000
ENDING WT THIS PERIOD	722.397
TOTAL GAIN THIS PERIOD	66.397
NUMBER OF DAYS THIS PERIOD	30
COST PER TON OF FEED-$	52.791
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	28.029
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	14014.529
AVG FEED COST/HEAD/DAY-$	.740
AVG FEED COST/GROUP/DAY-$	369.919
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.213
AVG FEED COST/LB OF GAIN-$	.334

FEED INGREDIENT TOTALS (LBS) FOR SEP

CORN	97297.567
SBM	13608.184
GRND LIMESTONE	613.611
SALT	1035.704
CORN SILAGE(35)	307880.801

Continued--

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation (Continued).

CONFINEMENT RATION OCT DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH	RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
370.646	CORN	8.295	7.300		3.604	13.342	WEIGHT	EQU	100.000	100.000	*********
19.885	SBM	13.764	12.250		6.878	14.246	DRY MATTER	MIN	.000	44.326	*********
1.115	DICAL	12.800	12.800		-7.694	79.132	C PROTEIN	MIN	12.030	12.030	5.332
1.216	GRND LIMESTONE	2.500	2.500		-21.518	38.021	DIG. ENERGY	MIN	146.150	146.150	64.783
10.218	SALT	3.300	3.300		**********	**********	CALCIUM	MAX	.600	.300	.133
4820.257	CORN SILAGE(35)	2.114	.740		*******	1.939	CALCIUM	MIN	.300	.300	.133
	CSM	11.809	11.100	9.233			PHOS.	MAX	.600	.300	.133
							PHOS.	MIN	.300	.300	.133
							FAT	MAX	5.000	3.189	1.413
							FIBER	MAX	25.000	20.526	9.099
							CORN	MIN	.000	15.961	7.076
							CORN SILAGE(35)	MIN	.000	82.559	92.283
							CSM	MIN	.000	.000	.000
							GRND LIMESTONE	MAX	1.000	.059	.023
							DICAL	MAX	1.480	.055	.021
							SALT	EQU	.500	.500	.196
							SBM	MIN	.000	.866	.381

FEED DATA

BATCH WEIGHT(LBS)	5223.337
COST PER BATCH-$	65.673
NUMBER OF BATCHES PER DAY	4
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	722.397
ENDING WT THIS PERIOD	802.868
TOTAL GAIN THIS PERIOD	80.472
NUMBER OF DAYS THIS PERIOD	31
COST PER TON OF FEED-$	25.146
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	41.787
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	20893.347
AVG FEED COST/HEAD/DAY-$	.525
AVG FEED COST/GROUP/DAY-$	262.693
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.596
AVG FEED COST/LB OF GAIN-$	.202

FEED INGREDIENT TOTALS (LBS) FOR OCT

CORN	45960.104
SBM	2465.783
DICAL	138.308
GRND LIMESTONE	150.746
SALT	1266.973
CORN SILAGE(35)	597711.836

Continued--

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation (Continued).

CONFINEMENT RATION NOV DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH
547.566	CORN	8.295	7.300		3.604	13.342
22.784	SBM	13.764	12.250		6.878	14.246
.851	DICAL	12.800	12.800		-7.694	79.132
2.515	GRND LIMESTONE	2.500	2.500		-21.518	38.021
10.999	SALT	3.300	3.300		**********	
4809.418	CORN SILAGE(35)	2.114	.740		********	1.939
	CSM	11.809	11.100	9.233		

RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
WEIGHT	EQU	100.000	100.000*********	
DRY MATTER	MIN	.000	47.532*********	
C PROTEIN	MIN	11.927	11.927	5.669
DIG. ENERGY	MIN	148.611	148.611	70.637
CALCIUM	MAX	.600	.300	.143
CALCIUM	MIN	.300	.300	.143
PHOS.	MAX	.600	.300	.143
PHOS.	MIN	.300	.300	.143
FAT	MAX	5.000	3.270	1.554
FIBER	MAX	25.000	19.248	9.149
CORN	MIN	.000	21.905	10.151
CORN SILAGE(35)	MIN	.000	76.520	89.160
CSM	MIN	.000	.000	.000
GRND LIMESTONE	MAX	1.000	.114	.047
DICAL	MAX	1.480	.039	.016
SALT	EQU	.500	.500	.204
SBM	MIN	.000	.922	.402

FEED DATA

BATCH WEIGHT(LBS)	5394.134
COST PER BATCH-$	78.888
NUMBER OF BATCHES PER DAY	4
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	802.868
ENDING WT THIS PERIOD	875.150
TOTAL GAIN THIS PERIOD	72.281
NUMBER OF DAYS THIS PERIOD	30
COST PER TON OF FEED-$	29.250
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	43.153
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	21576.537
AVG FEED COST/HEAD/DAY-$	.631
AVG FEED COST/GROUP/DAY-$	315.551
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.409
AVG FEED COST/LB OF GAIN-$	.262

FEED INGREDIENT TOTALS (LBS) FOR NOV

CORN	65707.955
SBM	2734.107
DICAL	102.109
GRND LIMESTONE	301.848
SALT	1319.879
CORN SILAGE(35)	577130.195

Continued--

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation (Continued).

CONFINEMENT RATION DEC DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH
568.958	CORN	8.295	7.300		3.604	13.342
5.425	SBM	13.764	12.250		6.878	14.246
1.203	DICAL	12.800	12.800		-7.694	79.132
2.390	GRND LIMESTONE	2.500	2.500		-21.518	38.021
11.454	SALT	3.300	3.300		**********	**********
5057.843	CORN SILAGE(35)	2.114	.740		********	1.939
	CSM	11.809	11.100	9.233		

RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
WEIGHT	EQU	100.000	100.000	*********
DRY MATTER	MIN	.000	47.125	*********
C PROTEIN	MIN	11.662	11.662	5.496
DIG. ENERGY	MIN	148.334	148.334	69.902
CALCIUM	MAX	.600	.300	.141
CALCIUM	MIN	.300	.300	.141
PHOS.	MAX	.600	.300	.141
PHOS.	MIN	.300	.300	.141
FAT	MAX	5.000	3.282	1.547
FIBER	MAX	25.000	19.373	9.130
CORN	MIN	.000	21.856	10.675
CORN SILAGE(35)	MIN	.000	77.276	89.563
CSM	MIN	.000	.000	.000
GRND LIMESTONE	MAX	1.000	.104	.042
DICAL	MAX	1.480	.052	.021
SALT	EQU	.500	.500	.203
SBM	MIN	.000	.211	.096

FEED DATA

BATCH WEIGHT(LBS)	5647.273
COST PER BATCH-$	80.218
NUMBER OF BATCHES PER DAY	4
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	875.150
ENDING WT THIS PERIOD	947.793
TOTAL GAIN THIS PERIOD	72.643
NUMBER OF DAYS THIS PERIOD	31
COST PER TON OF FEED-$	28.410
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	45.178
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	22589.091
AVG FEED COST/HEAD/DAY-$	.642
AVG FEED COST/GROUP/DAY-$	320.873
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.343
AVG FEED COST/LB OF GAIN-$	.274

FEED INGREDIENT TOTALS (LBS) FOR DEC

CORN	70550.771
SBM	672.757
DICAL	149.110
GRND LIMESTONE	296.329
SALT	1420.298
CORN SILAGE(35)	627172.547

Continued--

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation (Continued).

CONFINEMENT RATION JAN DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH
581.103	CORN	8.295	7.300		1.881	13.342
1.371	DICAL	12.800	12.800		-6.398	175.547
2.333	GRND LIMESTONE	2.500	2.500		-18.674	35.826
11.913	SALT	3.300	3.300		**********	**********
5301.492	CORN SILAGE(35)	2.114	.740		********	2.440
	CSM	11.809	11.100	4.207		
	SBM	13.764	12.250	6.878		

RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
WEIGHT	EQU	100.000	100.000	*********
DRY MATTER	MIN	.000	46.802	*********
C PROTEIN	MIN	11.435	11.591	5.425
DIG. ENERGY	MIN	148.097	148.097	69.312
CALCIUM	MAX	.600	.300	.140
CALCIUM	MIN	.300	.300	.140
PHOS.	MAX	.600	.300	.140
PHOS.	MIN	.300	.300	.140
FAT	MAX	5.000	3.281	1.535
FIBER	MAX	25.000	19.491	9.122
CORN	MIN	.000	21.464	9.852
CORN SILAGE(35)	MIN	.000	77.881	89.883
CSM	MIN	.000	.000	.000
GRND LIMESTONE	MAX	1.000	.098	.040
DICAL	MAX	1.480	.058	.023
SALT	EQU	.500	.500	.202
SBM	MIN	.000	.000	.000

FEED DATA

BATCH WEIGHT(LBS)	5898.211
COST PER BATCH $	82.278
NUMBER OF BATCHES PER DAY	4
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	947.793
ENDING WT THIS PERIOD	1026.679
TOTAL GAIN THIS PERIOD	78.886
NUMBER OF DAYS THIS PERIOD	31
COST PER TON OF FEED $	27.899
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	47.186
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	23592.843
AVG FEED COST/HEAD/DAY $	.658
AVG FEED COST/GROUP/DAY $	329.114
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.545
AVG FEED COST/LB OF GAIN $	.259

FEED INGREDIENT TOTALS (LBS) FOR JAN

CORN	72056.767
DICAL	169.964
GRND LIMESTONE	289.235
SALT	1477.155
CORN SILAGE(35)	657385.008

Continued-

Table A-7. Least cost feed mix and summary data, by month, for a feeding period simulation (Continued).

CONFINEMENT RATION FEB DATE = 3/8/79

AMT. ADJ BATCH WT	INGREDIENT	COST CWT DRY	COST CWT AS FED	MAX PRICE	PRICE RANGE LOW	PRICE RANGE HIGH	RESTRICTION		INITIAL LEVEL	ACTUAL AMOUNT DRY	ACTUAL AMOUNT AS FED
586.660	CORN	8.295	7.300		1.881	13.342	WEIGHT	EQU	100.000	100.000	********
1.428	DICAL	12.800	12.800		-6.398	175.547	DRY MATTER	MIN	.000	46.615	********
2.516	GRND LIMESTONE	2.500	2.500		-18.674	35.826	C PROTEIN	MIN	11.298	11.599	5.407
12.226	SALT	3.300	3.300		**********	**********	DIG. ENERGY	MIN	147.954	147.954	68.969
5465.352	CORN SILAGE(35)	2.114	.740		*******	2.440	CALCIUM	MAX	.600	.300	.140
	CSM	11.809	11.100	4.207			CALCIUM	MIN	.300	.300	.140
	SBM	13.764	12.250	6.878			PHOS.	MAX	.600	.300	.140
							PHOS.	MIN	.300	.300	.140
							FAT	MAX	5.000	3.276	1.527
							FIBER	MAX	25.000	19.566	9.121
							CORN	MIN	.000	21.114	9.844
							CORN SILAGE(35)	MIN	.000	78.233	90.169
							CSM	MIN	.000	.000	.000
							GRND LIMESTONE	MAX	1.000	.095	.038
							DICAL	MAX	1.480	.059	.024
							SALT	EQU	.500	.500	.201
							SBM	MIN	.000	.000	.000

FEED DATA

BATCH WEIGHT(LBS)	6067.982
COST PER BATCH-$	83.914
NUMBER OF BATCHES PER DAY	4
NUMBER OF ANIMALS(STEER)/GROUP	500
BEGINNING WT THIS PERIOD	1026.679
ENDING WT THIS PERIOD	1045.994
TOTAL GAIN THIS PERIOD	19.315
NUMBER OF DAYS THIS PERIOD	8
COST PER TON OF FEED-$	27.658
AVG FEED CONSUMPTION/HEAD(LBS)/DAY	48.544
AVG FEED CONSUMPTION/GROUP(LBS)/DAY	24271.927
AVG FEED COST/HEAD/DAY-$	.671
AVG FEED COST/GROUP/DAY-$	335.656
AVG DAILY GAIN(TARGET)(LBS)	2.600
AVG DAILY GAIN(PROJECTED)(LBS)	2.414
AVG FEED COST/LB OF GAIN-$	.278

FEED INGREDIENT TOTALS (LBS) FOR FEB

CORN	18773.122
DICAL	45.696
GRND LIMESTONE	74.113
SALT	391.217
CORN SILAGE(35)	174891.260

LAST DIET --- END PROGRAM

SOURCE [5]

Table A-8. Feeding period simulation summary, 500-head feedlot.

```
********************************************** FEEDING SUMMARY

NUMBER OF ANIMALS ON FEED----------------      500.000
ANIMAL TYPE------------------------------      STEER
INITIAL WEIGHT (LBS)---------------------      656.000
DAYS ON FEED-----------------------------      161
FINISH WEIGHT----------------------------      1045.994
BEGINNING MONTH--------------------------      SEP
ENDING MONTH-----------------------------      FEB
ENVIRONMENTAL STRESS---------------------      SLIGHT
AVG DAILY GAIN(TARGET)(LBS)--------------        2.600
AVG DAILY GAIN(PROJECTED)(LBS)-----------        2.422
TOTAL AMOUNT OF GAIN---------------------      389.994
AVG FEED COST PER LB GAIN----------------         .266
FEED INGREDIENT TOTALS (LBS) FOR PERIOD----------

        CORN                                370346.285
        SBM                                  19480.831
        GRND LIMESTONE                        1725.883
        SALT                                  6911.225
        CORN SILAGE(35)                    2942171.625
        DICAL                                 605.187
```

Table A-9. Feeding period simulation summary, 1,000-head feedlot.

```
********************************************** FEEDING SUMMARY

NUMBER OF ANIMALS ON FEED----------------     1000.000
ANIMAL TYPE------------------------------      STEER
INITIAL WEIGHT (LBS)---------------------      656.000
DAYS ON FEED-----------------------------      161
FINISH WEIGHT----------------------------      1045.994
BEGINNING MONTH--------------------------      SEP
ENDING MONTH-----------------------------      FEB
ENVIRONMENTAL STRESS---------------------      SLIGHT
AVG DAILY GAIN(TARGET)(LBS)--------------        2.600
AVG DAILY GAIN(PROJECTED)(LBS)-----------        2.422
TOTAL AMOUNT OF GAIN---------------------      389.994
AVG FEED COST PER LB GAIN----------------         .266
FEED INGREDIENT TOTALS (LBS) FOR PERIOD----------

        CORN                                740692.570
        SBM                                  38961.661
        GRND LIMESTONE                        3451.765
        SALT                                 13822.450
        CORN SILAGE(35)                    5884343.250
        DICAL                                1210.375
```

APPENDIX B

EQUIPMENT COMPANIES THAT CONTRIBUTED INFORMATION TO THIS STUDY*

Badger Northland, Inc., Kaukawna, Wisconsin
Bridgeforth Equipment Company, Perkins, Mississippi
Bowman Hydro-Vat, Inc., Fremont, Nebraska
Butler Manufacturing Company, Green City, Kansas
The Calument Company, Algoma, Wisconsin
Clark Equipment Company, Jackson, Mississippi
Clay Equipment Corporation, Cedar Falls, Iowa
Conrad-American, Eckford Dairy Supply, Starkville, Mississippi
H. C. Davis Sons Manufacturing Company, Bonner Springs, Kansas
Farm Hand Equipment Company, Hopkins, Minnesota
Granger, W. W. Granger Company, Jackson, Mississippi
Gehl Company, West Bend, Wisconsin
Gulf States Manufacturing, Starkville, Mississippi
Harvestore Products, Dixie Harvestore, McComb, Mississippi
Hesston Corporation, Hesston, Kansas
International Harvester, Triangle Equipment Company, Columbus, Mississippi
International Truck, Jackson, Mississippi
John Deere, Starkville District, Starkville, Mississippi
Kelly Ryan Equipment, Blair Manufacturing Company, Blair, Nebraska
Koehring, Fox Harvesting, Appleton, Wisconsin
Memphis Concrete Silo, Memphis, Tennessee
Mississippi Pump and Equipme Company, Jackson, Mississip
Mississippi Serum Distributo Jackson, Mississippi
Sperry-New Holland, Ne Holland, Pennsylvania
Piedmont Silo Company, In Covington, Georgia
People Green Constructio Jackson, Mississippi
Randolph Slats, Randolp Wisconsin
Rebel Trucks, Jackson, Mississip
Ritchie Industries, Inc., Conra Iowa
St. John Welding and Manuf turing, Inc., St. John, Kansas
W-W Manufacturing Compar Dodge City, Kansas
Weiser Concrete Products, Maid Rock, Wisconsin

**Additional information can be obtained from Department of Agricultural Economics, Mississippi State University.*

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