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ECONOMIES OF SIZE of WARM-UP CATTLE FEEDLOT OPERATIONS IN NEVADA

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SUMMARY AND CONCLUSIONS

Five warm-up feedlot models with capacities of 300, 600, 1,000, 1,500, and 2,400 head were developed using the synthetic cost approach. Fixed and variable costs were estimated for each size lot by using a combination of the engineering and statistical approaches. Short-run average cost curves were estimated for the five models. An economies of size curve was developed.

The 1,000-head warm-up feedlot model was employed in break-even and profitability analyses. These analyses were undertaken with respect to: (1) variations in purchase price of feeder calves, sale price of feeder steers, and price of feed, (2) comparisons between an alfalfa-silage ration and a ration consisting of alfalfa alone, (3) comparisions between custom feeding versus ownership of cattle, and (4) the effect of time on fixed and variable costs as related to the level of profitability of the warm-up operation.

The analysis of warm-up feedlot operations in Nevada clearly indicates that some economies of size exist within the range of feedlot sizes studied. The major portion of economies are realized through reduction of fixed costs per head as size of the feedlot is increased. The decrease in fixed costs per head is most significant in the range of the 300- to the 1,000-head capacity lot. Although there are economies to be gained in moving from the 1,000- to the 2,400-head capacity lot, reduction in costs per head decline at a lower rate.

Operation of 300- and 600-head capacity warm-up lots at or near full capacity is of importance in an effort to attain the economies indicated by the analysis. The difference in cost per pound of gain for a 300-head capacity lot operating at 100 percent of capacity versus 60 percent of capacity is 2.18 cents per pound. For the 600-head capacity lot, the difference in cost per pound of gain is 1.39 cents. Degree of utilization of feedlots with capacities of over 1,000 head have less effect on cost per pound of gain. The difference in cost per pound of gain amounts to 0.69 cents per pound for a 2,400-head capacity feedlot operating at 100 percent of capacity versus 60 percent of capacity.

Levels of profitability in warm-up feeding are highly sensitive to a few cents change in prices paid for feeder calves, feed, and prices received for feeder steers. Assuming a purchase weight of 400 pounds and a sale weight of 592.8 pounds, a 1-cent change in purchase or sale price would result in a change of profitability per head of $4.00 and $5.93, respectively. This sensitivity of profitability of warm-up operations to price changes for feeder calves and feeder steers clearly illustrates the importance of purchase and sale decisions in the feeding operation.

Comparison of the all hay versus the hay-silage ration in warm-up feeding provided no supportable conclusions.[1] For the 1,000-head feedlot, total costs per pound of gain were about .9 of a cent lower for the all hay ration (subject to some rather critical assumptions). Comparisons between the two rations must include consideration of digestive problems and rotation of field crops associated with the basic rations used in the warm-up operation.

Custom feeding versus cattle ownership may constitute a major decision for the warm-up feedlot operator during periods of depressed market prices. Given the cost of operation for a warm-up lot, the custom rate, calf purchase price, and the range for expected sale price are the important decision variables involved. For market conditions approximating the 1963–64 feeding year and with custom feeding rates at 18 cents, calf prices in the range of 20 to 24 cents, and a sale price of 20 cents for feeder steers, the analysis indicated that the feedlot operator would have been better off to custom feed for others than to feed his own cattle.

Historical price relationships between feeder steer calves and feeder steers for the 1953–64 period showed that negative price margins existed between calves and steers from 1958 to 1964. Given costs of operation as derived for the model warm-up feedlots in this study, positive profits could have been obtained in 3 of the 6 years in which negative margins were present. On the other hand, negative profit was indicated for 1 year during the period of positive price margins. It is apparent, given costs of operation, that positive or negative price margins do not insure profits or losses for the warm-up operation.

Results of this study indicate that a well managed warm-up feedlot would have realized positive profits in 7 of the 11 feeding years investigated.[2] In addition, in those years for which negative profits were indicated, a shift from ownership of cattle to custom feeding for others may have resulted in a profitable operation or a minimum loss situation.

[1]An experimental feeding study at the University of Nevada Experiment Station was initiated by the Animal Science Division in the fall of 1965. Various levels of alfalfa and corn silage are being fed to animals typical of those fed in Nevada warm-up feedlots.

[2]In the calculation of profit, total cost *includes* a 6 percent return on investment plus a return to labor of $1.50 per hour.

ECONOMIES OF SIZE OF WARM-UP CATTLE FEEDLOT OPERATIONS IN NEVADA[1]

By JOHN W. MALONE, JR., and LEROY F. ROGERS[2]

The Nevada cattle feeding industry[3] is characterized by finishing and warm-up[4] operations. During the past 10 years there has not been a discernible trend in numbers of cattle finished in the State. Reasons advanced for lack of expansion in the finishing sector of the feeding industry are: (1) Insufficient grain production in Nevada, and (2) a relatively small slaughter industry in the State.

Warm-up feeding has been increasing during the last several years and accounts for a little more than 50 percent of cattle placed on feed in the State. Many Nevada farmers and ranchers are constantly faced with decisions concerning warm-up versus finishing operations. The warm-up feedlot operation is, in many cases, one of several enterprises involved in the ranching operation. The maintenance of a cow herd and the production of alfalfa hay usually comprise the other enterprises. There are numerous farmers and ranchers not involved in feedlot operations but who produce alfalfa which could be marketed through feeder cattle. Given the continued production of a high quality alfalfa hay, adequate supply sources for calves, and an available demand for feeder cattle by finishing lots in Nevada and other states, warm-up feeding could increase its position as an important segment of Nevada's agricultural economy.

Existing and potential warm-up feedlot operators should consider cost aspects of the operation as a major factor in the economic decision-making process. A knowledge of cost-output relationships with respect to fixed costs, feed, and non-feed variable costs is a necessary condition for the maximization of

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[1]The research on which this study is based is part of Western Regional Livestock Marketing Research Project WM–48, "Livestock Marketing Efficiency and Pricing in the West."

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[3]For a more detailed description of feedlot activities in Nevada, see John W. Malone Jr., and Herbert N. Friesen, *Cattle Feedlot Operations in Nevada,* Max C. Fleischmann College of Agriculture, University of Nevada, Bulletin B–2, December, 1964.

[4]Warm-up operations are defined as feedlot production of steers and heifers destined for finishing lots. A ration consisting mainly of alfalfa and silage or alfalfa alone is used.

revenue in an economic enterprise. An understanding of the variation of these costs with changes in output and size of feedlot is essential for an economically efficient operation.

Once the various cost components of warm-up operations are known for different output levels, assumptions regarding changes in variables such as prices of feed, calves, feeder steers, percent capacity of feedlot utilized, etc., may be set forth and an analysis of the effects of changes in these variables on revenue may be undertaken.

Specifically, the objectives of this study are:

1. To determine cost components of different size warm-up feedlot operations.
2. To determine economies of size in relation to different size feedlot models.
3. To assess the effects of changes in cattle and feed cost-price ratios on feedlots' level of revenue.
4. To evaluate the flexibility aspects in warm-up operations under differing market conditions with respect to "custom feeding" versus feeding of cattle owned by the feedlot operator.

Theoretical Framework of Analysis*

The theory of cost and production provides a general explanation of cost-output relationships regarding various size firms. Excellent treatises on the subject of diminishing marginal productivity and on economies of scale and size are presented by Viner, Boulding, and others.[5]

The Concept of Costs in the Short- and Long-Run Period

In an analysis of the firm or a single plant, as the case may be, the time period for the production process may be distinguished by a short- and long-run period. The short-run production period is characterized by some production costs which may vary as output increases or decreases within the capacity range for a given size plant. Since the plant in this study is the warm-up feedlot, such variable costs would be associated with variable inputs including feed, labor, etc. Costs of warm-up feeding operations related to feed handling equipment, pens, etc., are categorized as

*Those readers interested mainly in the empirical analysis may omit this section and turn to the section related to method of analysis and sources of data.

[5]Jacob Viner, "Cost Curves and Supply Curves," *American Economic Association Readings in Price Theory,* Editors Stigler and Boulding, Richard D. Irwin, Inc., Chicago, Vol. 6, pp. 198–232, 1952. Kenneth E. Boulding, *Economic Analysis,* Hamish Hamilton, London, Third Edition, pp. 733–759, 1955.

fixed costs. These costs do not vary with changes in output in the short run.

The theory of cost states that in the long run, all cost of operation are variable. This proposition as applied to the warm-up operation means that although a feedlot operator does not change his fixed facilities within a feeding season, he may contemplate a change in the size of his feeding operation for the next feeding year.[6] In this case, all costs associated with the expansion would be considered as variable in relation to output.

Theoretical Cost Curves of the Firm

Short-Run Average Cost Curves

Short- and long-run average cost curves (SAC and LAC, respectively) as postulated in economic theory are illustrated in Figure 1. The short-run average cost curves (SAC_1; SAC_2; SAC_3) are depicted as different size firms (feedlots) in which output may be varied within the limits of size in the short run. Short-run average costs for the firm are comprised of fixed and variable costs as discussed in the above section. The U-shaped curvature of the SAC's result from diminishing productivity as added variable inputs are used in conjunction with fixed inputs.

It would be expected that a variable input when applied to fixed inputs would result in declining variable cost per unit of output as output is increased to a certain level. Beyond a point (the minimum point on the SAC curves in Figure 1), average total costs per unit of output begin to increase as a result of the decline in rate of output.

Long-Run Average Cost Curve

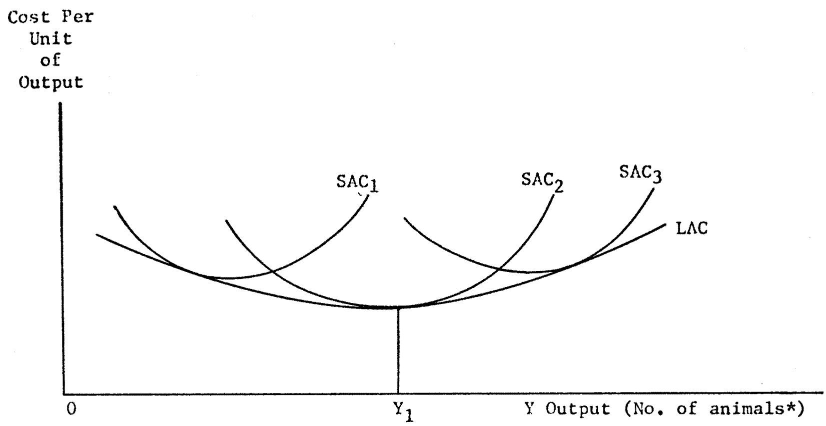
Long-run average costs reflect costs of inputs when all inputs may be considered as variable in planning a change in size of operation. The LAC curve (Figure 1) indicates costs of varying outputs between different size firms. For expository purposes, only three size plants are shown whereas the LAC curve may be comprised of innumerable plants of various size. The LAC curve may be traced out by the points of tangency of a large number of SAC curves.

The LAC curve decreases up to a certain level of output (Y_1 in Figure 1). Decreasing cost per unit of output as output increases result from economies of size. These economies may be realized

[6]Nevada warm-up feedlot operations usually feed only one lot per year. Animals are placed in feedlots during October and November and are generally marketed around March.

because of increased specialization, economies in purchasing, selling, obtaining capital, etc. For example, in warm-up feeding, especially in larger size operations, one man may devote all or a large majority of his time specializing in actual feeding; hence, the possibility of reductions in feeding costs. A large warm-up feedlot might also take advantage of new technological advances in feed handling equipment more readily than a small operation. Accordingly, the potential may exist for economies related to feed distribution.

At outputs larger than Y_1, diseconomies of size are the cause of increasing average costs. As a firm increases its size, levels may



*The number of animals designated on the X-axis as output assumes that individual animals in the feedlot are started at the same initial weight and perform equally in terms of daily rates of gain and feed conversion.

FIGURE 1. Theoretical Cost Curves for the Firm.

be reached where management is not able to efficiently handle the necessary decision-making. Such a situation would lead to increased costs per unit of output.

In this analysis, it is hypothesized that some economies of size exist within the range of different size feedlots studied. Diseconomies would not be expected in warm-up feeding within the size groups studied.

Method of Analysis and Sources of Data

The synthetic cost or economic-engineering approach was the major method used in this study.[7] Empirical cost curves for five

[7]The synthetic cost or economic-engineering approach consists of analyzing the physical relationships of the individual components of a total operation. Cost and price relationships are applied to the individual components of the total operation. The individual operations are then combined into the total production process.

model feedlots with capacities[8] of 300, 600, 1,000, 1,500, and 2,400 animals were derived using synthesized cost data and statistical data obtained from a survey of 55 warm-up feedlot operations in Nevada during 1963.[9]

Most of the synthesized data were in relation to fixed costs and capital investment. Some variable costs were synthesized in the study while others were derived by applying regression analysis to statistical data obtained from the 1963 survey of feedlot operators.

In addition to data acquired from the 1963 survey, other information was obtained from personal interviews with selected feedlot operators during 1964–65. Equipment costs were obtained from various dealers. Cattle and feed prices were secured from primary and secondary sources.

CAPITAL INVESTMENT OF WARM-UP FEEDLOTS

Capital investments in warm-up feeding operations are less extensive than is typical of finishing operations that have sizable investments in feed formulation and storage facilities. The hay or hay and silage rations typically fed in warm-up lots are usually distributed separately to the animals or mixed at the time of distribution with a self-unloading wagon. Thus, feed formulation equipment comparable to the feed mills found on finishing lots is seldom associated with these operations. On an operation of any size, however, field chopping of hay requires two wagons to efficiently transport hay from the field. The second wagon is not required for feeding, per se, but is charged to the feedlot operation since the method of harvesting and feeding hay is the determining factor in whether the extra wagon is needed. The field chopper and additional wagon are to some extent substitutes for some milling equipment in a conventional finishing feedlot. Chopped alfalfa hay is typically stacked without support or cover on most units in the low precipitation areas of Nevada. The only feed storage facility for these hay and silage feeding operations is the trench silo. This is generally an unlined trench.

Capital investment was divided into three components: (1) feed yard and miscellaneous facilities, (2) feed handling equipment,

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[8]Capacity is defined as the maximum number of animals that could be fed during a feeding period. Warm-up operations in Nevada generally consist of one lot per year.

[9]Herbert N. Friesen, *Cost Analysis of Nevada Cattle Feeding Operations*, Unpublished Masters Thesis, Division of Agricultural Economics, Max C. Fleischmann College of Agriculture, University of Nevada, Reno, Nevada, June, 1965.

and (3) land investment. Total capital investment ranged from $43.14 per head capacity for the 300-head yard to $16.57 per head for the 2,400-head capacity yard. Investment costs are shown in Table 1. Details are shown in Appendix Tables 1–5. Capital investment per head capacity for different size feedlots is illustrated in Figure 2. Investment per head capacity declines as size of feedlot increases, indicating economies as a result of allocating investment over larger numbers of animals. The rate of decline in investment per head decreases noticeably between the 1,500- and 2,400-head

TABLE 1
Synthesized Investment Costs for Nevada Warm-Up Feedlots

Item	Capacity Number of Head				
	300	600	1,000	1,500	2,400
Feed Pens and Facilities:					
Feed pens, bunks, loading chute, etc.	$2,862	$4,579	$7,050	$10,199	$17,140
Scales	1,274	1,274	1,274	1,274	1,274
Pickup truck (used)	500	500	500	500	500
Livestock squeeze and sprayer	375	375	750	750	750
Water system	895	1,425	1,541	1,980	2,697
Feed Handling Equipment:					
Tractor (one-half)	1,518	1,518	2,025	2,025	2,025
Hay fork	1,425	1,425	1,900	1,900	1,900
Elevator	600	600	1,200	1,200	1,200
Self-unloading wagons	2,450	4,900	4,900	4,900	4,900
Trench silo	162	324	540	810	1,296
Land:					
Land	880	1,720	2,680	3,880	6,080
TOTALS	$12,941	$18,640	$24,360	$29,418	$39,762
Investment per head capacity	$43.14	$31.07	$24.36	$19.61	$16.57

capacity yard. Indivisibilities associated with feed handling equipment cause the decrease in the rate of decline in investment costs per head capacity.

Feed Pens and Facilities

The feeding pens, working corrals, and hospital pens in the models were constructed from 2- x 6-inch rough lumber using 6- x 6-inch treated posts. These costs, as shown in Appendix Tables 1–5, may be reduced if ranchers can substitute cheaper materials such as railroad ties and cable. Animals were grouped in pens of 100 calves and each animal was provided with approximately 200 square feet of space in the feeding pens. An allowance of 1.5 percent of the feed yard capacity was made for use as hospital pens. Working corrals were provided in proportion to the size of the feedlot. Concrete bunk floors and watering platforms were included in the models.

Three basic feedlot designs are shown in Appendix Figures 1–3. The 300-head capacity yard has only a single row of three pens and the 2,400 capacity yard has three tiers of eight feeding pens each. Each size feedlot was equipped with a 5 ton capacity scale and a used pickup truck. The three largest lots were equipped with a calf squeeze and livestock sprayer. The 300- and 600-head lots were charged for only one-half of a livestock squeeze and sprayer. Many of these small lots are operated in conjunction with a cow herd enterprise. Thus, an arbitrary 50 percent of the livestock squeeze and sprayer investment has been allocated to the cow herd enterprise. All material and equipment costs are based on delivery in the Fallon area.

Investment in watering facilities also presents an allocation problem since the well and pump system are usually jointly shared

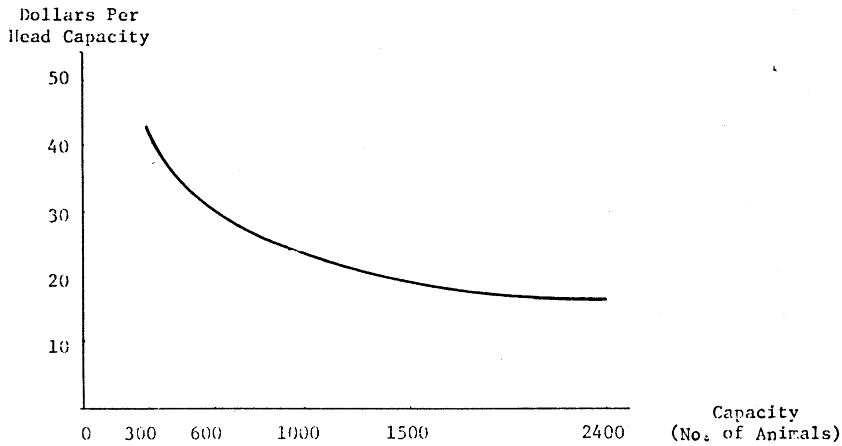

FIGURE 2. Synthesized Capital Investment Per Head Capacity—Nevada Warm-Up Feedlot Operation

by the household and the feedlot enterprise. Fifty percent of the cost of these facilities are charged to the feedlot. All water system costs internal to the feedlot are charged completely to the warm-up operation. The water distribution system utilizes 1-inch plastic pipe for main lines and ¾-inch laterals.

No office facilities were charged explicitly to the warm-up operation. The existing units typically use their residence as an office. Office and recordkeeping charges are expressed as variable costs in this study.

Feed Handling Equipment

The tractor used for feeding cattle is also commonly used on one or more other enterprises on these units. One-half of the cost of a new 40 hp tractor was charged to the three largest lots and one-half the cost of a new 30 hp tractor charged to the two smaller lots. The entire cost of a hydraulically operated hay fork fitted to each size tractor was charged to the warm-up operation.

These operations normally stack chopped hay on the ground with a conventional drag chain type of farm elevator. One-half the cost of a new 50-foot elevator was charged to the two smaller lots and the entire cost of such an elevator to the larger operations. As mentioned earlier, only one self-unloading wagon is necessary for feeding. To facilitate transporting the chopped hay from the field to the stack site, however, two power-take-off operated wagons with mixing beaters were charged to all but the 300-head capacity lot. Several ranchers now in the warm-up feedlot business have constructed their own self-unloading wagons which appear to meet their needs adequately.

A trench silo with sufficient capacity to store 1,450 pounds of silage for each calf on feed was synthesized for each unit. Excavation costs of 60 cents per cubic yard were obtained from local equipment operators. The estimates were based on soil conditions in the Fallon area.

Land

Land charges for this study were based on the opportunity cost concept.[10] A charge of $400 per acre was assessed against the feedlot for the area actually covered plus a 30-foot perimeter around the warm-up facilities. This may be an excessive charge for the small lots since many ranches are able to build these facilities on land with little other value.

FIXED COSTS OF WARM-UP FEEDLOTS

Fixed costs for the warm-up operation may be divided into the usual five components: depreciation, interest, taxes, insurance, and repairs. Depreciation and interest are treated together in this study through use of an amortization factor. Fixed costs impose a particular burden upon warm-up operations since these feedlots typically handle only one lot of cattle each year. Although an operator may have his lot filled to capacity for one 145-day feeding period, the lot remains unused for approximately 60 percent of the year. Finishing lots in the Western States typically operate on a continuous basis. Thus, in relation to finishing lots, these

[10]Opportunity costs for an enterprise are the values that factors of production used in the given enterprise could earn in their best alternative uses.

warm-up operations have fewer animals and less pounds of gain over which to spread fixed costs.

Annual fixed costs of each size lot are shown in Table 2. Depreciation and interest are by far the largest part of the fixed costs of operating a warm-up feedlot. Fixed costs per head decrease quite rapidly up to a feedlot capacity of 1,000 head but the rate of reduction lessens as lot sizes increase beyond that point as shown in Figure 3.

Depreciation and Interest

Each of the depreciable items included in the investment categories was assigned an expected life and amortized over this useful life at a 6 percent rate of interest. This one charge then accounts for both depreciation and interest expenses. The useful life and detailed cost figures are shown in Appendix Table 6. Machinery items were credited with a salvage value of 5 percent of original cost. Land is considered a non-depreciable asset and has only a 6 percent interest charge assessed against a value of $400 per acre.

TABLE 2
Annual Fixed Costs of Warm-Up Lot Models

	Capacity Number of Head				
Item	300	600	1,000	1,500	2,400
Depreciation and interest	$1,313	$1,833	$2,361	$2,773	$3,620
Taxes	124	180	241	296	406
Insurance	129	184	244	294	398
Repairs	68	98	140	194	309
TOTALS	$1,634	$2,295	$2,986	$3,557	$4,733
Total fixed cost per head capacity	$5.45	$3.83	$2.99	$2.37	$1.97
Total fixed cost per pound gain[1]	0.025	0.018	0.014	0.011	0.009
Total fixed cost per pound marketable gain[2]	0.028	0.020	0.015	0.012	0.010

[1]Assumes 1.5 pound gain per day for 145-day feeding period.
[2]Marketable gain reflects a 4 percent shrink at sale.

Depreciation and interest charges ranged from a high of $4.38 per head for the 300-head capacity lot to $1.51 for the 2,400-head lot. Assuming a weight gain of 217.5 pounds per head, the depreciation and interest costs per pound of gain ranged from 2.0 to 0.7 cents.

Taxes

Taxes on facilities and equipment were charged at 5 percent of the assessed valuation. Assessed valuations were assumed to be 35 percent of market value. Market values were calculated as follows:

$$\text{Market value} = \frac{\text{Original cost} + \text{salvage value}}{2}$$

This rate is slightly less than the 1 percent of original value used by King.[11] On a per-head capacity basis, taxes ranged from 41 cents for the 300-head capacity yard to 17 cents for the largest yard.

Insurance

In cases where pieces of equipment are not formally insured, the operator bears an implicit cost of assuming the liability associated with the ownership and operation of these assets. An

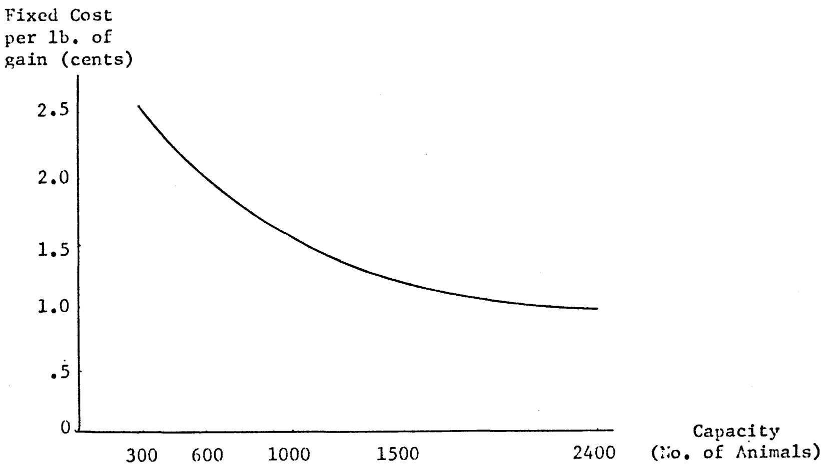

FIGURE 3. Fixed Cost Per Pound of Gain—Warm-Up Feedlots.

insurance charge of 1 percent of original investment was charged to each size feedlot. This charge ranged from 43 cents per head for the smallest lot to 17 cents per head on the largest lot. At these rates, taxes and insurance are of approximately equal magnitude, each accounting for about 8 percent of the annual fixed costs.

Repairs

Annual repair and maintenance costs on pen facilities and scales were estimated at 1½ percent of original investment. This

[11] Gordon A. King, *Economies of Scale in Large Commercial Feedlots*, California Agricultural Experiment Station, Giannini Foundation of Agricultural Economics, University of California, Research Report No. 251, p. 14, March, 1962.

is 25 percent less than the rate charged by King.[12] However, these repair and maintenance expenses are partially a function of use as well as exposure to weather and elements. Use of a lower rate is justified because of the fact that these lots operate at approximately 40 percent of annual capacity since only one lot of calves is handled each year. Repairs classified as fixed costs ranged from a high of 23 cents per head for the 300-head capacity yard to 13 cents for the 2,400-head yard.

VARIABLE COSTS OF WARM-UP OPERATIONS

Feed is the major item of variable costs. Although the relative importance of feed varied with size of feedlot and prices of feed, it always represented over 75 percent of total variable costs. Labor and death loss were the other two sizable variable costs. Table 3 and Figure 4 illustrate variable costs under an assumed

TABLE 3
Variable Costs Per Pound of Gain

Item	Size of Lot (Number of Head)				
	300	600	1,000	1,500	2,400
Feed[1]	$0.12983	$0.12983	$0.12983	$0.12983	$0.12983
Interest on livestock and feed	.01921	.01921	.01921	.01921	.01921
Labor ($1.50/hr.):					
Feeding	.00595	.00408	.00368	.00337	.00307
Non-feed	.00239	.00239	.00239	.00239	.00239
Death loss (1 percent)	.00561	.00561	.00561	.00561	.00561
Repair costs	.00204	.00142	.00117	.00105	.00095
Veterinary and medicine	.00307	.00239	.00212	.00198	.00187
Fuel and lubricant	.00182	.00143	.00127	.00118	.00113
Administration and bookkeeping	.00187	.00156	.00144	.00138	.00133
Power	0.00020	0.00015	0.00013	0.00012	0.00011
Total variable costs per pound of gain	$0.17199	$0.16807	$0.16685	$0.16612	$0.16550
Variable costs of marketable gain[2]	$0.19402	$0.18960	$0.18823	$0.18740	$0.18670

[1]Hay at $25 per ton and silage at $10 per ton.
[2]Marketable gain reflects a 4 percent shrink at sale.

set of feed and labor prices. Several of the costs were estimated from functional relationships developed from survey data obtained from warm-up operators. Although the variation explained by these regression equations was small, they were the best estimates available to the authors.

Feed

The basic ration used for developing feed cost figures was 12.3 pounds of chopped alfalfa hay and 8.2 pounds of corn silage per head per day. This is based on an average daily feed consumption throughout the 145-day feeding period. This level of feeding is

[12]*Ibid.*, p. 16.

assumed to produce a 1½ pound average daily rate of gain.[13] Table 4 shows the effect of varying feed prices on feed costs per pound of gain. The basic cost model developed in this study valued hay at $25 per ton and silage at $10 per ton in the silo. This results in a feed cost of 13 cents per pound of gain.

Although the hay and silage fed in these lots is typically produced on the farm or ranch, the feedlot enterprise should be charged a fair market price for these products.[14] The 1959–63 5-year average price received by Nevada alfalfa hay producers was $25.33 per ton.[15] Estimates of silage prices were obtained from ranchers in the area.

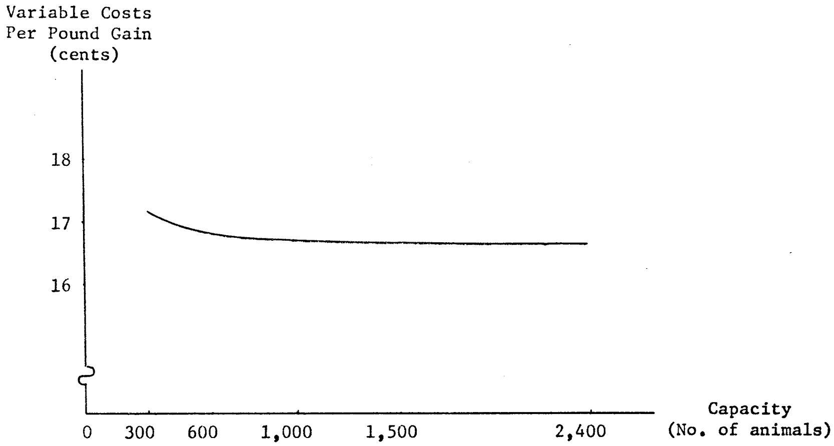

FIGURE 4. Variable Costs Per Pound Gain—Warm-Up Feedlots.

Feed costs for the basic model are expressed as a function of animal days on feed as follows:

$$Fc = \$0.1948X$$

where: Fc = total feed costs (dollars)
X = animal days on feed

[13]This feed intake is based on a requirement of 7.8 pounds of TDN per head per day, alfalfa at 57.6 percent TDN, corn silage at 18.3 percent TDN, and a wastage factor of 10 percent.

[14]An argument could be made for charging the feedlot enterprise approximately $1.50 per ton less than the roadside price for baled hay due to differences in cost per ton of baling and stacking versus chopping and stacking hay. For hay harvesting costs see: George A. Myles, *Harvesting Alfalfa Hay in Western Nevada*, Nevada Agricultural Experiment Station, Circular 17, May, 1959.

[15]Mabel L. Hartley, *Nevada Farm Prices 1910 to 1963 and Farm Price Index*, Max C. Fleischmann College of Agriculture, University of Nevada, Reno, R–8, November, 1964.

Feed prices may be permitted to vary by utilizing the equation below:

$$F'c = [8.2 \text{ (price of silage per pound)} + 12.3 \text{ (price of hay per lb.)}]X$$

Labor

All labor used in the feedlot operation was charged at a rate of $1.50 per hour. Feedlot operators feeding hay and silage with equipment similar to that assumed in this study provided estimates of time required for various tasks. Labor was broken into two classes: (1) feeding labor and (2) non-feeding labor. Labor for bookkeeping or accounting is not included in these figures.

TABLE 4

Feed Costs in Cents Per Pound of Gain Under Varying Feed Prices[1]

Price of Hay Per Ton	Price of Silage Per Ton				
	$6	$8	$10*	$12	$14
(dollars)	(cents)	(cents)	(cents)	(cents)	(cents)
17	8.6	9.2	9.7	10.3	10.9
19	9.4	10.0	10.5	11.1	11.6
21	10.3	10.8	11.3	11.9	12.4
23	11.1	11.6	12.2	12.7	13.3
25*	11.9	12.4	13.0	13.5	14.1
27	12.7	13.3	13.8	14.4	14.9
29	13.5	14.1	14.6	15.2	15.7

[1]Assumes 12.3 pounds of hay and 8.2 pounds of silage per head per day and 1.5 pounds average daily gain.
*Prices used in basic cost model.

Operator estimates of time requirements for the separate tasks involved in feeding were used to calculate labor costs for each size lot. These estimates were also used to develop labor requirements for each size feedlot operated at varying capacity levels.

TABLE 5

Feeding Labor Requirements and Costs for Model Warm-Up Feedlots Operated at Capacity

Size of Warm-Up Lot (Head)	Total Hours	Hours Per Head	Cost at $1.50/Hr.	Cost Per Pound Gain
300	259	.86	$388.35	$0.00595
600	355	.59	532.95	.00408
1,000	534	.53	801.15	.00368
1,500	732	.49	1,098.45	.00337
2,400	1,068	.45	1,602.30	0.00307

Estimates of non-feed labor requirements were obtained by interviewing selected operators. These operators estimated that non-feed labor would be approximately proportional to the number of cattle in the feed yard. It was estimated that for a 145-day feeding period, the labor requirement would be approximately .347 hours per animal on feed. Applying a wage rate of $1.50 per hour, this amounts to approximately 52 cents per animal or

$0.00239 per pound of gain. Approximately one-half of this time is spent treating sick animals. Receiving, shipping, branding, vaccinating, fixing fences, and other miscellaneous chores make up the remaining tasks.

Variable Costs Estimated by Regression Analysis

Regression analysis was employed in the attempt to estimate costs of machinery repairs, veterinary and medicine, fuel, and administration and bookkeeping (Table 6). Data used in the regression analyses were obtained from the survey of warm-up operators conducted in 1963. There were insufficient observations to estimate separate equations for the different cost items for each capacity feedlot.

TABLE 6
Regression Equations for Estimating Total Costs of Machinery Repairs, Veterinary and Medicine, Fuel, and Administration and Bookkeeping for Different Size Feedlots

Cost Item (Y)	Constant	b_1[1]	r^2	tb_1
Machinery repairs (Y_1)	$81.35	0.00187X_1$	.23	7.34*
Veterinary and medicine (Y_2)	88.82	.02558X_1	.42	5.57*
Fuel (Y_3)	51.61	.01535X_1	.43	5.66*
Administration and bookkeeping (Y_4)	39.86	0.01882X_1	.82	14.49*

[1]The independent variable X_1 is animal days on feed.
*The asterisk associated with the t-values denotes statistical significance at the .01 percent probability level.

Power Costs

The only power costs involved in this type of operation are those used to pump water for livestock. Nevada warm-up operations typically utilize the domestic water system for the ranch. A liberal allowance of 10 gallons of water per head per day was used in calculating total water pumped. Residential service rates were applied to the appropriate monthly power consumption.[16] The declining power rate as monthly consumption increases reduced the power charge per pound gain as the capacity of the yard increased (Table 7).

Interest on Livestock and Feed

An arbitrary interest rate of 6 percent was charged for use of short-term operating capital. Cattle were assessed at 6 percent on their assumed value one-half way through the feeding period. The cattle were assumed to weigh 509 pounds at the mid-point of the

[16]Schedule RS Residential Service, Sierra Pacific Power Company, Reno, Nevada. Issued May 1, 1963.

feeding period and to have a value of $24 per hundredweight. Interest charges were $3.05 for the 5-month period or $0.01402 per pound gain.

It was assumed that the inventory of feed is kept approximately 8 months. Each animal consumes $28.24 worth of feed at $25 a ton for hay and $10 per ton for silage. This yields an interest charge of $1.13 per head, or $0.00519 per pound gain.

Death Loss

Estimates of death loss obtained from warm-up operators varied among operators and different years, but averaged around 1 percent over a period of years. It was assumed that animals died one-half way through the feeding period and that their value was $122.16. Death loss amounted to $1.22 per animal or $0.00561 per pound gain.

TABLE 7
Power Charges for Pumping Water for Different Size Warm-Up Lots

Size of Lot (Head)	Power Charge: Per Pound Gain	Power Charge: Per Animal for Feeding Period
300	$0.00020	$0.043
600	.00015	.033
1,000	.00013	.029
1,500	.00012	.026
2,400	0.00011	0.023

Miscellaneous

Two items not explicitly set forth in these costs are manure disposal and marketing costs. There has been a sizable amount of literature published on value of manure with little unanimity of opinion as to the value of manure. For this study, the simplifying assumption has been made that the value of manure to the operator is about equal to its handling costs. Manure from warm-up feedlots is typically applied to the cropland of the feedlot owner.

Marketing costs were omitted from explicit treatment by making all prices net of marketing charges. As developed in a later section of this study, purchase prices will reflect the cost of calves "laid in" to the feed yard.

SUMMARY OF FIXED AND VARIABLE COSTS

Variable costs, in particular feed costs, are by far the major component of the total cost of feeding calves in a warm-up enterprise. Variable costs represent 94.8 percent of total costs for the

2,400-head capacity yard and 87.3 percent of total costs for the 300-head capacity yard. However, the economies of size that exist in these operations came largely from spreading fixed costs. Fixed costs were 1.6 cents less per pound of gain for the 2,400- than the 300-head capacity yard. Variable cost savings per pound of gain were 0.65 cents.

Total costs per pound of gain, assuming the yards are operated at 100 percent of capacity for one lot of cattle per year, are summarized in Table 8 and shown graphically in Figure 5. These figures indicate that within the size feedlots examined in this study the major portion of economies of size associated with warm-up lots are exhausted at around a capacity of 1,000 head. The average cost per pound of gain continues to decline slightly as capacity increases to 2,400, but the slope becomes rather slight (Figure 5). Given the assumptions of this study, small

TABLE 8
Total Costs Per Pound of Gain With Model Feed Yards

Size Yard (Head)	Cost Per Pound Gain: Total Weight Gain			Marketable Weight Gain		
	Fixed Costs	Variable Costs	Total Costs	Fixed Costs	Variable Costs	Total Costs
300	$0.025	$0.1720	$0.1970	$0.028	$0.1940	$0.2220
600	.018	.1681	.1861	.020	.1896	.2096
1,000	.014	.1669	.1809	.015	.1882	.2032
1,500	.011	.1661	.1771	.012	.1874	.1994
2,400	0.009	0.1655	0.1745	0.010	0.1867	0.1967

operators with 300- to 600-head capacity feedlots are operating at a 1- to 2-cent per pound of gain disadvantage when compared with the larger lots.

DERIVATION OF AVERAGE COST CURVES FOR NEVADA WARM-UP FEEDLOTS

Per unit costs of output vary with the percent of capacity at which feed yards are utilized.[17] Changes in cost per pound of gain are analyzed in this section as percent of capacity utilized varies in 10 percent increments from 60 percent to full utilization. The basic hay-silage ration is used in all situations. An analysis of the cost aspects of an all hay ration is presented in a following section.

[17]Percent of capacity is expressed as a ratio of animals fed to maximum capacity of the feeding pens which provides for a minimum space requirement of 200 square feet per animal. This differs from the traditional concept in that only one lot of cattle are permitted per year. The approximately 7-month period of non-use of the facilities has no effect upon the stated percent of capacity at which the facilities are used.

Fixed Costs

By definition, total fixed costs are unaffected by the level of capacity at which the feed yard is used. These costs are fixed in total amount. As a consequence, fixed costs per pound of beef produced increase as fewer pounds of beef are produced with a given size plant. Fixed costs made up a larger percentage of total costs for the small sized lots. Therefore, operation at less than capacity has a greater effect on costs per pound of gain for small lots than for larger lots. This may be illustrated by comparing the effect on fixed costs per pound of gain for the 300- and 2,400-head capacity yards operated at 50 percent of capacity. In each case fixed costs

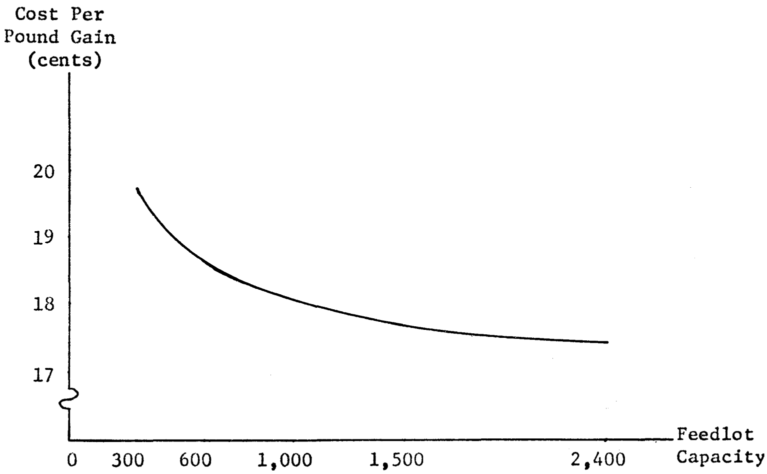

FIGURE 5. Total Costs Per Pound Gain—Warm-Up Feedlots.

per pound of gain are doubled. Fixed costs per pound of gain increase from 2.5 cents to 5.0 cents for the 300-head yard and from 0.9 cent to 1.8 cents for the 2,400-head yard. However, the absolute fixed costs per pound of gain increased 2.5 cents for the 300-head yard, or about 2.8 times the 0.9 cent increase for the 2,400-head yard.

Variable Costs

The variable costs that are not directly proportional to the number of cattle are: feeding labor, repairs, veterinary and medicine, fuel and lubricants, administration and bookkeeping, and power. The same assumptions as used in earlier cost computations were used throughout this section.

The total cost per pound of gain at varying levels of utilization of capacity are shown in Table 9 and presented graphically in Figure 6.

TABLE 9

Total Cost Per Pound of Gain at Various Levels of Utilization of Feedlots[1]

Percent of Capacity	Capacity of Yard (Number of Animals) 300	600	1,000	1,500	2,400
	(cents)	(cents)	(cents)	(cents)	(cents)
100	19.70	18.61	18.09	17.71	17.45
90	20.06	18.80	18.23	17.83	17.57
80	20.52	19.09	18.44	18.00	17.71
70	21.08	19.48	18.71	18.23	17.89
60	21.88	20.00	19.08	18.52	18.14

[1]Based on a 1.5-pound gain per head per day.

Fixed cost is the dominant factor in causing the short-run average cost curves to deviate from the long-run average cost curve when warm-up lots are operated at less than 100 percent of capacity (Figure 6). The relatively low investment costs for a warm-up feedlot enterprise, and consequent low ratio of fixed

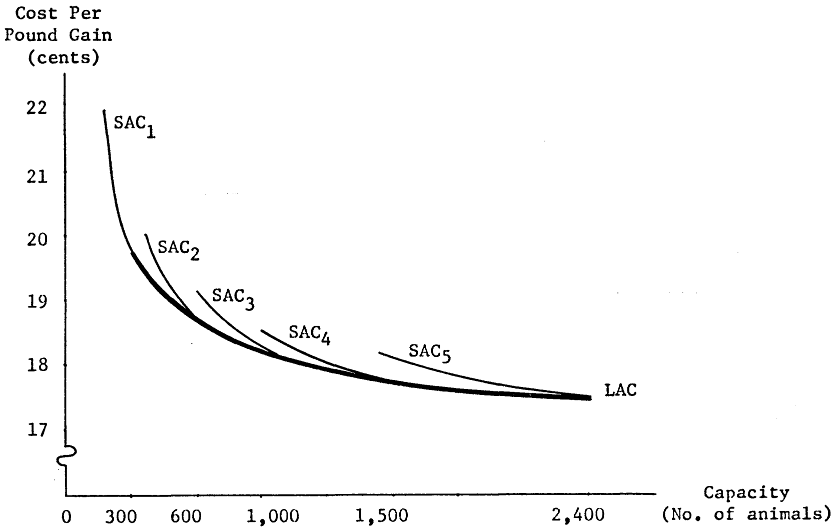

FIGURE 6. Short-Run Cost Curves—300-, 600-, 1,000-, 1,500-, and 2,400-Head Capacity Feedlots.

to variable costs, results in rather flat short-run cost curves for those yards with a capacity of 1,000 head or more. Essentially the same set of feed handling equipment will suffice for both a 2,400- and 1,000-head lot. Thus, the added fixed costs for a larger size lot are largely pen facilities for the additional livestock.

If a producer plans to feed a constant number of animals each year, say 600, a lot should be constructed at the capacity where the SAC_2 curve is at a minimum as shown in Figure 6. At this point the lowest cost of production, under the assumptions of this study, is achieved for this size feedlot. It is often the case that feedlot capacity is closely matched with hay production. If a producer has sufficient hay for a feeding enterprise of 1,500 head or more, but wishes to vary numbers fed with changes in price of hay and/or cattle, this may be accomplished within a fairly wide range of capacity without greatly influencing total costs of producing a pound of gain.

The divergence between theoretical short- and long-run cost curves and the empirically derived cost curves deserves mention. The definition of output and size of warm-up lots precludes the possibility of the appearance of the increasing portion of the theoretical short-run average cost curves above the minimum average cost position. In addition, the increasing portion of the long-run average cost curve as postulated in cost theory is not exhibited in the empirical long-run average cost curve derived for the range of different size feedlots analyzed in this study.

EFFECT OF CHANGES IN PURCHASE PRICE, SALE PRICE, AND FEED COSTS ON PROFITABILITY OF WARM-UP FEEDLOTS

Three important variables in determining the profitability of a warm-up enterprise are purchase price, sale price, and feed costs. Since the 1958–59 feeding year, Nevada warm-up operations have encountered a negative margin in terms of the relationship of the "in" price for calves and "out" price for feeder steers.[18] A 1- or 2-cent shift in price paid or received has a sizable influence upon profitability since calves gain only 200 to 250 pounds during the feeding period.

Figure 7 indicates profit per animal fed under varying purchase and sale prices.[19] This is based on the assumptions associated with the model 1,000-head capacity yard developed previously in this study and assumes prices of $25 per ton for hay and $10 per ton for silage. In Figure 7, purchase price of calves is shown on the horizontal axis and profit per head on the vertical axis. Profit is defined as the difference between gross receipts per head and total costs per head.[20] Each diagonal line on the graph represents a different sale price.

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[18]See Figure 10.

[19]Sale weight is assumed to be 592.8 pounds per animal. This represents the ending weight of 617.5 pounds less a 4 percent shrink.

[20]Total costs include a 6 percent interest charge on average investment and a labor charge of $1.50 per hour.

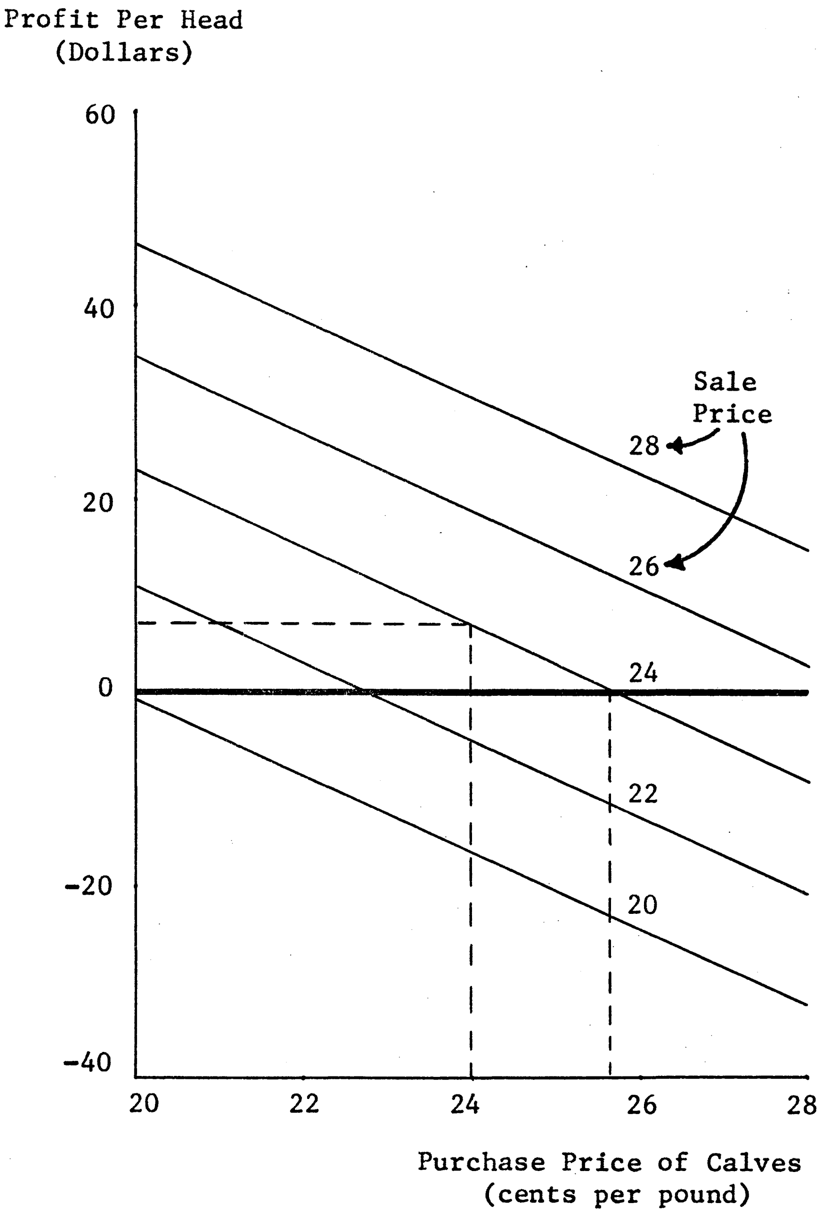

FIGURE 7. Effect of Purchase and Sale on Profit Per Head (1,000-Head Capacity Lot).

This graph illustrates the determination of anticipated profit per head, the breakeven sale price given the purchase price, and the breakeven purchase price given the anticipated sale price. Use of the graph may be illustrated by the following examples, assuming calves are both purchased and sold for 24 cents per pound.

Case 1—Profit Per Head: First, follow the line upwards from the **purchase price** of 24 cents to where it intersects the 24-cent sale price line. Then read the profit per head off the vertical axis at a point directly opposite the intersection of these two lines (approximately $6.92).

Case 2—Breakeven Sale Price:[21] Follow the line upwards from the **purchase price** of 24 cents to where it intersects the heavy dark line which is the "breakeven" or zero profit line. This point of intersection occurs approximately 40 percent of the vertical distance from the 22-cent sale price line to the 24-cent sale price line. Thus, the breakeven sale price is approximately $22.80 per hundredweight.

Case 3—Breakeven Purchase Price:[22] Assume calves have not been purchased and a sale price of 24 cents is anticipated. The purchase price that would permit a breakeven situation under these conditions may be determined as follows: First, follow the **sale price** line representing 24 cents down until it intersects the zero profit line. Then read the breakeven purchase price off the horizontal axis directly below this point of intersection (approximately $25.75 per hundred).

Figure 8 also illustrates the influence upon profitability of the absolute level of cattle prices as well as the margin between purchase and sale price. This results from the two types of margins that exist in feeding cattle. The "purchase versus sale price" margin may be thought of as applying only to the initial purchase weight. The "feeding" margin reflects the difference between sale price per pound and the cost of putting a pound of gain on an animal. If one assumes a constant purchase weight and cost per pound of gain, then the higher the absolute level of cattle prices, the more favorable becomes the "feeding" margin.

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[21]Breakeven sale price may be calculated from the following equation:

$$\text{Breakeven sale price per pound} = \frac{\text{Purchase price of calf} + \text{total cost per head in feeding period}}{\text{Sale weight of feeder steer (pounds)}}$$

[22]Breakeven purchase price may be calculated from the following equation:

$$\text{Breakeven purchase price per pound} = \frac{(\text{sale weight})\left(\begin{array}{c}\text{Anticipated}\\ \text{sale price}\end{array}\right) - \left(\begin{array}{c}\text{Total cost per head}\\ \text{in feeding period}\end{array}\right)}{\text{Purchase weight (pounds)}}$$

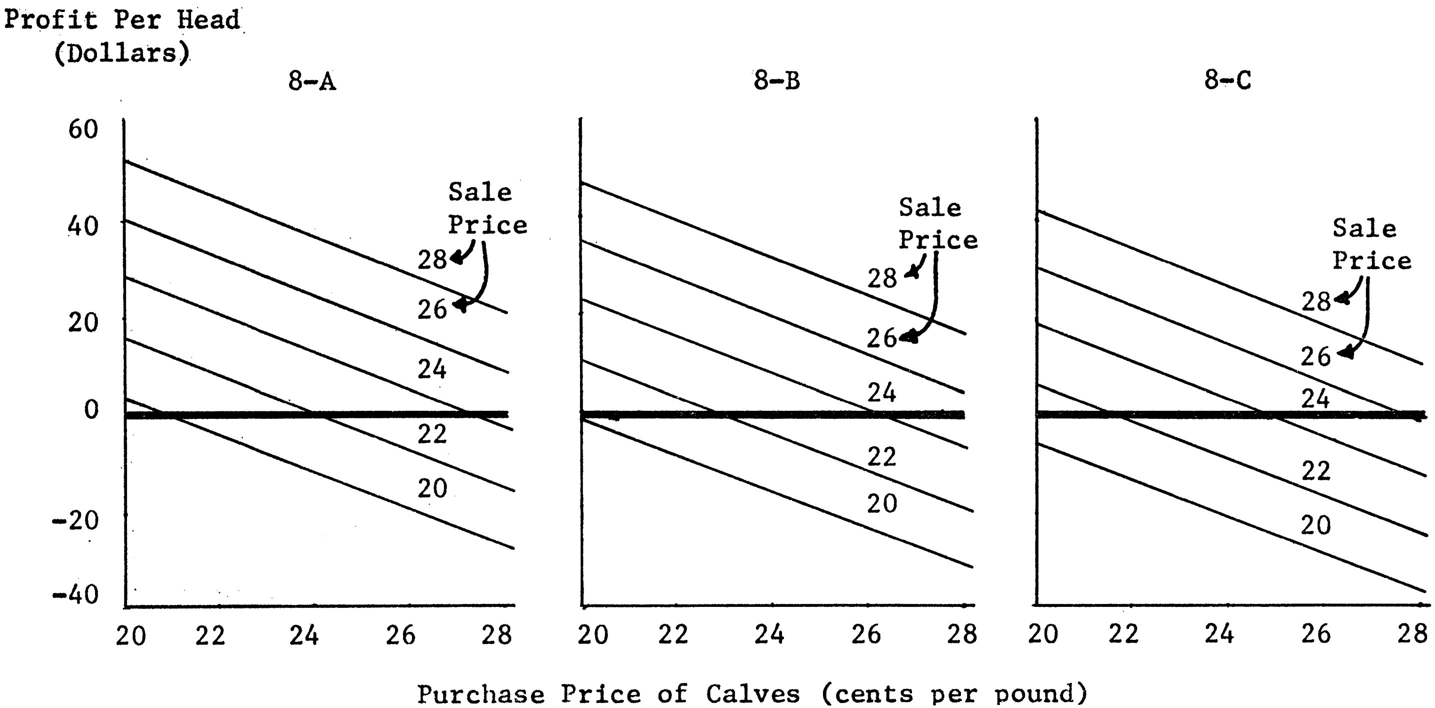

FIGURE 8. Effect of Feed Costs and Price Margin on Profitability of Warm-Up Cattle Feedlots. (Feed cost per pound gain: A=10.39 cents, B=12.98 cents, and C=15.58 cents.)

The "feeding" margin also increases in importance relative to the "purchase versus sale price" margin as the absolute level of cattle prices increase. This may be illustrated by assuming a constant negative "purchase versus sale price" margin of 2 cents and a sale price of 20 cents and 26 cents per pound. In the first case, assuming a sale price of 20 cents and a purchase price of 22 cents, the feeder would incur a loss of approximately $8.75 per head. In the second case, assuming a sale price of 26 cents and a purchase price of 28 cents, the feeder would make a profit of $2.78 per head. The profit difference between these two situations is a result of a constant cost of 18.09 cents per pound of gain for the 217.5-pound weight gain during the feeding period.

All other factors constant, cattle feeding profits will increase (or losses be reduced) as feed costs are reduced. This point is illustrated in Figure 8 employing the 1,000-head capacity model yard developed earlier in this study. The median feed cost situation, Figure 8–B, is the same graph as was shown separately in Figure 7 and assumes a hay price of $25 per ton and silage at $10 per ton. The low feed cost situation, Figure 8–A, assumes a 20 percent reduction in the price of both hay and silage, hay being priced at $20 and silage at $8 per ton.

The high feed cost situation, Figure 8–C, represents a 20 percent increase in feed prices with hay being priced at $30 and silage at $12 per ton. Assuming the conditions under the 1,000-head model feed yard developed earlier in this study, increasing or decreasing the cost of each feed item by 20 percent changed profit per head in the opposite direction by $5.66. A much smaller change in either purchase or sale price of cattle may have a greater effect upon profitability. A 1-cent per pound change in purchase price, assuming a 400-pound purchase weight, would change profitability per head by $4. If the 1-cent price change were on the shrunk sale weight of 592.8 pounds, the profit per head would change by $5.93, an amount greater than that resulting from a 20 percent shift in feed prices. Thus, if profits are to be maximized, it can be seen that feeders should exercise considerable care in purchase and sale of cattle.

ALL HAY RATION
(No Silage)

There are operations in the area under study that do not feed silage. This section examines operations of the same size feedlots as before, but assumes a ration of straight chopped alfalfa hay.

Investment Costs

Investment in equipment and facilities shown earlier would be unchanged except for deletion of the cost of constructing trench silos. This is a rather small part of investment amounting to approximately 54 cents per head capacity. In addition, it would not be necessary for an operator to have a corn head for a chopper. A one-row corn head costs approximately $500. Although this investment in forage harvesting equipment does not appear in the inventory of equipment under the "model" feeding system, investment for the total ranch unit would be reduced by this amount.

Fixed Costs

The savings in fixed costs are all related to reduced investment as a result of no need to harvest or store corn silage. These savings are shown in Table 10.

TABLE 10

Savings in Annual Fixed Costs With All Hay Ration[1]

Item	Size Lot (Number of Animals) 300	600	1,000	1,500	2,400
Depreciation and interest	$12	$24	$39	$59	$94
Taxes	2	3	5	7	11
Insurance	2	3	5	8	13
Repairs	3	5	8	12	19
Total savings	$19	$35	$57	$86	$137
Savings per head	$0.063	$0.058	$0.057	$0.057	$0.057

[1]Includes reduction in fixed costs associated with deletion of requirement for corn head on chopper.

Variable Costs

Variable costs differ with respect to feed costs, feeding labor requirements, fuel and lubricants associated with use of feeding equipment, and interest on investment in feed. Animal scientists at the University of Nevada and several warm-up feedlot operators stated that the feeding of silage tended to reduce digestive problems, particularly bloat associated with last-cutting alfalfa. Lacking any substantive quantitive information on this or the relative efficiencies of these two feeds under warm-up lot conditions, they are equated on a TDN basis. A ration of 14.9 pounds alfalfa hay is assumed to substitute equally for 8.2 pounds of silage and 12.3 pounds of hay. Using the same basic hay price as under the model feeding plan, the cost equation becomes:

$F''c = \$0.1861X$

$F''c$ = Total feed costs using a ration of straight chopped alfalfa hay (dollars).

X = Animal days on feed.

This equation yielded a feed cost per pound of gain of 12.41 cents as opposed to 13 cents for the hay-silage ration.

Feeding labor requirements are not greatly changed from the hay-silage feeding system. The feeding labor requirements for each size lot under an all hay feeding program are shown in Table 11. Fuel and lubricant costs were reduced approximately 12 percent with deletion of the silage feeding task. Interest on investment in feed is $0.86 per head, compared to the $1.13 per head under the hay-silage feeding program. This results in an interest

TABLE 11
Feeding Labor Requirements With an All Hay Feeding Program

Size of Yard (No. of Animals)	Feeding Labor Hours	Cost at $1.50 Per Hour	Cost Per Pound Gain
300	174.0	$261.00	$0.00400
600	253.8	380.63	.00292
1,000	401.2	601.75	.00277
1,500	551.0	826.50	.00253
2,400	855.5	1,283.25	0.00246

savings of $0.00124 per pound of gain. The total cost of producing a given amount of gain in the feedlot under a hay-silage combination or an all hay feeding system is quite sensitive to relative prices of hay and silage.

The above calculations indicate lower costs per pound of gain with an all hay feeding program (Table 12). This condition is dependent upon three important assumptions: (1) A $10 per ton price for silage was assumed based on estimates of feeders in the

TABLE 12
Costs Per Pound of Gain Under an All Hay and a Hay-Silage Feeding Program

Size Lot (No. of Animals)	Total Cost Per Pound Gain: Hay-Silage	All Hay
300	$0.1970	$0.1875
600	.1861	.1770
1,000	.1809	.1722
1,500	.1771	.1688
2,400	0.1745	0.1666

area, (2) hay and silage were assumed to be equally efficient in producing gain when equated on a TDN basis, and (3) all costs other than those explicitly set forth in the first part of this section are independent of the feed ration.

The breakeven price for silage in order to make the hay-silage and all hay feeding systems equal in terms of cost per pound of gain would be $6.82 per ton. This calculation is based on an alfalfa price of $25 per ton, using the 1,000-head capacity feedlot, and adhering to the second and third assumptions mentioned above. If silage were priced in relation to hay on the basis of TDN ratios, $25 per ton for hay would be equivalent to $7.94 per ton for corn silage.[23] Using this ratio of hay to corn silage prices (25.00:7.94), the cost per pound of gain with a 1,000-head capacity lot is 17.52 cents with a hay-silage ration and 17.22 cents with an all hay ration.

A secondary consideration not evaluated in the above comparisons is the relative productivity of corn for silage versus other crops that may be used in rotation with alfalfa. To the extent that corn for silage enjoys an advantage over barley, its most common alternative crop, the hay-silage ration is unduly disadvantaged in relation to the all hay ration.

A number of variables need to be considered when determining the appropriate ration for a warm-up cattle feeding enterprise. The procedure for costing inputs is one of the most critical problems. This is particularly true of inputs produced on the farm or ranch for which there is no established market for the product. This is the case with silage. The analysis reported in this section **is not** meant as an endorsement for either feeding system. The least cost method of feeding these cattle is largely dependent upon the relative prices assumed for hay and silage.

CUSTOM FEEDING VERSUS OWNERSHIP OF CATTLE*

The most common custom feeding arrangements are a fixed charge per pound of gain, a fee per animal day on feed, a fee based on feed consumed, or variations of these basic methods. The effect upon the feedlot operator's profit of various cattle prices and custom rates, under custom feeding versus ownership of cattle, is analyzed in the following part of this study.

The predominant type of feeding contract, a fixed fee per pound of gain, serves as the contractual agreement assumed for purposes of this analysis. Under this contractual agreement, all costs incident to operation of the feedlot except death loss, veterinary expenses, and interest on investment in livestock are normally borne by the feedlot operator. All charges are based on the cost structure associated with a 1,000-head capacity feedlot.

Assuming the same basic feedlot model as developed earlier in this report, and feed costs of $25 per ton for hay and $10 per ton for silage, the cost per pound of gain under this type of custom

[23]Assumes alfalfa hay at 57.6 percent TDN and corn silage at 18.3 percent TDN. Estimates of TDN for alfalfa were obtained from the Animal Science Division, Max C. Fleischmann College of Agriculture, University of Nevada. Percent TDN for silage was obtained from Frank B. Morrison, *Feeds and Feeding*, 22nd Edition, Morrison Publishing Company, Ithaca, New York, 1956.

*The term "ownership of cattle" will be used in this study to represent the situation where the cattle being fed are owned by the feedlot operator.

contract would be $0.1577. A breakdown of these costs is shown in Table 13.

Feed represents the largest cost item in this type of enterprise. However, feed costs are not a variable between systems when

TABLE 13

Costs Per Pound of Gain Under Custom Feeding Contract Model—1,000-Head Feedlot

Item	Cost Per Pound Gain
Fixed costs	$0.01373
Feed	.12983
Interest on feed	.00520
Labor: (a) feeding	.00368
(b) non-feeding	.00126
Repair costs	.00117
Fuel and lubricants	.00126
Administration and bookkeeping	.00144
Power	0.00013
Total weight gain	$0.15770
Reimbursable weight gain[1]	$0.17236

[1]Reimbursable weight gain reflects a 3 percent shrink on "outweight."

comparing custom versus ownership of the cattle being fed. Feed prices do not depend upon ownership of the cattle. Custom rates and purchase and sale prices of cattle are the important variables when comparing the two feeding systems. Returns above total cost for a 1,000-head feedlot operated at capacity under varying custom rates and prices are shown in Table 14. The most commonly quoted rate for custom feeding in 1963 and 1964 was 18 cents per pound of gain.

TABLE 14

Returns Above Cost Per Head to Feedlot Operator for Custom Feeding Versus Ownership of Cattle at Differing Purchase and Sale Prices and Custom Rates[1]

Type of Operation					
Feeding Cattle Owned by Feedlot Operator				Custom Feeding	
Purchase Price Per Pound for Feeder Calves (Cents)	Returns Above Cost Per Head for Different Sale Prices Per Pound for Feeder Steers: 20 Cents	22 Cents	24 Cents	Custom Rate Per Pound of Gain (Cents)	Returns Above Cost on Per Head Basis
20	—$0.79	$11.07	$22.92	17	—$0.47
	—0.79	11.07	22.92	18	1.52
	—0.79	11.07	22.92	19	3.51
22	—8.79	3.07	14.92	17	—0.47
	—8.79	3.07	14.92	18	1.52
	—8.79	3.07	14.92	19	3.51
24	—16.79	—4.93	6.92	17	—0.47
	—16.79	—4.93	6.92	18	1.52
	—16.79	—4.93	6.92	19	3.51

[1]Based on model 1,000-head feedlot developed in this study and feed costs of $0.1298 per pound of gain.

Final weighing conditions vary among operators and between lots which custom feed and those lots feeding their own cattle. A 3 percent shrink is typically taken on cattle custom fed on a cost per pound of gain basis in Nevada warm-up lots. The profit figures for custom feeding shown in Table 14 and Figure 9 are based on payment being received for a 199-pound gain per animal during the feeding period. This results from a 617.5-pound final weight less a 3 percent shrink (18.5 pounds) and an initial weight of 400 pounds. Weighing conditions for the cattle owned by the feedlot operator assume a 4 percent shrink. Thus, the profit figures for a feedlot operation in which cattle are owned by the operator as shown in Table 14 and Figure 9 are based on a sale weight of 592.8 pounds. This sale weight is the final weight (617.5 pounds) less a 4 percent shrink (24.7 pounds).

Assuming a custom rate of 18 cents per pound of gain and the cost assumptions used in the basic model, it may be seen that if the estimated sale price were 20 cents per pound, a feedlot operator would be better off to custom feed within the range of calf purchase prices shown in the table. Using an 18-cent custom rate and an estimated sale price of 22 cents per pound, Table 14 indicates that the operator would obtain greater returns through ownership of the cattle at purchase prices through 22 cents and that custom feeding would be preferable at a purchase price of 24 cents per pound.

Figure 9 graphically illustrates the information shown in the previous table and permits easy estimation of breakeven points between custom feeding and ownership of cattle.[24] Assuming a given custom feeding rate and sale price, the breakeven purchase price of calves is read off the horizontal axis at a point directly below the intersection of the custom rate and sale price lines. As an example, assume a custom rate of 18 cents and a sale price of 20 cents. These two lines intersect at a point directly above the point representing a breakeven purchase price of 19.42 cents (Point A on Figure 9). Thus, if calves can be purchased for less than 19.42 cents per pound, a feedlot operator would obtain greater profit through owning the cattle rather than custom feeding.

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[24]Breakeven points may be calculated from the following formulas:

$$\text{Breakeven purchase price (cents per lb.)} = \frac{(Sw \times Sp) + (G \times Cc) - (K \times G') - (G \times Co)}{Pw}$$

$$\text{Breakeven sale price (cents per lb.)} = \frac{(Pw \times Pp) + (K \times G') + (G \times Co) - (G \times Cc)}{Sw}$$

where Sw = final sale weight adjusted for shrink (computations based on 4 percent shrink).
Sp = final sale price.
Pw = purchase weight.
Pp = purchase price.
G = pounds of gain during feeding period.
G' = pounds of gain during the feeding period after deducting the shrinkage associated with custom feeding contracts (computations based on 3 percent shrink).
Co = cost per pound of gain if cattle owned.
Cc = cost per pound of gain if cattle custom fed.
K = custom charge per pound of gain.

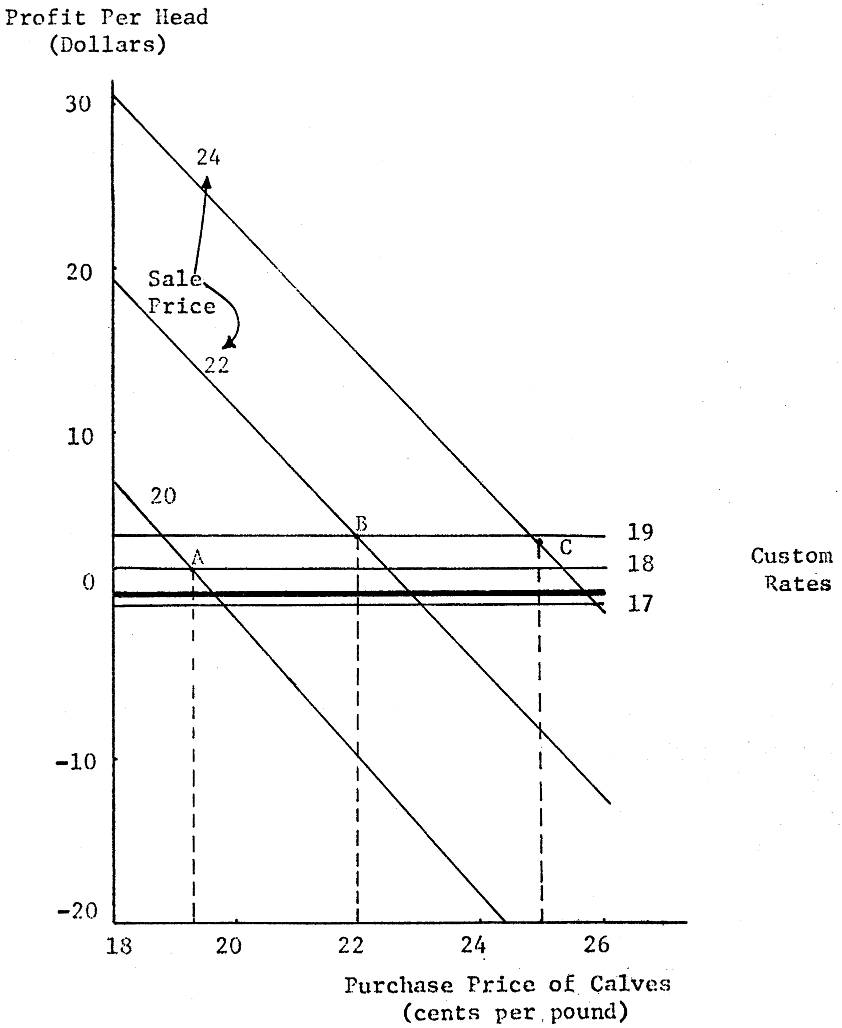


FIGURE 9. Breakeven Analysis for Custom Feeding Versus Ownership of Cattle for Warm-Up Feedlot Operations.

Assuming a custom rate and purchase price, the breakeven sale price is easily read off of Figure 9. The breakeven sale price is found first by locating the point of intersection of the purchase price and custom rate and then estimating the position of this point relative to the sale price lines above and below the point of intersection. As an example, assume a purchase price of 22 cents and a custom rate of 19 cents per pound of gain. These lines intersect at a point slightly above the 22-cent sale price line (Point B on Figure 9). Thus, the breakeven sale price between custom feeding and owning the cattle under these conditions is slightly greater than 22 cents per pound (22.07 cents). If an operator estimates that animals leaving the yard will sell for a price greater than 22.07 cents, profits would be greater through ownership rather than custom feeding.

Breakeven custom rates are found in a similar manner. Locate the point of intersection of the assumed purchase and sale prices, then note where this point of intersection lies with respect to the custom rate lines. As an example, assume a purchase price of 25 cents and a sale price of 24 cents per pound. These lines intersect at point C on Figure 9. This point lies approximately three-fourths of the distance from the 18-cent to the 19-cent custom rate line. The formula shown in footnote 24 yields a breakeven custom rate of $18.70 per hundred pounds of gain. Thus, with an estimated purchase price of 25 cents and sale price of 24 cents per pound, a feedlot operator would prefer to own the cattle unless custom rates were greater than 18.7 cents per pound of gain.

The foregoing analysis does not explicitly consider the added element of risk associated with cattle ownership. An operator with a high aversion to risk may well accept a lower average return per head with custom feeding in order to avoid the risk associated with ownership of cattle.

HISTORICAL ANALYSIS OF COST AND PRICE RELATIONSHIPS AND PROFITABILITY OF NEVADA WARM-UP FEEDLOT OPERATIONS

Cattle warm-up feedlots in Nevada have been a segment of the state's agricultural economy for many years. The relationship of costs, prices, and profits as related to feeding operations over a period of time is of interest to feedlot operators, financial lending agencies, and other groups interested in Nevada's warm-up feeding industry. An understanding of fluctuations in market prices of cattle and calves over time and their effect on margins and profitability should provide some guidance in decision-making related to the feeding enterprise.

Feeder Steer Calf and Feeder Steer Prices

Prices for feeder steer calves and feeder steers for 11 feeding years, 1953–54 to 1963–64, are illustrated in Figure 10.[25] Since a time series for prices of these classes of animals was not available for a market in Nevada, a California market was used as a basis for determining prices for Nevada feeder steer calves and feeder steers.[26] A published price series was available for the Stockton, California, market.[27] Sale prices for Nevada feeder steers leaving the warm-up lot were estimated from this market by adjusting Stockton prices for shrinkage and transportation charges. Purchase prices or the value of feeder steer calves in Nevada were also derived from Stockton market prices. Since 65 percent of the feeder steer calves entering Nevada warm-up lots were obtained from a supply source other than warm-up operators' own herds, two methods were employed in the attempt to determine prices of feeder steer calves in Nevada. First, those feeder steer calves originating from operators' own herds were priced in the same manner as feeder steers, i.e., Stockton price minus transportation and shrinkage. Second, prices for those feeder steer calves purchased by warm-up lot operators from sources in Nevada[28] other than their own herds, were estimated in the following manner; the feeder steer calf price in the Stockton market was used as the basic price. This price was adjusted to a price at a Nevada supply source for feeder calves (ranches, auctions, etc.) by deducting shrinkage and transportation charges represented by an average distance for which cattle are shipped between Nevada and California. This price at Nevada supply sources was adjusted upward to reflect intrastate shipment of feeder calves from Nevada supply sources to the warm-up feedlot. The average distance for feeder calf shipments within Nevada was 150 miles.[29] Estimated feeder steer calf prices obtained from

[25]Market weights for feeder steer calves and feeder steers range from 300 to 500 pounds and from 500 to 800 pounds, respectively.

[26]Approximately 65 percent of Nevada's feeder steers marketed from warm-up lots are shipped to California. Malone and Friesen, op. cit.

[27]United States Department of Agriculture and California Department of Agriculture, *Livestock and Meat Prices and Receipts*, Federal-State Market News Service, Sacramento and Washington, D.C., various issues.

[28]More than 63 percent of feeder calves entering warm-up lots originate within the State. Malone and Friesen, op. cit.

[29]Edmund R. Barmettler, *Interstate Transportation for Nevada Cattle*, Max C. Fleischmann College of Agriculture, University of Nevada, Reno, Bulletin 234, February, 1964.

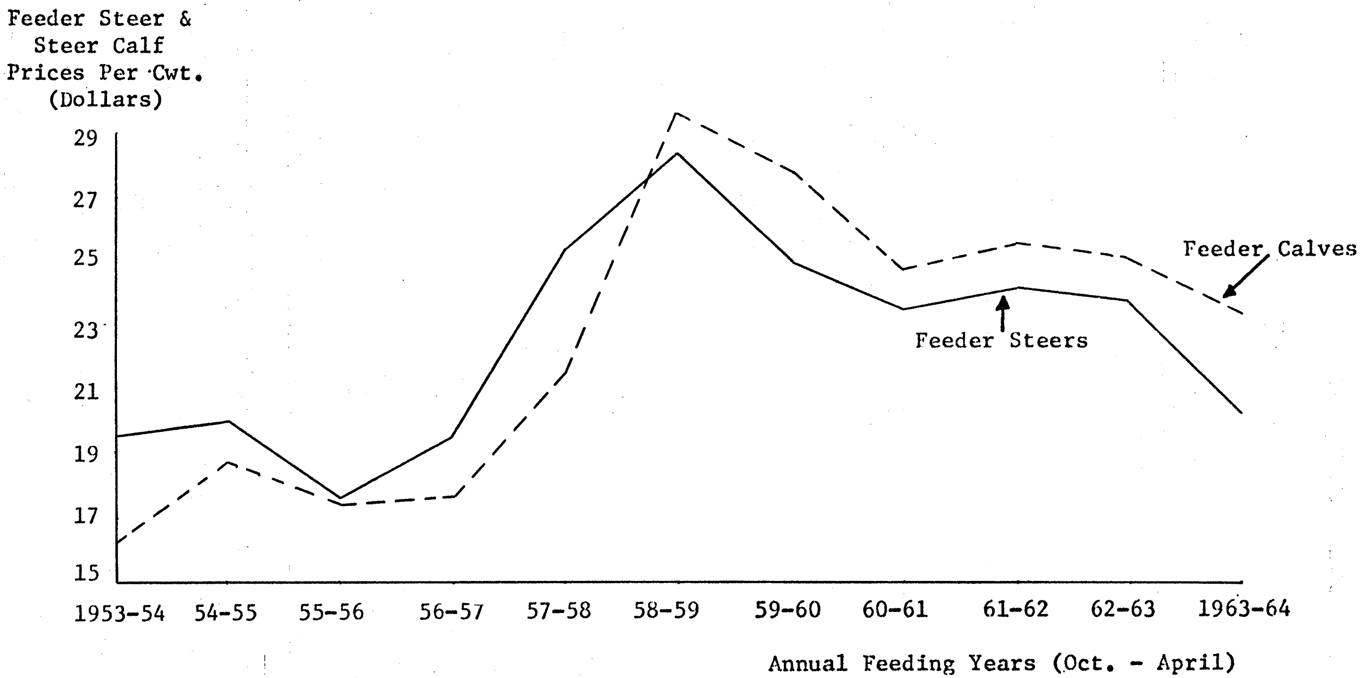


FIGURE 10. Feeder Steer and Feeder Steer Calf Prices (Choice and Good) for Feeding Years 1953–54 to 1963–64.

the two methods described above were used to obtain a weighted price for Nevada feeder steer calves.

Prices for feeder steer calves and feeder steers reflect Choice and Good grades since the Stockton market did not differentiate between the two grades until 1962. Calf prices represent October-November market prices and steer prices were obtained from price quotations for the months of March and April. These sets of monthly prices correspond closely to the feeding period of warm-up operations in Nevada which begin in the late fall and end in early spring.

The estimated price series for feeder calves and steers as shown in Figure 10 indicates that a positive price margin for steers and calves existed from the 1953–54 feeding year up to the 1958–59 period. A negative price margin between steers and calves occurred every year from the 1958–59 to the 1963–64 feeding year. The existence of a relatively large negative margin, as shown in the following section, has often been associated with losses for the warm-up operation.

ESTIMATES OF PROFIT PER HEAD[30] FOR NEVADA WARM-UP FEEDLOTS, 1953–54 TO 1963–64

Profitability of warm-up feedlot operations on a per-head basis for the feeding years 1953–54 to 1963–64 is illustrated in Figure 11. Purchase prices of calves and sale prices of feeder steers used in this analysis of profitability per head were those estimated in the previous section. As in preceding analyses in this study, the 1,000-head feedlot model is used in determination of profit per head.

In an attempt to show the effect of time on investment costs for the warm-up operation in relation to profitability per head, two modifications of the basic 1,000-head feedlot based on 1964 investment costs were introduced. Investment cost for a 1,000-head feedlot utilizing the same equipment and facilities as the basic feedlot were calculated using 1953 and 1958 prices. Investment costs for these two feedlots were derived by adjusting investment costs for the basic feedlot by the appropriate indexes of prices paid by farmers.[31]

The effect of non-feed variable costs of feedlot operations over

[30]The reader is reminded that in the calculation of profit in this study total cost includes a 6 percent return on investment plus a return to labor of $1.50 per hour.

[31]United States Department of Agriculture, *Agricultural Prices,* AMS, Various Annual Summaries, Washington, D.C.

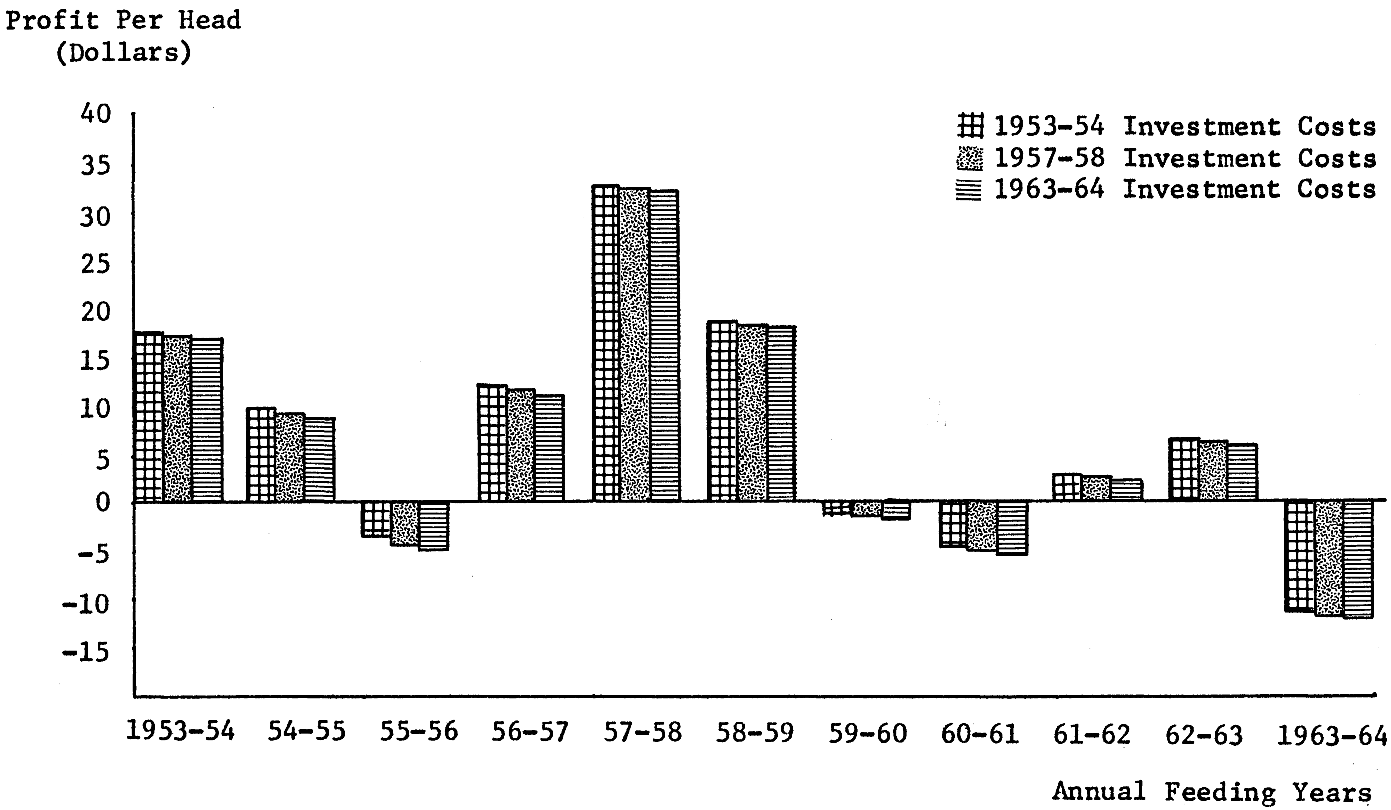


FIGURE 11. Profitability Per Head for 1,000-Head Capacity Feedlots With 1953, 1958, and 1964 Investment Costs for Annual Feeding Years 1953–54 to 1963–64.

time in relation to profitability per head was also considered. Nonfeed variable costs of operations were adjusted over the time period by deflating or inflating these costs for any given year by the appropriate indexes of prices paid by farmers.

A published price series for alfalfa hay for the time period under consideration was available.[32] Prices of corn silage over time were not available. For purposes of this study, corn silage prices at the silo were valued at 45 percent of alfalfa prices on a ton basis. The general equation is below:

$$CS_p = (A_p - .50\ A_p) - .10\ (A_p - .50\ A_p)$$

where:

$CS_p =$ price of corn silage.
$A_p =$ price of alfalfa hay.

The 10 percent factor is an allowance value for shrinkage of silage in the silo. Formulation of the above relationship was based on discussion with some warm-up feedlot operators and extension personnel in the area. Given the price series for alfalfa hay, corn silage prices for the time period under study were estimated from the equation above.

Profits per head for a 1,000-head capacity feedlot employing the 1953, 1958, and 1964 models for the time period 1953–54 to 1963–64 are shown in Figure 11. The difference among the three models with respect to profits per head is the result of differences in fixed costs per head. Total fixed costs per head were $2.99, $2.73, and $2.51 for the 1964, 1958, and 1953 models, respectively. The differences in fixed costs per head are attributable to price increases for the majority of items comprising the index of prices paid by farmers over the period of time under study.

A positive margin was apparent for the first 5 years of the 11-year period (Figure 10). A loss or negative profit per head occurred in only 1 of these years (Figure 11). During the last 6 years, a negative margin existed between feeder steers and feeder steer calves. Figure 11 shows that losses or negative profits per head occurred in 3 out of the 6 feeding years. It is clear that a positive or negative price margin, by itself, is not indicative of profits or losses. It is the degree of spread between prices of feeder steer calves and feeder steers, given costs of operation and the feeding margin, that will determine a positive or negative profit.

[32]Hartley, op. cit.

SELECTED REFERENCES

BARMETTLER, EDMUND R., *Interstate Transportation for Nevada Cattle,* Max C. Fleischmann College of Agriculture, University of Nevada, Reno, Bulletin 234, February, 1964.

BOULDING, KENNETH E., *Economic Analysis,* Third Edition, Hamish Hamilton, London, 1955.

FRIESEN, HERBERT N., "Cost Analysis of Nevada Cattle Feeding Operations," Unpublished Masters Thesis, Division of Agricultural Economics and Education, University of Nevada, Reno, June, 1965.

HARTLEY, MABEL L., *Nevada Farm Prices, 1910 to 1963, and Farm Price Index,* Max C. Fleischmann College of Agriculture, University of Nevada, Reno, R–8, November, 1964.

KING, GORDON A., *Economies of Scale in Large Commercial Feedlots,* California Agricultural Experiment Station, Giannini Foundation of Agricultural Economics, University of California, Research Report No. 251, March, 1962.

MALONE, JOHN W., JR., and FRIESEN, HERBERT N., *Cattle Feedlot Operations in Nevada,* University of Nevada, Max C. Fleischmann College of Agriculture, B 2, December, 1964.

McDOWELL, JAMES I., "Scale Economies and Returns in Commercial Cattle Feedlots," Unpublished Ph.D. Dissertation, Department of Agricultural Economics, Oklahoma State University, Stillwater, May, 1964.

MORRISON, FRANK B., *Feeds and Feeding,* 22nd Edition, Morrison Publishing Company, Ithaca, New York, 1956.

MYLES, GEORGE A., *Harvesting Alfalfa Hay in Western Nevada,* Nevada Agricultural Experiment Station, Circular 17, May, 1959.

REED, A. D., *Machinery Costs and Performance,* University of California Agricultural Extension Service, Unnumbered Mimeo, February, 1964.

RICHARDS, JACK A., and KORZAN, GERALD E., *Beef Cattle Feedlots in Oregon . . . A Feasibility Study,* Oregon State University, Agricultural Experiment Station, Corvallis, Special Report No. 170, March, 1964.

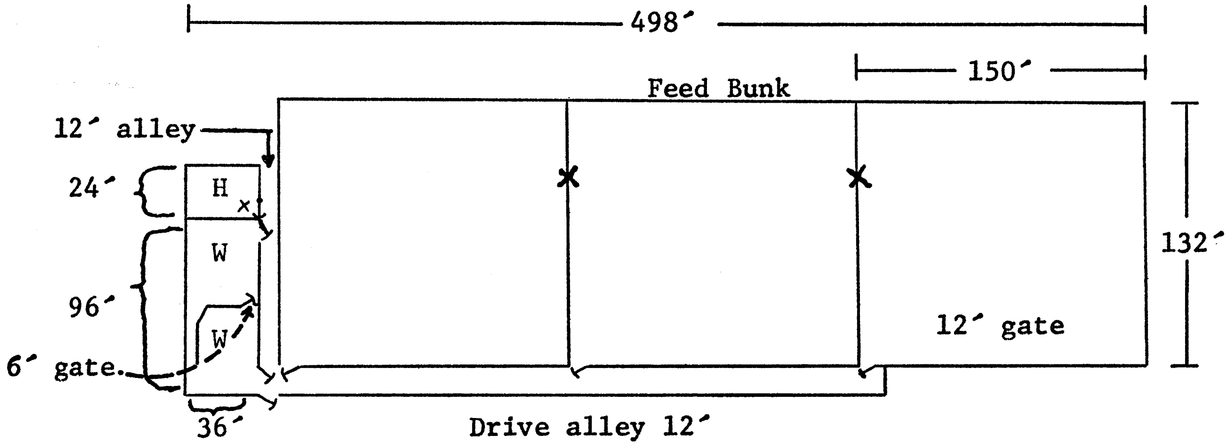
SIERRA PACIFIC POWER COMPANY, *Schedule RS Residential Service,* Reno, Nevada, May, 1963.

UNITED STATES DEPARTMENT OF AGRICULTURE AMS, *Agricultural Prices,* Various Annual Summaries, Washington, D.C.

UNITED STATES DEPARTMENT OF AGRICULTURE and CALIFORNIA DEPARTMENT OF AGRICULTURE, *Livestock and Meat Prices and Receipts,* Federal-State Market News Service, Sacramento and Washington, D.C., Various issues.

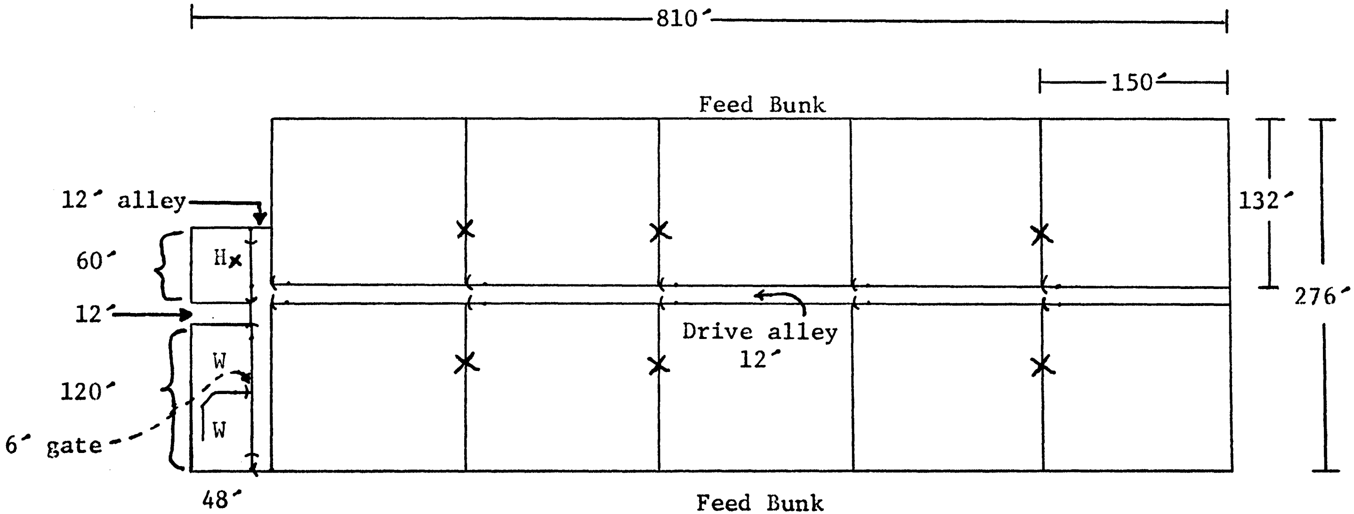
VINER, JACOB, "Cost Curves and Supply Curves," *American Economic Association Readings in Price Theory,* Editors Stigler and Boulding, Richard D. Irwin, Inc., Chicago, Vol. 6, 1952.

W - Working pens
H - Hospital pen
X - Water trough



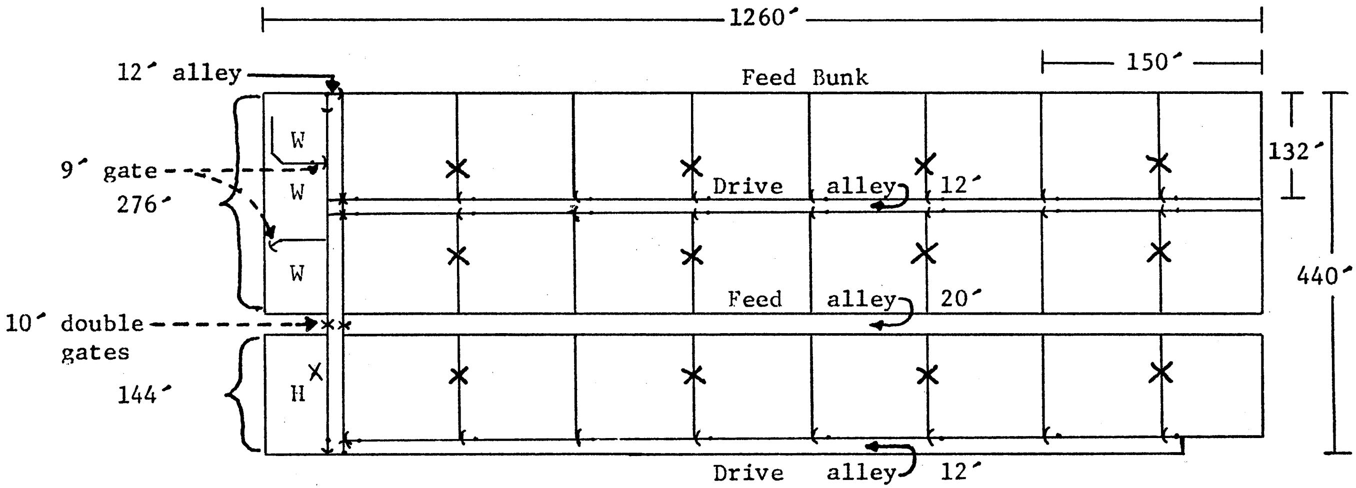
APPENDIX FIGURE 1. Design for 300-Head Capacity Warm-Up Feedlot.

W - Working pens
H - Hospital pen
X - Water trough



APPENDIX FIGURE 2. Design for 1,000-Head Capacity Warm-Up Feedlot.

W - Working pens
H - Hospital pen
X - Water trough



APPENDIX FIGURE 3. Design for 2,400-Head Capacity Warm-Up Feedlot.

APPENDIX TABLE 1
Investment Costs for 300–Head Lot

Item	Cost — Total	Cost — Per Head
Feeding pens and bunks:		
Fences and gates, 2 in. x 6 in.—9,078 bd. ft. @ $90 per M	$817	$2.72
Posts, 6 in. x 6 in.—3,588 bd. ft. @ $118 per M	423	1.41
Labor—50% of materials	620	2.07
Hardware	43	0.14
Concrete bunk bottom—14 cu. yds. @ $16 per yd.	224	0.75
Labor on concrete—25% of materials	56	0.19
Working and hospital pens:		
Fences and gates—3,114 bd. ft. @ $90 per M	280	0.93
Posts—1,200 bd. ft. @ $118 per M	141	0.47
Labor—50% of materials	211	0.70
Hardware	47	0.16
Scales—5-ton capacity	1,274	4.25
Pickup truck (used)	500	1.67
Livestock squeeze and sprayer (one-half)	375	1.25
Water system	895	2.98
Tractor (one-half)—30 hp. gasoline	1,518	5.06
Hay fork	1,425	4.75
Elevator (one-half)—50 ft.	600	2.00
Self-unloading wagon	2,450	8.17
Trench silo—60 cents per cu. yd. of earth moved	162	0.54
Land—2.2 acres @ $400	880	2.93
Totals	$12,941	$43.14

APPENDIX TABLE 2
Investment Costs for 600–Head Lot

Item	Cost — Total	Cost — Per Head
Feeding pens and bunks:		
Fences and gates, 2 in. x 6 in.—15,660 bd. ft. @ $90 per M	$1,409	$2.35
Posts, 6 in. x 6 in.—6,042 bd. ft. @ $110 per M	713	1.19
Labor—50% of materials	1,061	1.77
Hardware	86	0.14
Concrete bunk bottom—27 cu. yds. @ $16 per yd.	432	0.72
Labor on concrete—25% of materials	108	0.18
Working and hospital pens:		
Fences and gates—3,602 bd. ft. @ $90 per M	324	0.54
Posts, 6 in. x 6 in.—1,329 bd. ft. @ $118 per M	157	0.26
Labor—50% of materials	241	0.40
Hardware	48	0.08
Scales—5-ton capacity	1,274	2.12
Pickup truck (used)	500	0.83
Livestock squeeze and sprayer (one-half)	375	0.63
Water system	1,425	2.38
Tractor (one-half)—30 hp. gasoline	1,518	2.53
Hay fork	1,425	2.38
Elevator (one-half)—50 ft.	600	1.00
Self-unloading wagon (2)	4,900	8.17
Trench silo—60 cents per cu. yd. of earth moved	324	0.54
Land—4.3 acres @ $400	1,720	2.87
Totals	$18,640	$31.07

APPENDIX TABLE 3
Investment Costs for 1,000-Head Lot

Item	Cost — Total	Cost — Per Head
Feeding pens and bunks:		
Fences and gates, 2 in. x 6 in.—25,396 bd. ft. @ $90 per M	$2,286	$2.29
Posts, 6 in. x 6 in.—9,726 bd. ft. @ $118 per M	1,148	1.15
Labor—50% of materials	1,717	1.72
Hardware	137	0.14
Concrete bunk bottom—44 cu. yds. @ $16 per yd.	704	0.70
Labor on concrete—25% of materials	176	0.18
Working and hospital pens:		
Fences and gates—4,054 bd. ft. @ $90 per M	365	0.37
Posts—1,568 bd. ft. @ $118 per M	185	0.19
Labor—50% of materials	275	0.28
Hardware	57	0.06
Scales—5-ton capacity	1,274	1.27
Pickup truck (used)	500	0.50
Livestock squeeze and sprayer	750	0.75
Water system	1,541	1.54
Tractor (one-half)—40 hp. gasoline	2,025	2.03
Hay fork	1,900	1.90
Elevator—50 ft.	1,200	1.20
Self-unloading wagon (2)	4,900	4.90
Trench silo—60 cents per cu. yd. of earth moved	540	0.54
Land—6.7 acres @ $400	2,680	2.68
Totals	$24,360	$24.36

APPENDIX TABLE 4
Investment Costs for 1,500-Head Lot

Item	Cost — Total	Cost — Per Head
Feeding pens and bunks:		
Fences and gates, 2 in. x 6 in.—37,568 bd. ft. @ $90 per M	$3,381	$2.25
Posts, 6 in. x 6 in.—14,520 bd. ft. @ $118 per M	1,713	1.14
Labor—50% of materials	2,547	1.70
Hardware	204	0.14
Concrete bunk bottom—66 cu. yds. @ $16 per yd.	1,056	0.70
Labor on concrete—25% of materials	264	0.18
Working and hospital pens:		
Fences and gates—4,584 bd. ft. @ $90 per M	413	0.28
Posts—1,986 bd. ft. @ $118 per M	235	0.16
Labor—50% of materials	325	0.22
Hardware	61	0.04
Scales—5-ton capacity	1,274	0.85
Pickup truck (used)	500	0.33
Livestock squeeze and sprayer	750	0.50
Water system	1,980	1.32
Tractor (one-half)—40 hp. gasoline	2,025	1.35
Hay fork	1,900	1.27
Elevator—50 ft.	1,200	0.80
Self-unloading wagon (2)	4,900	3.27
Trench silo—60 cents per cu. yd. of earth moved	810	0.54
Land—9.7 acres @ $400	3,880	2.59
Totals	$29,418	$19.61

APPENDIX TABLE 5
Investment Costs for 2,400–Head Lot

Item	Cost Total	Cost Per Head
Feeding pens and bunks:		
Fences and gates, 2 in. x 6 in.—65,658 bd. ft. @ $90 per M	$5,909	$2.46
Posts, 6 in. x 6 in.—24,375 bd. ft. @ $118 per M	2,876	1.20
Labor—50% of materials	4,393	1.83
Hardware	424	0.18
Concrete bunk bottom—105 cu. yds. @ $16 per yd.	1,680	0.70
Labor on concrete—25% of materials	420	0.18
Working and hospital pens:		
Fences and gates—6,436 bd. ft. @ $90 per M	580	0.24
Posts—2,676 bd. ft. @ $118 per M	316	0.13
Labor—50% of materials	448	0.19
Hardware	94	0.04
Scales—5-ton capacity	1,274	0.53
Pickup truck (used)	500	0.21
Livestock squeeze and sprayer	750	0.31
Water system	2,697	1.12
Tractor (one-half)—40 hp. gasoline	2,025	0.84
Hay fork	1,900	0.79
Elevator—50 ft.	1,200	0.50
Self-unloading wagon (2)	4,900	2.04
Trench silo—60 cents per cu. yd. of earth moved	1,296	0.54
Land—15.2 acres @ $400	6,080	2.53
Totals	$39,762	$16.57

APPENDIX TABLE 6

Annual Depreciation and Interest Charge on Investment in Warm-Up Feedlot Models

Item	Useful Life (Years)	Capacity 300	600	1,000	1,500	2,400
Pen facilities	20	$250	$399	$615	$889	$1,495
Self-unloading wagons	12	278	555	555	555	555
Tractor	12	172	172	230	230	230
Hay fork	12	162	162	215	215	215
Pump and water system	15	66	98	132	178	252
Scales	30	92	92	92	92	92
Elevator	15	59	59	117	117	117
Pickup truck (used)	5	113	113	113	113	113
Livestock sprayer	15	23	23	46	46	46
Livestock squeeze	20	13	13	26	26	26
Well	25	20	20	20	20	20
Trench silo	30	12	24	39	59	94
Land (6% interest only)	----	53	103	161	233	365
Totals	----	$1,313	$1,833	$2,361	$2,773	$3,620
Total/head capacity	----	$4.28	$3.06	$2.36	$1.85	$1.51