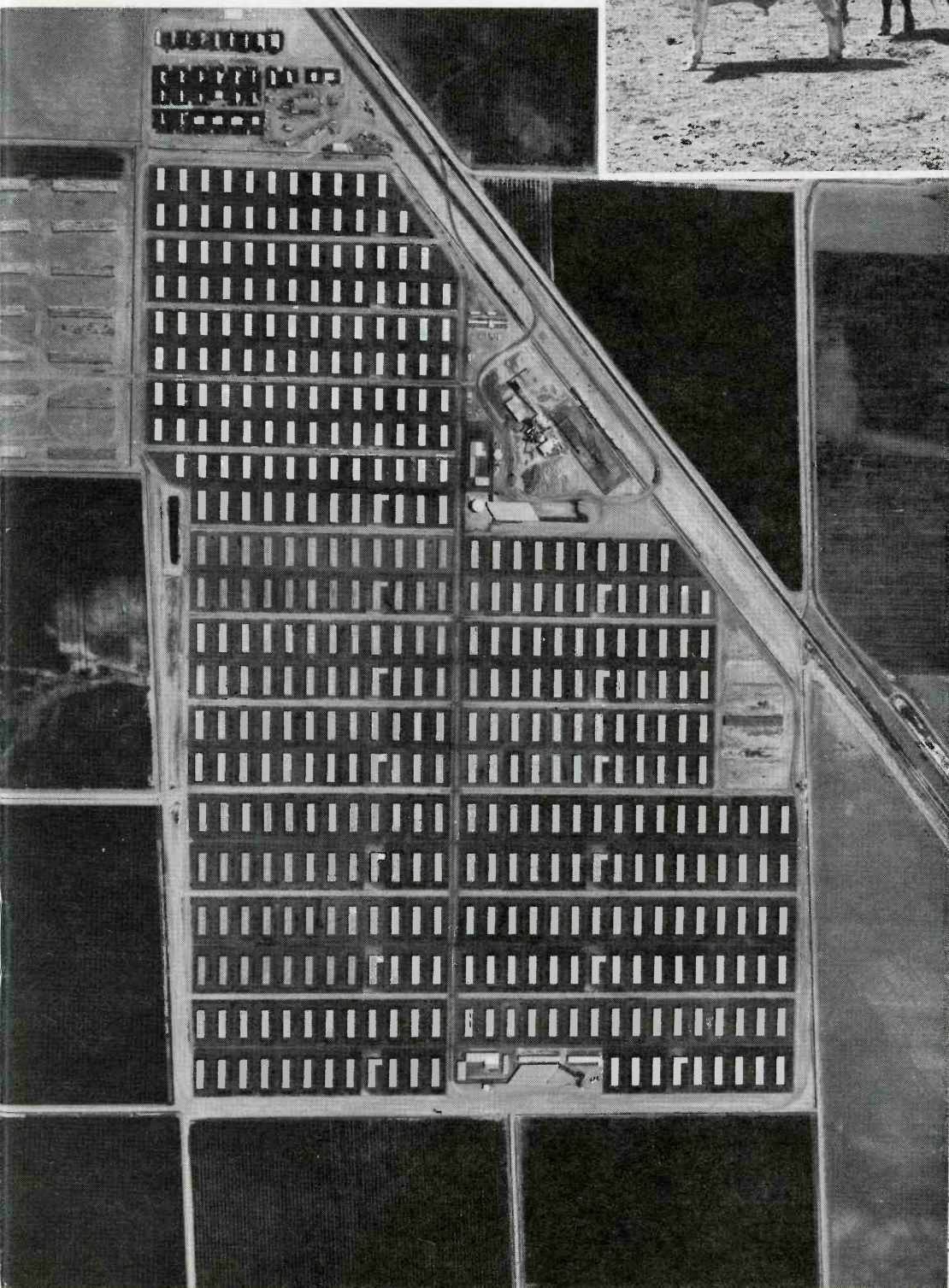
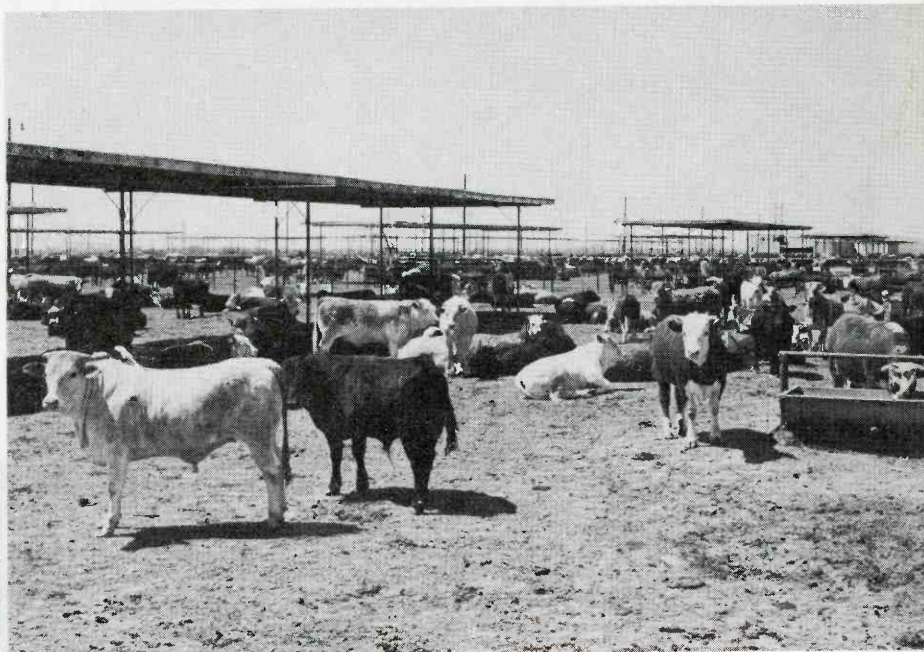


The Arizona Cattle Feeding Industry



Technical Bulletin 191

The University of Arizona
Agricultural Experiment Station
Tucson, Arizona

The Arizona Cattle Feeding Industry

**AGRICULTURAL EXPERIMENT STATION
UNIVERSITY OF ARIZONA
TUCSON, ARIZONA**

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Acknowledgments

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Appreciation also is expressed for the cooperation and assistance of various individuals in the United States Department of Agriculture and in the College of Agriculture, University of Arizona, in checking and editing the report. Special thanks are due to members of the cattle feeding industry for cooperation in providing data.

The aerial photo on the cover is of the Hughes and Ganz Cattle Co. feed yard at Queen Creek, Arizona. The close-up photo of a feedpen is from the Red Rock Feeding Co. at Red Rock, Arizona. Thanks are due to the Arizona Cattle Feeders' Association for cooperation in helping to obtain the cover photos, and to owners of the feedlots for making the photos available.

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The Arizona Cattle Feeding Industry

by

RUSSELL GUM and ELMER L. MENZIE¹

Introduction

Cattle feeding is one of the most dynamic and important sectors of the agricultural economy in Arizona. The dynamic nature of the industry is evidenced by the many developments which have taken place since the end of World War II. Significant increases have occurred in the number of cattle fed; the numbers of feedlots have declined while the size of feedlots has expanded, and the efficiency of feeding has improved.

This report is designed to describe

the important changes which have taken place in the Arizona cattle feeding industry and to examine its current economic characteristics.

The following are included in the study:

- (1) a review of the importance of the cattle feeding industry in Arizona, in relation to other agricultural production in the State and to cattle feeding in the rest of the United States;
- (2) a description of the present structure of the industry with

special emphasis on the size and number of feedlots;

- (3) a description of cattle imports and exports to and from Arizona;
- (4) a review of the prevailing system of marketing for fat cattle;
- (5) analysis of the cost of custom feeding within the state as well as of feedlot operators providing the custom service;
- (6) a budget study of economies of size for custom feedlot operations.

IMPORTANCE OF CATTLE FEEDING

Arizona is one of the main cattle feeding areas in the nation. In terms of the number of cattle on feed January 1, each year, Arizona has ranked among the top 12 states since 1955. This ranking increased from the 1930-1950 period, when the state was between sixteenth and twenty-first, to between eighth and eleventh for the 1955-1970 period (Table 1). Arizona ranked ninth in numbers of cattle on feed January 1, 1970, with a total of 510,000 head.

TABLE 1. CATTLE ON FEED, THE UNITED STATES AND ARIZONA, JAN. 1, 1930 to 1970.

Year	Arizona	United States ¹	Rank of
			Arizona Cattle Feeding Industry
			Thousand Head
1930	23	3,113	21st
1935	28	2,215	16th
1940	64	3,633	16th
1945	60	4,411	20th
1950	59	4,390	16th
1955	169	5,795	11th
1960	265	7,535	9th
1965	348	9,483	8th
1970	510	13,249	9th

Source: Agricultural Statistics, U.S.D.A. for the years 1930-1970.
¹26 major states

¹RUSSELL GUM IS AN ASSOCIATE PROFESSOR, DEPARTMENT OF HYDROLOGY AND WATER RESOURCE ADMINISTRATION (AT THE TIME THE REPORT WAS PREPARED, HE WAS AN AGRICULTURAL ECONOMIST, FARM PRODUCTION ECONOMICS DIVISION, ECONOMIC RESEARCH SERVICE, U.S. DEPARTMENT OF AGRICULTURE). ELMER L. MENZIE IS A PROFESSOR OF AGRICULTURAL ECONOMICS, DEPARTMENT OF AGRICULTURAL ECONOMICS, UNIVERSITY OF ARIZONA.

The number of cattle on feed in Arizona increased from 23,000 in 1930 to over 500,000 in 1970. The greatest growth occurred after World War II. From 1950, there were only two years, 1958 and 1964, when the number of cattle on feed did not increase. Numbers increased over sevenfold from 1950 to 1970 (Figure 1), representing

an average rate of growth per year of approximately 11 percent.

Cattle on feed in the 26 major feeding states increased from 3,113,000 in 1930, to 12,838,000 on January 1, 1970. As in Arizona, most of the increase came during 1950 to 1970 (Figure 2). However, that constituted less than a threefold increase versus the

sevenfold for Arizona, and it provided an average rate of growth per year of about 5.5 percent, amounting to one-half the Arizona rate during the same period.

CASH RECEIPTS

Cash receipts from livestock, including both feeder and fat cattle, have been rising steadily since 1935, due in large part to increases in the number of cattle fed in the state (Table 2). Returns from cattle and calf sales have been increasing in importance relative to the rest of Arizona's agriculture. In 1935, only 14 percent of the cash receipts from agriculture were due to sales of cattle and calves, while in 1969, this amounted to 44 percent, making livestock one of the most important sectors in terms of gross income.

Structural Characteristics

The most significant structural characteristics of the Arizona cattle feeding industry are the number and size of feedlots in the state. Many of the other characteristics of the industry such as marketing arrangements and custom feeding are directly related to the dominance of large feedlots in Arizona's cattle feeding industry.

NUMBER AND SIZE OF FEEDLOTS

Cattle feeding in Arizona has been shifting towards larger size feedlots. Concurrent with this trend, there has been a reduction in the total number of feedlots in the state and an increase in total marketings. In 1962, there were 189 feedlots in Arizona marketing 568,000 cattle. By 1968, the number of feedlots had dropped to 77, while the number of cattle marketed had increased to 703,000 head. A further decline in feedlot numbers to 61 was recorded in 1970, while marketings rose to 860,000 head.²

The greatest reduction in feedlot numbers occurred in the early 1960's. Since 1962, feedlots with less than 4,000 head capacity have declined both in number of firms and cattle

FIGURE 1

CATTLE ON FEED IN ARIZONA

THE NUMBERS ARE FOR JAN 1 EACH YEAR

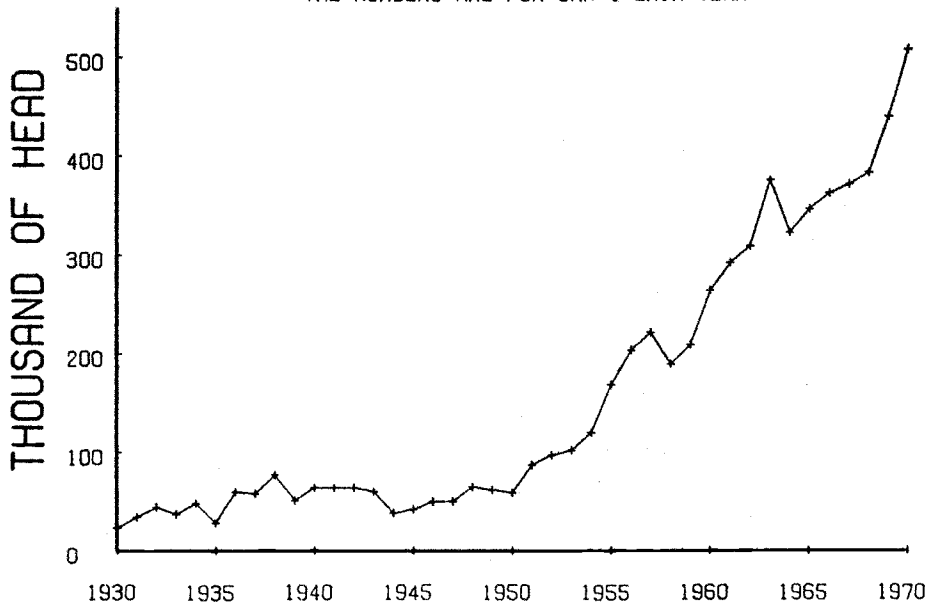
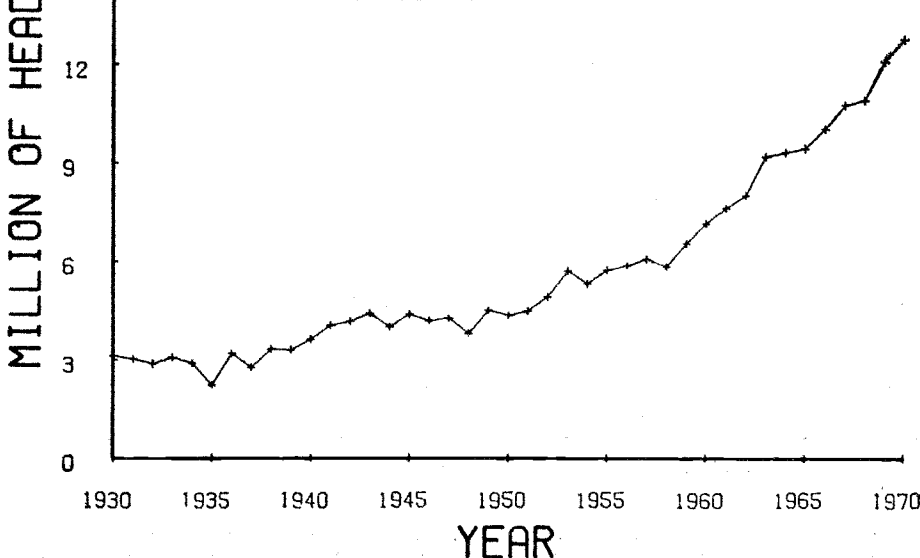


FIGURE 2

CATTLE ON FEED IN U.S.

THE NUMBERS ARE FOR JAN 1 EACH YEAR



marketed. Feedlots with less than 1,000 head capacity declined from 95 in 1962, to nine in 1968. This sharp decline in the smallest sizes reflected the advantages of larger size units which will be discussed in a later section of this report.

Feedlots exceeding 16,000 head of cattle were the only ones with an increased number of cattle marketed, which illustrates their relatively favorable position. The number of feedlots with a capacity in excess of 16,000 head increased from seven in 1962, to nine in 1968. More significantly, the number of cattle marketed by these feedlots rose from 211,000 or 37 percent of total marketings in 1962, to 370,000 or 52.5 percent in 1968 (Figures 3 & 4). By 1970, the number of lots exceeding 16,000 head increased further to 14, and the marketings to 608,000 or approximately 70 percent of the total for the state.

CUSTOM FEEDING

Custom feeding is a prevalent system of feeding cattle in Arizona, though the small feedlots do not use this practice to any extent (Table 3). In the feedlots with over 16,000 head capacity, only one-third of the number reporting owned 50 percent or more of the cattle. However, these statistics may be somewhat misleading since many of the large feedlots are corporations and the stockholders and managers may have cattle custom fed in their own name. Thus, while the feedlot may consider all of its cattle custom fed, the owners of the feedlot may also be buyers of its services as custom feeders.

The normal arrangement for custom feeding is for the customer to furnish cattle for the feedlot and to pay a charge per ton of feed consumed plus veterinary services. The feedlot is responsible for feeding the cattle and, normally, for providing the marketing service as well.

Another form of custom feeding is becoming evident in Arizona. In this system, the customer agrees to feed a given number of cattle each month; a middleman procures the cattle and

arranges to have them custom fed by a feedlot. The owner of the cattle merely provides the financing of the feeding operation.

Locational Characteristics

Although cattle feeding is an important sector of the state's economy,

it is not of significance to all counties in the state. Most of the feeding is carried on in three of the fourteen counties. On January 1, 1968, Maricopa, Pinal, and Yuma Counties had 60, 22, and 12 percent, respectively, of the cattle on feed (Figure 5).³ Other counties accounted for only 6 percent of the total cattle on feed.

TABLE 2. CASH RECEIPTS IN ARIZONA AGRICULTURE AND FOR SALES OF CATTLE AND CALVES.

Year	Arizona Agriculture Total Receipts ¹	Receipts From the Sale of Cattle and Calves		Percent Attributed to Sale of Cattle and Calves
		Thousand Dollars		
1935	43,156	6,229		14
1940	60,963	15,964		26
1945	141,597	32,642		23
1950	277,637	46,959		17
1955	345,646	70,278		20
1960	437,745	126,480		29
1965	513,778	170,084		33
1969	709,854	312,385		44

¹Including government payments.

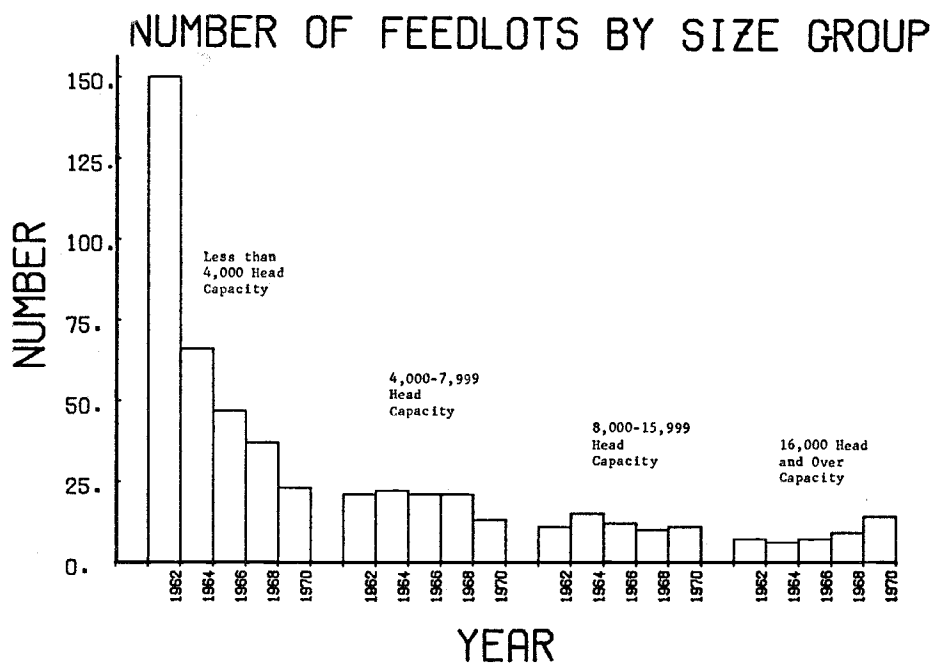
Source: USDA Agricultural Statistics for the years 1935-1970.

TABLE 3. CUSTOM FEEDING IN ARIZONA, 1968.¹

Size of Feedlot	Percent Custom Fed				
	0	1-25	26-50	51-75	76-100
	Number of Feedlots				
0-3, 999	9	2			
4,000-15,999	5	2		1	3
16,000+		1	2	3	3
Total Feedlots	14	5	2	4	6

¹These data were obtained in a mail questionnaire by Duane Patterson in the process of completing a Master's thesis. Respondents represent about 30 percent of the total feedlots.

FIGURE 3



OUTSHIPMENTS

Total live cattle shipments out of Arizona have exceeded 600,000 head in every year since 1960, and in 1967 amounted to nearly 800,000. In 1968, the number declined considerably to a total of 677,058 head. Much of this decline was due to the increase in fat cattle slaughtered in Arizona, a result of the opening of a large new slaughter plant.

In 1968, there were 703,000 head of cattle marketed out of Arizona feedlots. From this number, approximately 418,000 head were slaughtered in local plants, leaving about 273,000 fat cattle for shipment out of the state. Therefore, about 400,000 of the total shipped from the state were feeder cattle and calves. It is assumed at least 50 percent of these were Arizona feeder calves, with the remainder made up of cattle originating in other states or Mexico.

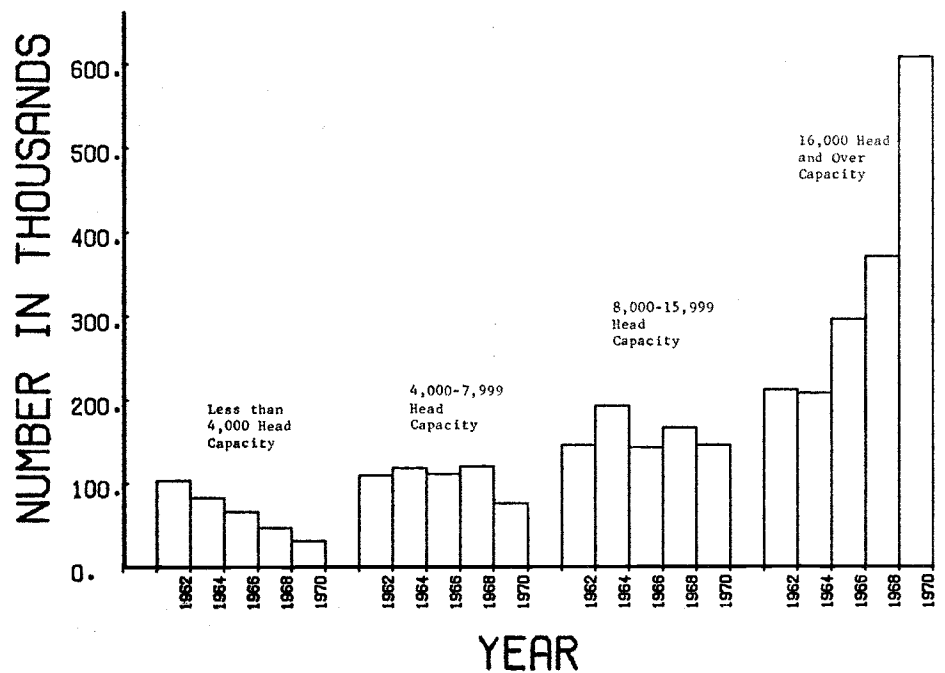
The Arizona range calf crop in recent years has amounted to approximately 300,000 head annually. While some of these are kept for replacement and some are fed in Arizona, the largest part of them are considered to be shipped out of the state. Arizona feeders, in general, prefer to feed cattle imported from other states and Mexico.

The largest proportion of all live cattle shipped from Arizona goes to California. For the years 1960-1968, live cattle shipments to California averaged 78 percent of the total. Other areas of importance are Texas, New Mexico, Colorado, and Utah (Figure 6).

Total cattle shipments out of Arizona in 1969 amounted to 728,899, of which 556,782 went to California. Of this total, Arizona feedlots shipped 257,874 head direct to California packers. (Texas was the only other significant market for fat cattle outside of Arizona and shipments there have been relatively small.) Thus, about 300,000 head, including Arizona feeder calves and unfinished cattle brought into the state from other sources, were shipped to California in 1969.

FIGURE 4

NUMBER MARKETED BY SIZE GROUP



INSHIPMENTS

Cattle shipments into Arizona are made up largely of feeders to meet the needs of commercial feedlot operators and for prefinish or "warmup" operations. Considerable variation in the flow occurs from year to year. In 1960, a total of 468,519 animals were imported to the state, whereas in 1962 and 1968, the number exceeded 700,000. Imports have exceeded 200,000 each year since 1953.

Texas supplies the majority of the live cattle shipped into Arizona. For the period 1960-68, 57 percent of the total inshipments to Arizona were from Texas. Other areas of importance are Mexico, New Mexico, Oklahoma, and Louisiana (Figure 7).

SEASONALITY

Although cattle are being placed on feed every month of the year in Arizona, there is a seasonal pattern of placements and marketings (Figure 8). Marketings exceed placements from January through August but placements are heaviest in October and November. This pattern can be ascribed to a combination of seasonal availability of feeder cattle supplies and cli-

matic conditions. The relatively even flow of marketings reflects varying weights of cattle placed on feed and differences in feeding programs employed by feeders.

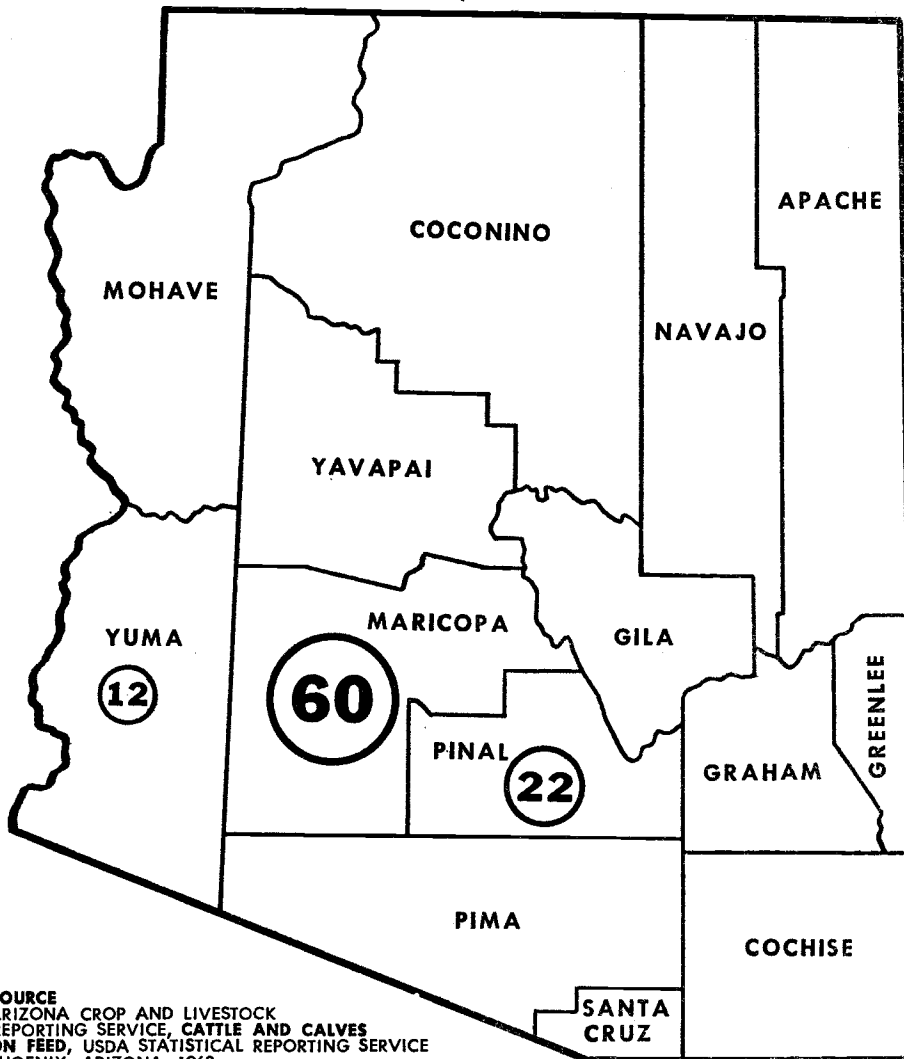
The Marketing System

There are two important factors determining the marketing system used for fed beef in Arizona. One is the dominance of this region's cattle feeding industry by large-scale feedlots. The other is the large consumer demand for fed beef within the Arizona-California region.

DIRECT SALES

The marketing system for fat cattle which has evolved is characterized by almost complete reliance on direct sales to packers located within the region. This has developed as a marketing system which meets the needs of the large-scale producers and packers at an efficient level of cost. Since direct sales reduce the number of times livestock are handled, the cost for assembly, shrinkage, commissions, yardage, and transportation are less (Table 4). These cost advantages can be realized

Figure 5
Cattle Feeding by County
 January 1, 1968



SOURCE
 ARIZONA CROP AND LIVESTOCK
 REPORTING SERVICE, CATTLE AND CALVES
 ON FEED, USDA STATISTICAL REPORTING SERVICE
 PHOENIX, ARIZONA, 1968.

by the large feedlots which in general have enough volume so that they can internally perform the functions which under other situations are the responsi-

bility of intermediate marketing agencies.

The most common type of direct sales occurs on an FOB feedlot basis.

According to estimates for 1964, this method accounted for over 90 percent of the cattle sold in the state. (There are indications that this percentage has increased since 1964.) About 5 percent of the cattle were sold on some type of a carcass evaluation, with grade and yield sales the most common system used (Table 5). Advance contracts were used by many of the feedlots in this area, especially the larger lots. The use of this method of selling depends upon the prevailing price conditions. Generally, with expectations of rising prices, buyers wish to enter contracts but are reluctant to do so on falling markets.

ECONOMIES OF SIZE IN MARKETING

The results of a study in California indicate the number of actual and potential buyers for fat cattle is related to the size of the feedlot. Due to the similarity between the Arizona and California industry, these results probably hold for Arizona as well. As might be expected, the two largest buyers in California accounted for most of the sales. This may be described as an informal type of vertical integration. The degree of dependence upon particular buyers is lower for the large volume lots. The two largest buyers purchased 51 percent of the total output of lots with a capacity of 10,000 head or more versus 90 percent from lots with 0-999 head capacity.

The large feedlots tend to have access to a greater number of potential buyers. The California study showed feedlots of more than 10,000 head capacity had on the average nineteen

TABLE 4. ESTIMATED PRODUCER COST OF SELLING 600-POUND FEEDER AND 1,000-POUND SLAUGHTER STEERS BY MARKET OUTLET, WESTERN STATES, 1962.

Cost Item	600-Pound Feeder Cattle			1,000-Pound Slaughter Cattle		
	Auction	Terminal	Direct	Auction	Terminal	Direct
	(dollars per head)					
Transportation	1.57	8.42	0.00	2.59	5.43	0.00
Commission and Yardage	2.77	1.96	0.00	3.36	2.33	0.00
Shrinkage	4.22	6.04	3.96	9.20	12.63	9.88
Feed and Water	.22	.54	0.00	.40	.11	0.00
Inspection, Insurance, etc.	.22	.16	.26	.14	.13	.12
Total	9.00	17.12	4.22	15.69	20.63	10.00

Source: Stubblefield, Thomas M., Hilliard Jackson, and Harold Abel, *Evaluation of Marketing Practices Used by Cattle Feeders and Producers in the Western States*, Technical Bulletin 181, College of Agriculture, Agricultural Experiment Station, University of Arizona, page 43, December 1968.

potential buyers, while lots with less than 1,000 head capacity had on the average only five potential buyers.⁴

The number of sales transactions per year also varies with the size of the feedlot. The feedlots, with more than 10,000 head capacity, averaged 387 sales transactions, while those with less than 1,000 head capacity averaged only fourteen sales transactions per year.⁵

Assuming the characteristics are similar for Arizona and California feedlots, it is hypothesized that the following factors should provide advantage to the larger feedlots in the state:

- 1) The fact that the numbers of buyers and potential buyers increase with increases in the size of feedlots indicates a possible competitive advantage for larger operators. The larger numbers of fat cattle involved in one loca-

tion will obviously result in certain economies of purchase and transport which may be passed on by the buyer to the feeder. Assurance of a supply on a continuous basis and more uniformity of product throughout the year provides an added incentive for buyer interest in larger feedlots.

- 2) Reliance on direct marketing by feedlots and packers in the region places a premium on being well-informed about the value of the cattle. It is likely that large feedlots can perform this information-gathering function more efficiently than small feedlots.
- 3) The greater use of advance contracts by the large feedlots should give some advantage to them in terms of reducing risk.
- 4) The larger number of sales per year, in the larger feedlots, may help reduce risk. As the number of sales per year increases, sales made in low price periods are averaged out with those of higher price periods, thus reducing the influence of short-run price movements. The custom feeder will also have this opportunity for averaging if he is a relatively large investor. The smaller investor, however, may be in a similar position to the owners of smaller feedlots having cattle for sale only a few times a year and, therefore, influenced more by short-run price movements.

FIGURE 6

DESTINATION OF OUTSHIPMENTS BY AREA

AVERAGE VALUES FOR THE YEARS 1960 THROUGH 1968

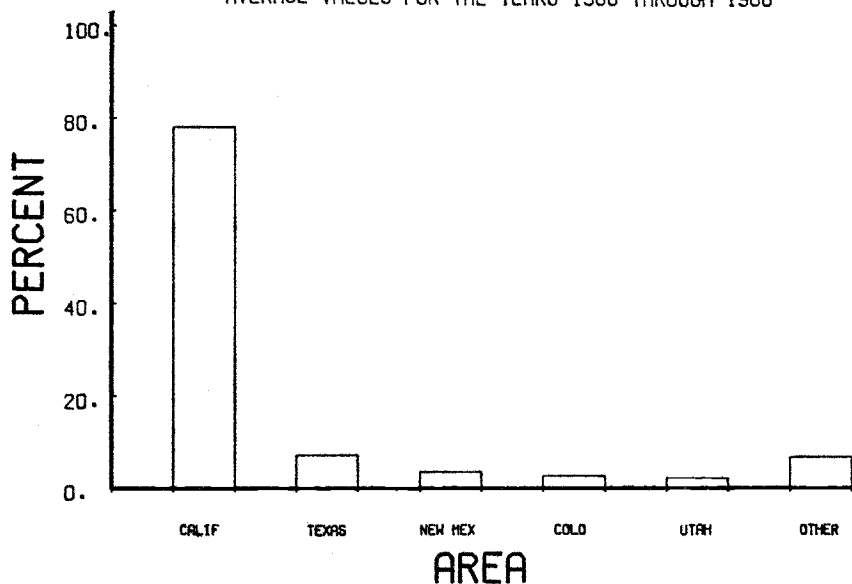
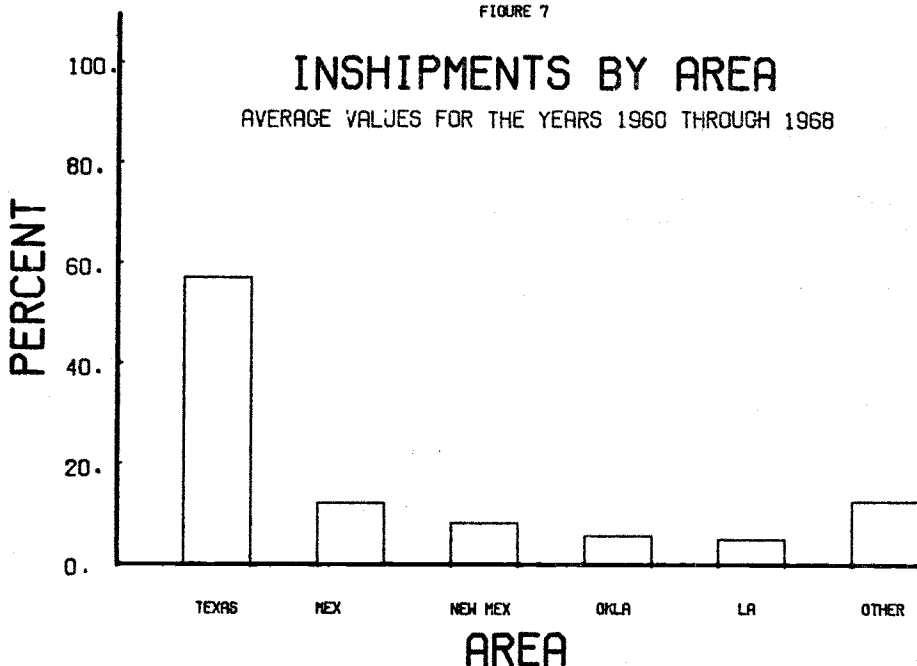


FIGURE 7

INSHIPMENTS BY AREA

AVERAGE VALUES FOR THE YEARS 1960 THROUGH 1968



Cost of Cattle Feeding

There are numerous feeding plan combinations which by nature provide different costs and returns. For the purpose of this study, the cost data presented are based on specific feeding plans which can be considered typical for the feeding of yearling steers and calves in Arizona.

In addition to the many physical differences in feeding plans in Arizona, a variety of financial and ownership arrangements for feeding cattle exist as indicated earlier. For purposes of simplicity, it has been assumed that the cattle were custom fed. The costs presented here have thus been broken into two components:

⁴LOGAN, S. H., AND G. A. KING, BEEF CATTLE FEEDING AND SLAUGHTERING IN CALIFORNIA, BULLETIN 826, CALIFORNIA AGRICULTURAL EXPERIMENT STATION, AUGUST 1966, PAGE 23.

⁵IBID. PAGE 23.

- 1) those costs associated with the owner of the cattle being custom fed, and
- 2) the costs of operation of a custom feedlot.

The data contained in this section are based upon information supplied by members of the cattle feeding industry and of the Departments of Agricultural Economics, Agricultural Engineering, and Animal Science, University of Arizona.⁶ The information can be considered typical of feedlots utilizing good management and adequate capital investment. Prices of feed, cattle and other factors will depend on market conditions and may be higher or lower than those used in this report.

COSTS FOR CUSTOM FEEDING

FEEDING YEARLING STEERS:

Under this plan, the cattle are placed on feed at 600 pounds and fed for a period of 157 days. Typically, three different rations are utilized as follows: 55, 75, and 85 percent concentrate rations fed for 15, 56, and 86 days, respectively. The weighted average daily level of concentrate fed is 78.6 percent. At the prices assumed, this ration costs \$46.49 per ton (Table 6).

Assuming an average rate of gain of 2.7 pounds per day, the 157 day feeding period results in a total gain of 425 pounds and a final weight of 1,025 pounds. Based on a 1 to 7.5 feed conversion ratio, 3,188 pounds of the average ration would be required during the total feeding period. The resulting feed cost on a per pound of gain basis is 17.44 cents.

In addition to feed, the custom feeder must assume a number of other costs for feeding his cattle. These include veterinary fees and other medical costs, death losses, interest charges on the investment, and a custom charge for services provided by the feedlot owner. For the feeder of yearling steers these were estimated to be approximately 6.53 cents per pound of gain, which added to the feed cost amounts to a total of 23.97 cents (Table 7).

FEEDING CALVES:

The cost data developed for this section are based upon a specific feeding plan which can be considered "typical" for the feeding of calves in Arizona. Under this plan, the calves are placed on feed at 400 pounds and fed for a period of 250 days. During this feeding period, four different concentrate rations are fed: 35, 55, 75, and 85 percent for 70, 50, 50, and 80 days, respectively.

The weighted average daily concentrate ration fed is 63 percent. Based on the prices assumed, this ration costs \$42.83 per ton (Table 8).

Assuming an average rate of gain of 2.5 pounds per day, the 250 day feeding period results in a total gain of 625 pounds and a final weight of 1,025 pounds. Based on a 1 to 6.9 feed conversion ratio, 4,312 pounds of the average ration are required during the feeding period. The resulting

FIGURE 8

PLACEMENTS AND MARKETINGS

AVERAGE FOR THE YEARS 1961-1968

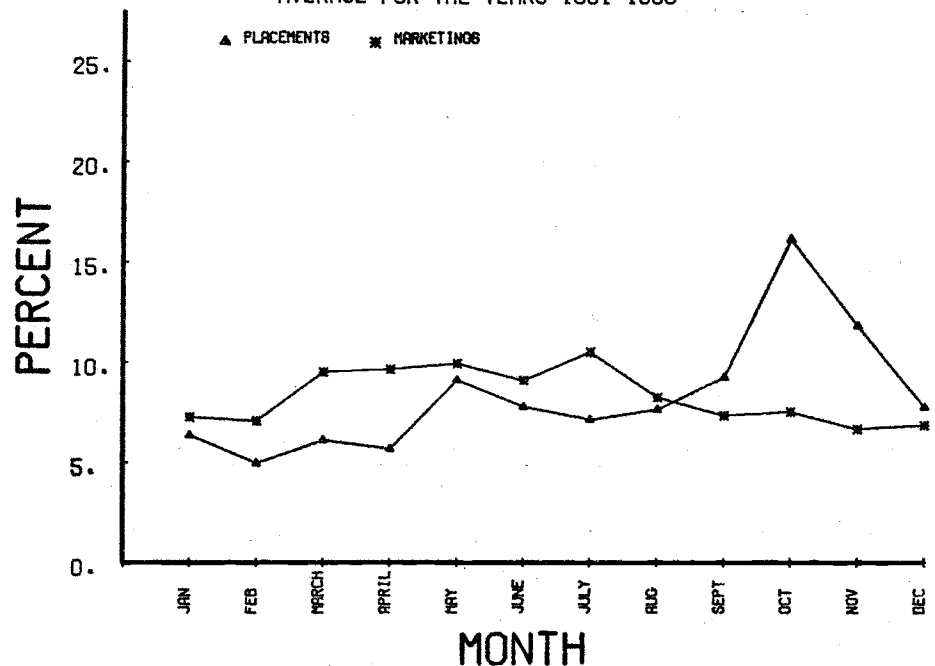


TABLE 5. ARIZONA FED CATTLE MARKETINGS BY SELLING METHODS, 1964.¹

		Percent
Live Basis	FOB Feedlot	91.6
	Delivered to Packer	.2
	Terminal or Auction	.2
	Total	92.0
Carcass Basis	Consignment	1.0
	Grade and Yield	3.4
	Rail Basis	.5
	Total	4.9
Other		3.1

¹NOTE: The Packers and Stockyards Resume, USDA, Dec. 18, 1970, indicated direct purchases by packers in Arizona in 1969, amounted to 95.6 percent of the total; in California, 96.7 percent. Only 1.1 percent of cattle purchases by packers in Arizona were on a carcass grade and weight basis; in California, 4.7 percent. Since most of Arizona fed cattle go to packers in Arizona and California, the above figures are fairly indicative of the system of sale used by feeders in the state in 1969.

Source: National Commission on Food Marketing Technical Study No. 1, Organization and Competition in the Livestock and Meat Industry, June 1966, page 121.

⁶THE DATA ARE DRAWN IN LARGE PART FROM JEFFRIES, DANIEL B., WILLIAM E. MARTIN, AND ROBERT A. YOUNG, "ARIZONA DATA FOR ESTIMATING FEEDLOT COSTS AND RETURNS," FILE REPORT 68-2, DEPARTMENT OF AGRICULTURAL ECONOMICS, THE UNIVERSITY OF ARIZONA, TUCSON, ARIZONA, AUGUST 1968.

TABLE 6. AVERAGE RATION FOR YEARLING STEERS

Percentage of Total Feed Fed	Ingredients	Price Per Ton (dollars)
21.4	Alfalfa Hay	30
63.2	Milo	44
4.5	Cottonseed Pellets	81
.6	Urea	100
.5	Salt	28
.5	Dicalcium Phosphate	100
.2	Limestone	15
.1	Trace Minerals	350
5.0	Molasses	36
4.0	Fat	130
100.0		46.49

Source: Gum, Russell, and John Wildermuth, "Cost-Return Comparisons for Finishing Yearling Steers," *Progressive Agriculture*, University of Arizona, November-December, 1968.

TABLE 7. COSTS PER POUND OF GAIN OF CUSTOM FEEDING

Item	Feeder Calves	Yearling Steers
	Cents	
Vet. Fees	.41	.25
Death Loss	.42 ^a	.49 ^b
Interest	1.94 ^d	2.04 ^c
Feed Costs	14.77 ^e	17.44 ^f
Custom Charge	3.45 ^g	3.75 ^h
Total Costs per Pound of gain	20.99	23.97

^aOne and one-half percent death loss valued at 29 cents per pound for a 600-pound steer.

^bOne percent death loss valued at 26 cents per pound for an 800-pound steer.

^cInterest on feeders valued at 26 cents per pound plus interest on cost of gains. Interest is at 10 percent per year rate.

^dInterest on feeders valued at 29 cents per pound plus interest on costs of gains. Interest is at 10 percent per year rate.

^eFeed costs calculated assuming an average price of \$42.83 per ton of ration used and a 1 to 6.9 conversion ratio.

^fFeed costs calculated assuming an average price of \$46.49 per ton of ration used and a 1 to 7.5 conversion ratio.

^gThis represents a custom feeding charge of \$10 per ton of feed fed.

TABLE 8. AVERAGE RATION FOR FEEDER CALVES

Percentage of Total Feed Fed	Ingredient	Price Per Ton (dollars)
37.0	Alfalfa Hay	30
50.3	Milo	44
3.2	Cottonseed Pellets	81
.4	Urea	100
.5	Salt	28
.4	Dicalcium Phosphate	100
.1	Limestone	15
.1	Trace Minerals	350
5.0	Molasses	36
3.0	Fat	130
100.0		42.83

Source: Based on Russell Gum and John Wildermuth, "Cost>Returns Comparisons for Finishing Yearling Steers," *Progressive Agriculture*, University of Arizona, January-February, 1969.

feed cost on a per pound of gain basis is 14.77 cents.

As in the case of yearlings, the custom feeder of calves has a number of costs for feeding his cattle in addition to feed. These are estimated to be approximately 6.22 cents per pound of gain. When included with feed costs the total is estimated to be 20.99 cents (Table 7).

BREAK-EVEN PRICES

Based on feeding costs as indicated above, break-even prices for feeders and fat cattle can be ascertained (Figure 9). For example, at a cost of 34 cents a pound for 400-pound calves, a fat cattle price of 25.71 cents a pound will be necessary to cover all costs. If the fat cattle price is 28 cents per pound, a profit of 2.29 cents per pound would be realized by the owner of the custom fed cattle.

Similar estimates can be derived for yearling steers. It should be noted however, that for decision-making purposes, profits per pound for yearling steers cannot be compared directly to profits per pound for calves due to differences in the length of the feeding period.

FEEDLOT OPERATING COSTS

The following discussion of feedlot operating costs is based upon the assumption that the feedlot is providing a custom feeding service for all cattle in the feedlot. Costs are analyzed as variable and fixed. Variable costs include utilities, general operating expenses, feedlot labor, and repairs and maintenance (Table 9). Fixed costs include depreciation on assets, interest on investment, taxes and insurance (Table 13).

The estimates used for investment and costs obviously cannot be expected to describe any particular operation. Some will have higher and some lower input costs for the various factors depending on organization and management. Inflation will continue to affect some factor prices. Nevertheless, the estimates should provide a fairly good indication of expectations in terms of the operations described.

The budgets provided in this re-

port, include only units up to 20,000 head capacity. While most of the operations in Arizona fall within this range, there are feedlots with larger capacity. However, the development of these larger size feedlots has been fairly recent, and sufficient, adequate data were not available to include analysis of the larger capacity units in this study.

VARIABLE COSTS

Utilities and Fuel: Electricity costs cover all electric power costs for the feedlot operation. Costs will vary somewhat from feedlot to feedlot, depending upon the number of electrical motors, the electrical district, and amount of lighting used. The costs shown in this report are intended to represent typical operations based on information obtained from consultations with electrical company officials and feedlot operators (Table 9).

Gasoline, oil, grease, and other fuel requirements for feedlot trucks, tractors, and other machinery depend upon the type of equipment and number of hours operated.⁷

General Operating Expenses: General production expenses include bookkeeping, nutrition and veterinary consultants, marketing costs, and repairs and maintenance. Some feedlots retain the services of a consulting veterinarian. The retainer fee averages about \$1,500 per year, but services are paid for by the owner of the cattle. The majority of feedlots, both large and small, hire a nutrition consultant to assist in determining ration formulations and feed requirements. The cost of this service depends upon the number of cattle for which the service is being performed.

The marketing expense consists of dues for membership in the Arizona Cattle Feeders Association and a brand inspection fee, each of which is \$0.15 per head. All cattle are sold f.o.b. feedlot so there are no transportation costs charged to the marketing operation.

⁷FOR DETAILED VARIABLE COSTS OF OPERATING TRACTORS, MANURE LOADERS, POWER FEED WAGONS AND POWER FEED TRUCKS, SEE ROBERT A. YOUNG, WILLIAM E. MARTIN, AND DALE L. SHAW, ARIZONA DATA FOR CROP FARM PLANNING, DEPARTMENT OF AGRICULTURAL ECONOMICS, THE UNIVERSITY OF ARIZONA, TUCSON, JULY, 1968.

FIGURE 9

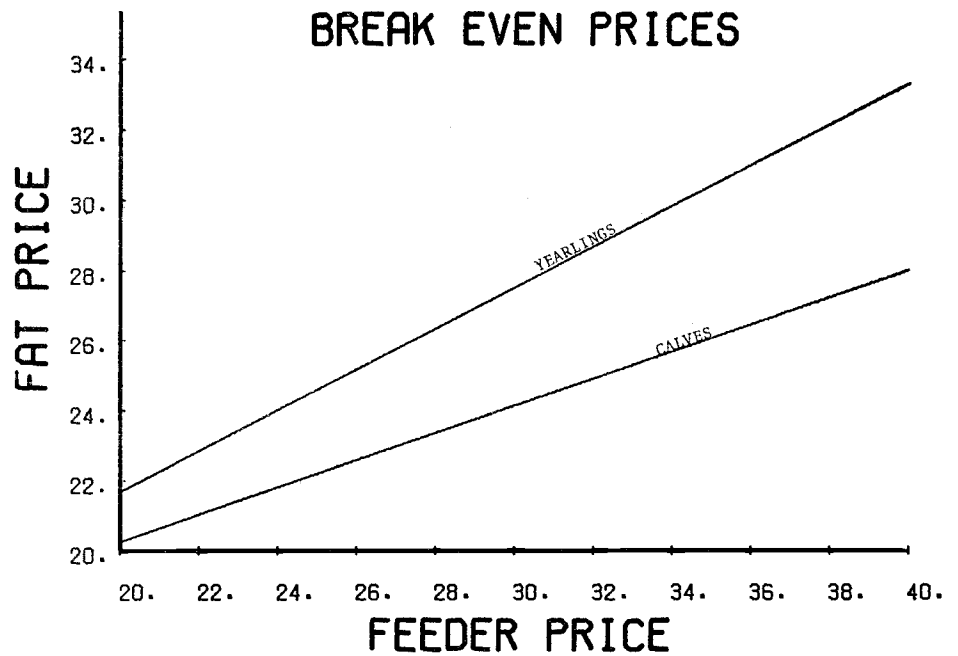


TABLE 9. VARIABLE FEEDLOT OPERATING COSTS FOR CUSTOM FEEDLOT OPERATIONS BY SIZE OF LOT.

	Capacity		
	5,000	10,000	20,000
	Dollars		
Utilities and Fuel			
Electricity	8,400	13,200	19,200
Gas & Oil	7,300	10,900	18,200
Telephone	1,200	4,000	10,000
General Operating Expenses			
Consulting Veterinarian	1,500	1,500	1,500
Consulting Nutritionist	1,200	2,400	4,800
Bookkeeping	8,000	12,000	25,000
Marketing	3,000	6,000	12,000
Feedlot Labor	75,400	119,200	199,700
Repair & Maintenance	14,370	20,520	31,640
Total	120,370	189,720	322,040
Costs/Head Capacity	24.07	18.97	16.10

TABLE 10. LABOR COSTS, CUSTOM FEEDING OPERATIONS, BY SIZE OF LOT.

	Capacity of Lot					
	5,000		10,000		20,000	
	Number of Men	Cost	Number of Men	Cost	Number of Men	Cost
	Dollars					
Feed Mill and Feeders	3	21,000	5	31,200	10	56,700
Maintenance	2	14,800	2	14,800	3	18,800
Cowboys and Yard Men	3	21,600	5	32,400	10	59,400
Office	1	6,000	2	16,800	4	28,800
Management	1	12,000	2	24,000	3	36,000
Total	10	75,400	16	119,200	30	199,700
Cost/Head Capacity		15.08		11.92		9.98

Labor and Management: The amount of labor and management required for Arizona feedlot operations varies depending upon the size of operation, degree of automation within the system and skill of the personnel. Most feedlots have labor classified as feed mill, mill maintenance, cowboys, and office help. The larger lots have separate divisions for feed distribution, dust control, and yard maintenance (Table 10). Wage rates vary depending upon the skill of the laborer, type of job performed, and whether housing is provided (Table 11).

Repair and Maintenance: Expenses for buildings, corrals, feed mill, feed equipment, and other machinery are based on the assumption that items will be kept in a state of repair consistent with satisfactory use in the production of fat cattle over a reasonable number of years. Included are the costs of replacement of worn-out and broken parts; overhaul and repair of equipment; and paint and other maintenance requirements for corral fences, buildings, and feeding equipment.

Annual repairs and maintenance costs are estimated to be 5 percent of total new investment costs for the feed mill; 3 percent for trucks, machinery, and equipment; and 3 percent for buildings including feed pens, shades, etc.

Total Variable Costs: Average variable costs per head of capacity based on the above items range from \$24.07 for the 5,000 head lot, to a low of \$16.10 for the 20,000 head unit (Table 9). Indications are that considerable economies in variable costs exist with respect to the size of the unit (Table 9). (A more detailed discussion of these size economies is included in a later section.)

FIXED COSTS

The fixed costs contained in this study are based upon the investment levels contained in Appendix Tables I, II, III, and summarized in Table 12. These investment levels are considered to be "typical" for a modern feedlot enterprise in Arizona. Investment per head of capacity declines from \$88.45 per head with lots of 5,000 head ca-

TABLE 11. TYPICAL WAGE RATES, CUSTOM FEEDING OPERATIONS.

	Foreman	Other
	Dollars	
Feed Mill and Feeders	900/month	425/month
Maintenance	900/month	2/hour
Cowboys and Yard Men	900/month	450/month
Office	900/month	500/month
Management		1,000/month

TABLE 12. SUMMARY OF INVESTMENTS, CUSTOM FEEDLOT OPERATIONS, BY SIZE OF LOT.

	Capacity		
	5,000	10,000	20,000
	Dollars		
Land	31,250	50,000	62,500
Automotive	43,900	69,500	141,900
Buildings and Corral	265,270	407,150	644,400
Mill	101,830	124,500	161,030
Total	442,250	651,150	1,009,830
Investment per Head Capacity	88.45	65.11	50.49
Average Total Investment	236,750	350,575	536,165

capacity to \$50.49 for lots of 20,000 head capacity. Over 60 percent of the total investment in each size group is estimated to be in buildings and corrals. (Annual fixed costs are summarized in Table 13.)

Interest on Investment: Interest rates vary with the type of investment or loan. Loan rates usually are lowest on land, buildings, and improvements; they are highest on machinery and equipment. Rates of 8 and 10 percent, respectively, were used for this study. The amount charged was based on the total value of the nondepreciable investment in land and the average value of the investment in machinery, equipment, buildings, corrals, and other improvements classed as depreciable.

Taxes: Taxes are directly related to the amount and value of land and property. Typical tax rates are difficult to determine since rates vary between school districts. An annual property tax of one percent of average total investment was estimated to be representative for Arizona feedlots.

Insurance: The cost of insurance carried by feedlots varies depending upon the amount of coverage and type of insurance. Most feedlots carry insurance to cover fire and vandalism on the feed mill, and the larger more elaborate lots carry fire insurance on the

corrals, shades, and office. For the office, most feedlots have a 3-D policy which includes a bond on the employees.

Tractors and other equipment are covered under an Agricultural Equipment Floater policy. Most feeders have a Livestock and Motor Cargo policy which covers cattle being transported within the feedlot grounds and to and from the terminal market. Also, most lots carry fire insurance on the cattle to cover injury or death by lightning. Some lots have an Extra Expense Policy which covers costs resulting from delays in the operation due to fire or other damage.

All feedlots carry liability insurance on their licensed and unlicensed vehicles operating for the feedlot, and most custom feedlots also carry third party liability. Workman's compensation is carried on all employees and most feedlots have some type of group health insurance for employees and their families.

After conferring with feedlot operators and insurance agents, it was estimated that one percent of total investment in the feedlot operation would cover the annual premiums for insurance of the types outlined above.

Summary of Fixed Costs: As with variable costs, fixed costs per head are

TABLE 13. AVERAGE FIXED COSTS, CUSTOM FEEDLOT OPERATIONS, BY SIZE OF LOT.

	Capacity		
	5,000	10,000	20,000
	Dollars		
Depreciation			
Corrals and Buildings	13,260	20,360	32,220
Feed Mill	10,180	12,450	16,103
Automotive	4,390	6,950	14,190
	<u>27,830</u>	<u>39,760</u>	<u>62,513</u>
Interest on Average Investment			
Land	2,500	4,000	5,000
Corrals and Buildings	13,260	20,360	32,220
Feed Mill	5,090	6,230	8,050
Automotive	2,200	3,480	7,090
	<u>23,050</u>	<u>34,070</u>	<u>52,360</u>
Taxes	2,368	3,506	5,362
Insurance One Percent			
Total Investment	<u>4,422</u>	<u>6,512</u>	<u>10,098</u>
Total	<u>57,670</u>	<u>83,848</u>	<u>130,333</u>
Cost/Head Capacity	<u>11.53</u>	<u>8.38</u>	<u>6.52</u>

TABLE 14. SUMMARY OF NONFEED COSTS FOR FEEDLOT OPERATIONS BY SIZE OF LOT.

	Capacity		
	5,000	10,000	20,000
	Dollars		
Variable	120,370	189,720	322,040
Fixed	57,670	83,848	130,333
Total	<u>178,040</u>	<u>273,568</u>	<u>452,373</u>
Total Costs/Head Capacity	35.60	27.36	22.62
Percent Capacity Needed to Break Even*	95	73	61
Needed to Cover Variable Costs	65	51	44

*This assumes a charge of \$10 per ton of feed fed to yearling steers with average daily feed consumption of 20.25 pounds per head per day. This would result from an average gain per day of 2.7 pounds and a feed conversion ratio of 7.5 pounds of feed per pound of gain.

reduced considerably as capacity increases. The 5,000 head units had a cost per head of \$11.53, whereas the 20,000 head unit's fixed costs were only \$6.52 (Table 13).

ECONOMIES OF SIZE

As indicated in the previous sections discussing fixed and variable costs, the larger feedlots have considerable advantage over the smaller ones. This results largely from indivisibility of certain cost items for the smaller operators which provides an opportunity for greater efficiencies as size increases. Labor is a major factor in reducing per unit variable non-feed costs which decline from \$24.07 per head of capacity for 5,000 head lots to \$16.10 for 20,000 head lots. Fixed costs decline from \$11.53 per head capacity to

\$6.52 for corresponding sizes. Economies are made in relation to land and building use as size increases. There is a certain amount of fixed plant necessary regardless of size. Feed mill investment, for example, is less than half as much per head for the larger unit.

Total annual fixed and variable non-feed costs of owning and operating the feedlot amount to \$35.60 per head capacity for a 5,000 head unit versus \$22.62 with 20,000 head (Table 14). Assuming yearling steers are fed 365 days per year, with 2.7 pounds per day gain, nonfeed cost per pound of gain at capacity would be 3.61 cents for the 5,000 head unit and 2.30 cents with 20,000 head.

Feedlots generally do not operate at

100 percent of capacity. The effects of size economies associated with different levels of capacity use are illustrated below. Assume the feedlot is handling only custom fed cattle at a charge, exclusive of the feed cost, of \$10 per ton of feed fed. Assuming yearling steers are being fed, the average consumption of feed, per day, per head is estimated at 20.25 pounds. On this basis, a 5,000 head capacity lot would need an average occupancy rate of 65 percent, to cover variable costs, and an occupancy rate of 95 percent, to cover both fixed and variable costs. The corresponding figures for lots of 10,000 head capacity are 51 and 73 percent occupancy. For lots of 20,000 head capacity, it requires only an average occupancy of 44 percent to cover variable costs and 61 percent to cover fixed and variable costs.

It is obvious that the smaller feedlots are not in an economic position to rely completely on custom feeding to maintain a viable business. This is reflected in the actual practice of smaller lots reducing some of the risk of having empty lots by owning a greater percentage of the cattle on feed than do the larger lots (Table 3).

While the above example is in terms of the owner providing custom feeding services, the relationship between sizes of feedlots with respect to economies of scale should hold for all other patterns of cattle ownership.

Summary

The Arizona cattle feeding industry can be characterized by its steady growth in recent years, and the dominance of the industry by large feedlots. Other aspects of the industry are in large part directly related to these two facts. For example, the marketing system for both fat and feeder cattle is geared to handling large numbers of cattle.

The use of custom feeding has developed as a result of large feedlots trying to specialize by providing service rather than in accepting the risk of cattle ownership. It is a major means of providing much of the financing necessary for the larger feedlot opera-

tions. As a result, they can capitalize on economies of size available.

The results of the analysis in this report indicate that size economies are significant, at least up to 20,000 head

capacity. Continued growth in some feedlots beyond this size suggests further economies likely are available for larger units not included in this report. The predominance and growth of large

size feedlots in Arizona appears to be a logical outgrowth of basic economic processes and increasing significance of large size operations is likely in the future.

Appendices

APPENDIX TABLE I. INVESTMENT COSTS 5,000 HEAD CAPACITY FEEDLOT.

Item	Number	Description	Capacity	Horse-Power	Total Cost
					Dollars
Land	50 acres				31,250
Water System					80,000
Corrals	30	Pens 130x200 feet, sucker rod and pipe, 4½' high, 5 rails, 2' concrete base			17,770
		Gates			1,950
		Concrete feed trough with adjustable neck cables			25,500
		Concrete apron 10' wide			18,000
		Water troughs with concrete aprons			2,250
		Shade constructed of 30-gauge galvanized roofing with all steel framework 180x20 feet per pen			32,400
Automotive					
Pickup	1	½ ton	½ ton		2,500
Auto	1	Sedan			3,000
Feed truck	1	Automatic scale, 10 ton, 10 wheel, gas powered	10 ton		16,800
Skip loader	1	Front end wheel skip loader 1½ yard bucket, 80 h.p. gas powered—used		80	9,500
Tractor	1	35 h.p.		35	5,300
Water truck	1	2½ ton gas	2½ ton		5,000
Spray rig	1	300 gallons	300 gallons		800
Horses	5				1,000
Grain and Hay Storage					
Grain	4	Steel bins	4,000 tons	20	67,000
Hay	1	Pole and timber construction	1,000 tons		8,500
Office and Scales					
Office	1				5,500
Truck Scales	1	24' x 12'	20 T		5,200
Feed Formulating Equipment and Buildings					
Hay Mill Hay Chopper	1	24" hammer mill	10 T/hr.	145	12,680
Bale Hay Conveyor	1	100' long, 24" wide		2	2,100
Building	1	40' x 100' shed type			1,200
Grain Conveying to and from Storage					
Bucket Elevator	1	5" x 8" bucket 90' high	40 T/hr.	10	4,200
Spouting	300	8" steel			800
Distributing Head	1	6-way head	40 T/hr.		400
Elevator Pit	1	Drive over dump pit	40 T/hr.		2,500
Auger Conveyor	6	8" auger from bin to roller	40 T/hr.	10	2,900
Grain Roller, Steamer Blower					
Roller	1	36", 6-8 T/hr.	6-8 T/hr.	40	9,200
Steam Boiler	1	60 h.p.	10 T/hr.	60	8,900
Steamer	1	Vertical 12' high	8 T/hr.		1,300
Blower	1	Vacuum type	10 T/hr.	30	3,800
Batch Scales and Holding Bins					
Batch Scales and Hopper	1	Scales, hopper 2 tons	10 T/hr.		9,500
Molasses Equipment	1	Pump meter and gauge	10 T/hr.		1,000
Patch Mixer	1	2 ton horizontal	10 T/hr.	40	4,500
Mixer Conveyor	1	2 ton horizontal	10 T/hr.	30	2,200
Hay Bin	1	Line bottom	10 tons	3	8,000
Grain Bin	2	Auger bottom	5 tons each	2	5,000
Meal Bin or Premix Bin	2	Auger bottom	10 tons each	2	7,000
Delivering Auger	1	8" horizontal	20 T/hr.	2	600
Molasses Tank	1	30,000 gallon tank	30,000	5	1,750
Conveying Finished Feed from Blender to Finished Feed Bins					
Chain Drag	1	Double chain	20 T/hr.	5	2,500
Two-Compartment Holding Bin	1	Finished feed bin	10 tons	5	11,000

APPENDIX TABLE II. INVESTMENT COSTS 10,000 HEAD CAPACITY FEEDLOT

Item	Number	Description	Capacity	Horse-Power	Total Cost
					Dollars
Land	80 acres				50,000
Water system					92,000
Corrals	60	Pens 130 x 200 feet sucker rod and pipe, 4½' high, 5 rails, 2' concrete base			35,400
		Gates			3,900
		Concrete feed trough with adjustable neck cables			51,000
		Concrete apron 10' wide			36,000
		Water troughs with concrete aprons			4,500
		Shade constructed of 30-gauge galvanized roofing with all steel framework 180 x 20 feet per pen			64,800
Automotive					
Pickup	2	½ ton	½ ton		5,000
Auto	1	Sedan			3,000
Feed truck	2	Automatic scale, 10 ton, 10 wheel, gas powered	10 ton		33,600
Skip loader	1	Front end wheel skip loader 1½ yard bucket, 80 h.p. gas powered—used		80 h.p.	9,500
Tractor	2	35 h.p.		35 h.p.	10,600
Water truck	1	2½ ton gas	2½ ton		5,000
Spray rig	1	300 gallons	300 gallons		800
Horses	10				2,000
Grain and Hay Storage					
Grain Bins	5	Steel bins, 36' x 40'	5,000 tons	25	83,750
Hay	1	Pole and timber construction	1,500 tons		12,500
Office and Scales					
Office	1				5,500
Scales, Livestock	1	12' x 28'	15 tons		5,600
Scales, Truck	1	10' x 70'	50 tons		11,000
Feed Formulating Equipment					
Hay Mill and Bale Breaker	1	24" hammer mill and	10 tons/hr.	125	12,700
	1	24" bale breaker	10 tons/hr.	40	
Bale Hay Conveyor Building	1	100' x 24" single chain 40' x 100' shed type	20 tons/hr.	2	2,100
Grain Conveying Equipment					
Bucket Elevator	1	5" x 8" x 50' high	40 tons/hr.	10	4,200
Spouting		300' 8" steel	40 tons/hr.		800
Distributor Head	1	6-way head			400
Elevator Pit	1	Drive over dump pit	60 tons/hr.		2,500
Auger Conveyors	7	8" handling grain	40 tons/hr.	10	3,800
Grain Roller, Steam Blower					
Roller	2	36", 6-8 tons/hr. each	12-16 tons/hr.	40	18,000
Steam Boiler	1	100 H.P. rating	20 tons/hr.		12,000
Steamer	2	Vertical 12' high	16 tons/hr.		2,550
Batch Scales and Holding Bins					
Batch Scales and Hopper	1	Molasses tank	30,000 gallons	5	1,750
Batch Scales	1	Scales and hopper	20 tons/hr.		12,500
Molasses Equipment	1	Pump meter and gauge	20 tons/hr.	5	1,200
Batch Mixer	1	3-ton horizontal	15 tons/hr.	60	6,500
Mixer Conveyor	1	3-ton horizontal	15 tons/hr.	60	3,500
Hay bin	1	Line bottom	10 tons	5	8,000
Grain bin	2	Auger bottom	5 tons each	2	5,000
Meal and Premix Bin	2	Auger bottom	10 tons each	3	8,000
Delivering Auger	1	8" horizontal auger	20 tons/hr.	3	600
Chain Drag	1	Double chain conveyor	20 tons/hr.	5	3,000
Finished Feed Bin	1	3 compartment dump bin	15 tons	10	15,000

APPENDIX TABLE III. INVESTMENT COSTS 20,000 HEAD CAPACITY FEEDLOT

Item	Number	Description	Capacity	Horse-Power	Total Cost
					Dollars
Land	100 acres				62,500
Water System					116,000
Corrals	120	Pens 13 x 200 feet, sucker rod and pipe, 4½' high, 5 rails, 2' concrete base			70,800
		Gates			7,800
		Concrete feed trough with adjustable neck cables			102,000
		Concrete apron 10' wide			72,000
		Water troughs with concrete aprons			9,000
		Shade constructed of 30-gauge galvanized roofing with all steel framework 180 x .20 feet per pen			129,600
Automotive					
Pickup	5	½ ton	½ ton		12,500
Auto	3	Sedan			9,000
Feed truck	4	Automatic scale, 10 ton, 10 wheel, gas powered	10 ton		67,200
Skip loader	2	Front end wheel skip loader 1½ yard bucket 80 h.p. gas powered—used			
				80	19,000
Tractor	3	35 h.p.		35	15,900
Water truck	1	2½ ton gas	2½ ton		5,000
Spray rig	1	300 gallons	300 gallons		800
Road grader	1	12' blade, 80 h.p. gas—used		80	9,500
Horses	15				3,000
Grain and Hay Storage					
Grain Bins	6	Steel bins 36' x 40'	6,000 tons		100,500
Hay Storage	1	Pole and timber construction	1,500 tons		12,500
Office and Scales					
Office	1				5,500
Scales, Livestock	1	40" x 12'	20 tons		6,500
Scales, Truck	1	10' x 70'	50 tons		11,000
Feed Formulating Equipment					
Hay Mill and Bale Breaker	1	24" hammermill, and 24" bale breaker	30 tons/hr.	290	18,650
Bale Hay Conveyor Shed	1	100' x 24" single chain 40' x 100' shed	30 tons/hr.	2	2,100
					1,200
Grain Conveying Equipment					
Bucket Elevator	1	5" x 9", 90' high	80 tons	20	5,300
Spouting		400' steel 8" spouting	100 tons		1,100
Distributor Head	1	6-8" outlets	100 tons		400
Elevator Pit	1	Drive over dump pit	100 tons		3,500
Auger Conveyor	2	Handling grain	40 tons		4,580
Grain Roller, Steam Boiler and Steamer					
Rollers	2	36", 6-8 ton hours each	15 tons/hr.	40	18,400
Steam Boiler	1	100 h.p. rating	20 tons/hr.		12,000
Steamer	2	Vertical 12' high	20 tons/hr.		2,550
Molasses Tank	1	Steel, 30,000 gallons	30,000 gallons	5	1,750
Batch Scales and Hopper					
Batch Scales	1	Scale and hopper	25 tons/hr.		24,500
Molasses Equipment	1	Pump motor and gauge	25 tons/hr.	5	1,200
Batch Mixer	1	5 ton horizontal	25 tons/hr.	100	8,500
Mixer Conveyor	1	5 ton horizontal	25 tons/hr.	100	5,500
Hay Bin	1	Line bottom	10 tons	5	8,000
Grain Bin	2	Auger bottom	10 tons each	3	8,000
Meal and Premix Bins	2	Auger bottom	10 tons each	5	8,000
Delivering Auger	1	8" horizontal auger	25 tons/hr.	5	8,000
Chain Drag	1	Double chain conveyor	25 tons/hr.	7½	4,000
Finished Feed Bin	1	3 compartment bin	15 tons	15	15,000