AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

cattle feeding in the united states

Economic Research Service
U.S. Department of Agriculture

Agricultural Economic
Report No. 186

ABSTRACT

This report describes the beef cattle industry and traces some recent trends in its makeup. It centers mainly on the cattle-feeding phase of the industry, but also considers feeder cattle and marketing.

Beef consumption is high and still rising. Beef now accounts for about two-thirds of all red meat consumed in the United States. Continuation of present per capita trends coupled with increasing population will call for a third more beef by 1980. However, the supply of feeder cattle may become a limiting factor. Past increases have come from saving more calves as well as from larger numbers. Nearly all available calves are now used for feeders. Hence, further supplies will have to come from expanding beef cow numbers.

Large-scale feedlots (those with 1,000 or more head capacity) accounted for only 1 percent of all feedlots in 1968, but they handled nearly half of all fed cattle. Farmer feedlots handled the others.

Nearly all regions produce some fed cattle, but the leading cattle feeding areas are in the Corn Belt, the Northern Plains, the High Plains, and California.

Large-scale commercial feedlots operate under a variety of arrangements in addition to feeding their own cattle. Some do custom or contract feeding. Some are tied into cooperatives, packing plants, or cattle ranches. Financing the physical plant for feeding cattle may run from a few thousand dollars to several million.

Key Words: Beef, feeding, feedlots, feeders, placements, contracting, futures.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402

PREFACE

The expanding cattle-feeding sector is one of the most important in agriculture today. This report makes use of the available published reports and statistical data, together with judgments of a number of research analysts concerned with the cattle industry.

The purpose of the report is to view the industry in its broad outlines and to attempt to lay a foundation for appraising significant problem areas that most need analysis. Many studies of specific parts of the industry have been made, and before proceeding again to detailed studies, the time seemed right for an appraisal of how these parts fit into a general framework.

Special recognition is extended to Ronald L. Mighell, Farm Production Economics Division, ERS, for his guidance throughout the development and preparation of the report.

Essential regional material was supplied by William A. Elder, Lake States; Neil R. Martin, Jr., Corn Belt; Henry C. Gilliam, Southeastern States; Ralph D. Johnson, Northern Plains; James R. Martin, High Plains; C. Kerry Gee, Colorado and Mountain States; Russell L. Gum, Arizona and California; and James B. Johnson, Pacific Northwest. All are in the Farm Production Economics Division.

CONTENTS

	Page
Summary	iii
Introduction	1
The situation	1
Objectives of study	4
Sources of data	4
Feeder cattle and feed grain production	5
Feeder cattle production	6
Supplies and movement of feeder cattle	12
Feed grain production by region	20
Fed cattle production	22
Cattle-feeding areas	23
Types of cattle feeders	23
Number and size of feedlots	33
Production of fed cattle	37
Feedlot capacity and degree of use	43
Placement of feeder cattle in feedlots	46
Programs for feeding cattle	56
Economies of size	62
Financing cattle-feeding operations	65
Vertical coordination in cattle feeding	66
Uncertainties in cattle feeding	70
Live cattle futures market	73
Marketing fed cattle	75
Methods of marketing fed cattle	75
Cattle quality	78
Marketing practices	79
Cattle slaughtering	82
Beef consumption	86
Selected references	90

Washington, D.C. 20250

October 1970

SUMMARY

Cattle feedlots handle more beef today than the entire cattle industry produced a scant 20 years ago. Yet the industry still needs to increase its output by a third to keep pace with trends in population and in per capita consumption over the next 10 years.

There is therefore a need to take stock of the industry and seek to define its problems, that they might be overcome, and that a foundation may be laid for further research.

Additional feeder cattle have been obtained in two ways: first, by feeding a larger share of the available calf crop (including more male dairy calves); and second, by expanding beef cow herds. At the present time, nearly all available calves above replacement needs are being fed, so further increases must come from beef cow herd expansion.

Numerous changes have taken place in the last 2 decades. Feeder cattle formerly moved mainly through terminal markets. Now they are sold chiefly by direct purchase and through auctions. In addition, feeder cattle quality has improved since 1950. And cattle entering feedlots in recent years have been lighter than in earlier periods; most weigh 500 to 700 pounds.

The Corn Belt, the Northern Plains, the High Plains, and California, in that order, led all other cattle-feeding regions in feeding cattle in feedlots in 1968. All regions fed some cattle.

Custom feeders, packer-feeders, and cooperative feedlots represent special types of feedlots and are found mainly among the larger commercial feedlots. Most custom feedlots combine feeding their own cattle with custom feeding for others. Packer feeding is done in packer-owned lots and in custom feedlots. In 1968, packers owned about 7 percent of all cattle marketed. Packer-associated interests accounted for another 4 percent. Cooperative feedlots fed less than 1 percent.

Farmer feeders in 1968 had 99 percent of cattle feedlots in the United States but produced 53 percent of the fed cattle. Commercial feedlots (with capacities for 1,000 head or more) had the other 1 percent of the feedlots and produced the remaining 47 percent of the fed cattle. Except for the smallest of the farmer feeders, both farmer feedlots and commercial feedlots may be with us for some time. Both have their advantages and disadvantages.

Placements are distributed more evenly by seasons now, as large feedlots try to operate continuously. But the peak placement period is still the October-December quarter, because of fall marketings from range operations.

Feeding programs differ greatly from area to area, depending on available feeds and other circumstances. Warmup feeding and finishing are separate specialties in some areas.

Investment in the physical plant for feeding cattle may range from a few thousand to several million dollars, depending on size of feedlot and degree of mechanization. In all regions, commercial banks are the primary source of fixed investment and operating credit. In some areas, production credit associations (PCA's) also make a significant contribution to capital needs.

Various forms of vertical coordination are used to combine the several stages of beef production. Contracting and vertical integration may be either forward or backward from the feedlot.

Cattle feeding is considered a high-risk enterprise because of technical, price, and other uncertainties. Price uncertainties are the most troublesome. Hedging in the live cattle futures market is one means by which some farmers can reduce the risk of loss from price changes. Contract arrangements also help.

Marketing methods for fed cattle have changed greatly in the last 20 years. As late as 1955, 38 percent of fed cattle moved through terminal markets. Direct sales now represent the leading method of marketing, especially in commercial cattle-feeding areas.

Cattle-slaughtering facilities are moving from the large terminal market areas to beef production areas. Cattle now more often move directly from feedlot to slaughter plant.

Beef consumption per capita is high and rising. Beef and veal account for two-thirds of the red meat consumed in the Nation. Although cattle feeding is almost entirely a domestic industry, imports have contributed to the total supply of beef available for consumption.

Less than half the beef consumed in the United States in 1950 was from fed cattle. By 1968, the proportion had risen to 70 percent.

Projections of U.S. beef consumption to 1980, based on expected trends in population and per capita consumption, indicate an increase of about a third above the 1968 level. Production capacity projections suggest that production of cattle and calves will increase accordingly.

Many research areas related to cattle feeding need attention. Data are needed on beef cow replacement rates, production, and seasonality of production. Information on preconditioning, warmup feeding, feedlot capacity, economies of size, financing, vertical coordination, and feedlot pollution are essential for analysis of trends in growth and organization. Improved data on capacity and number of slaughter plants by regions are needed to understand production and marketing changes. More information on surplus and deficit beef production areas would also improve supply-demand analysis.

CATTLE FEEDING IN THE UNITED STATES

by

Ronald A. Gustafson and Roy N. Van Arsdall
Agricultural Economists
Farm Production Economics Division

INTRODUCTION

One of the most romantic and exciting stories in the history of American agriculture is that of the conquest of Western rangelands and the long cattle drives along such famous routes as the Chisholm and Santa Fe Trails, to railheads in Abilene and Dodge City, for shipment to Eastern markets. Although beef production today is hardly likely to generate many heroes for the movie screen, the industry is nevertheless giving an unparalleled performance, which has shown up in the account books of producers and the shopping carts of consumers. The big story is not in the cow herds, as it was in the early days. It is in the feedlots, which now turn out some 15 billion pounds of fed beef annually where total output was only a fraction of that amount not two generations ago. It is at the feedlot that this study is centered.

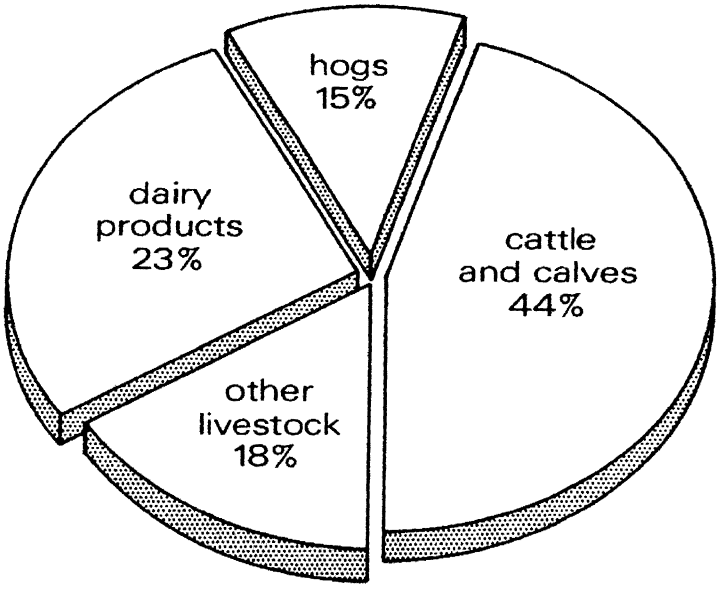
The Situation

Beef production has been and still is a business of rapid change, of extremes and contrasts. Although cattle are among the least efficient animals for converting concentrate feeds into meat for human consumption, they are among the most efficient in using materials that would otherwise go to waste. Probably half the cattle destined for the feedlot come not from large specialized ranches, but from small sideline beef-cow herds, and even dairy herds, found mainly on general crop-livestock farms of the central and southeastern United States. On an industry-wide basis, there appear to be incongruous inefficiencies. During the course of their growing and finishing programs, some calves move thousands of miles, perhaps ending in an even higher cost feed area than that of their birth, only to return eventually, as processed beef in the marketplace, to the area of origin.

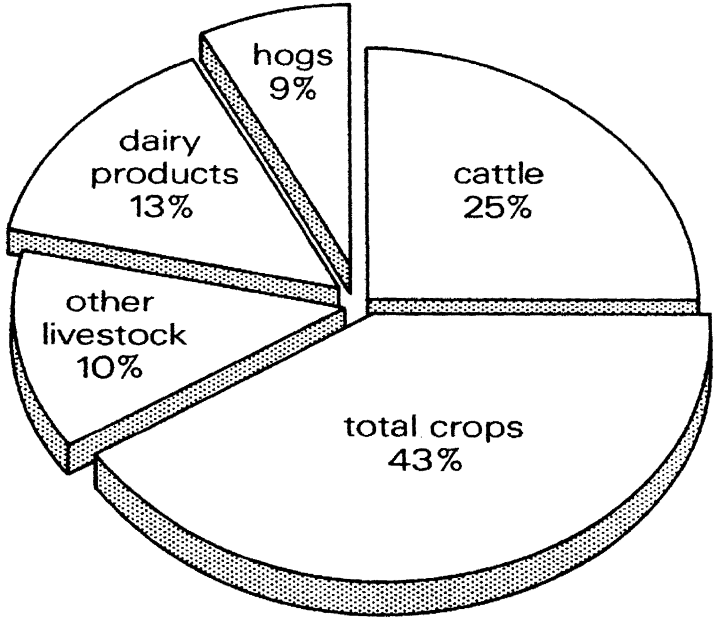
Despite some inefficiencies and a seeming lack of professionalism in some of the industry's segments, sales of beef now account for more than 44 percent of total cash receipts from all livestock products. They account for a fourth of cash receipts from farm marketings of all crops and livestock produced in the country (fig. 1). Cash receipts from dairy products run about half those from beef, while cash receipts from hogs amount to about a third (13). 1/

1/ Underscored numbers in parentheses refer to Selected References, p. 90.

CASH RECEIPTS FROM FARM MARKETINGS, BY COMMODITY, 1968



Livestock and Livestock Products



Crops and Livestock

U.S. DEPARTMENT OF AGRICULTURE NEG. ERS 7688-70 (5) ECONOMIC RESEARCH SERVICE

Figure 1

The recent growth in cattle feeding has been phenomenal. From a modest level in the 1930's, cattle feeding grew slowly until after World War II. The industry then expanded rapidly to an output of over 23 million head of fed cattle by 1968.

Beef consumption in the United States has paralleled the increase in cattle feeding, moving generally upward in both total and per capita terms over the last 20 years, despite changes in the prices of beef and competitive meats. This expansion is expected to continue. Total beef consumption is projected to increase by about a third from 1968 to 1980 as a result of population growth and a further increase in per capita consumption (4¢). Farm production projections indicate that numbers of beef cattle and calves will expand to meet this consumption need.

Cattle feeding is almost wholly a domestic business. Few beef cattle move between the United States and other countries, either by export or import. The U.S. feed supply is also domestically produced. In fact, concentrate cattle feeding is not practiced to any great extent elsewhere in the world. New areas of growth in the industry have been widespread in the United States, however. First, starting in the Midwest, then leaping to the West, and more recently rising in the High Plains and on the fringes of the Corn Belt, they now show signs of spreading elsewhere in the country.

The cattle-feeding industry includes more than 200,000 producers, most of whom have exceedingly small operations. But there are giants among these feedlots, some of them turning out over $50 million worth of fed cattle a year. So far, coexistence of small and large feedlots has been the rule. But large commercial feedlots have come to produce nearly half the fed cattle total and a much larger share of the increases that the industry has experienced. A major question is whether these feedlots will eventually produce nearly all of the total.

Most feedlots are independent, but some are formally integrated into the supply-processing chain. Many, especially the small ones, embody several production processes within their own operations, from feed and calf production to the finishing of cattle, perhaps gaining efficiency in some phases and losing it in others.

Entry into cattle feeding as yet has few restrictions. Facilities need be no more than a dirt lot on a general farm, where a farmer may spend as much as 25 hours to finish one steer. Others use elaborate, highly specialized feeding facilities, costing as much per square foot of space as a modern ranch-style home. In such facilities and in large commercial operations, labor needs may drop to no more than 1 hour a head.

Cattle feeding is a high-risk business, where a feeder may not even recover his feed costs in some years. The typical farmer feeder, however, makes only limited use of the risk-reducing measures available to him. Seemingly, the chance of windfall gains from cattle feeding means more than the possibility of more stable margins gained through hedging in the futures market or by forward contracting for the sale of slaughter cattle. Yet these same feeders are essentially conservative in other ways. They commonly buy insurance on their crops and frequently participate in Government programs to obtain minimum-price guarantees.

Cattle feeders, from the smallest to the largest, have been strongly independent operators. They have resisted all forms of supply-price control on domestically produced cattle. Now the entire industry is confronted with new technologies in feed production and processing, in animal husbandry, in materials handling, in marketing, and in overall business management. These developments may force members of the industry into a different structure and into greater interdependence because of inefficiencies in the present production chain, from raw feeds to processed meats. What may be a boon for some members of the industry could well be the end of the road for others.

A new breed is at work--a new breed of people providing management at a highly professionalized level, as in large-scale nonfarm enterprises. These people are attracting large amounts of new capital from sources inside and outside of agriculture. This management and money may weigh the heaviest of all factors producing change in cattle feeding.

The demand appears to be increasing for information regarding these changes in cattle feeding, the present status of the industry, and the growth and adjustments yet to come. This study attempts to provide a basis for meeting this demand.

Objectives of Study

The chief objectives of this study are to describe and appraise the structural characteristics of the beef-producing industry as it now exists and to trace and explain its past development. This information is to serve as the foundation for efforts to determine the direction of future adjustments and the type of adjustments needed and to delineate problem areas most in need of further study.

The study concentrates on cattle feeding, but it also moves in a limited way into production of feeder calves and other resources used in cattle feeding. And it examines the initial phases of the marketing system for slaughter cattle because of this system's relationship to efficiency, location, and structural characteristics of cattle-feeding businesses. 2/

Sources of Data

Data used in this study were derived almost entirely from secondary sources. Information collected chiefly by USDA agencies and State Departments of Agriculture was used to define trends and to describe the present status of the industry. Most of the trends described in this report relate to the period from 1950 to 1968. Information compiled from previously published studies of beef production and marketing was used for much of the economic interpretation of industry trends and status and probable future adjustments.

2/ For an excellent descriptive analysis centered more on the marketing phases of the beef industry, see the recent report by Jack H. Armstrong (2).

This report is also based in part on the qualitative judgment and opinions of persons having knowledge of the industry. Such opinions were obtained from agricultural economists, animal scientists, cattle feeders, and members of the industry throughout the country. The regions most often referred to in this report are shown in figure 2. They represent individual States and combinations of States in which somewhat similar cattle-feeding situations are found. Data for 48 States (excluding Alaska and Hawaii) are used. In some instances, data on cattle feeding are reported for 39 States, for 32 States, for 28 States, or for lesser numbers as stated. The differences in number of States are related to costs and statistical problems of data collection.

FEEDER CATTLE AND FEED GRAIN PRODUCTION

Americans have always consumed substantial amounts of beef, but in earlier years, much of it was from grass-fed animals. Relatively few cattle were fed grain before slaughter. The strong development of grain feeding of cattle since 1950, and especially in the last 10 years, has caused the supply of cattle available for feeding to be rapidly utilized. The industry now uses nearly all of the beef cattle and many of the dairy animals that hold a potential for grain feeding before slaughter. Future increases in the supply of feeder animals must therefore come largely from expansion of breeding herds. The pattern of growth and development in cow-calf operations, along with changes in dairying, will have substantial influence on the level, location, and structure of cattle feeding in the future.

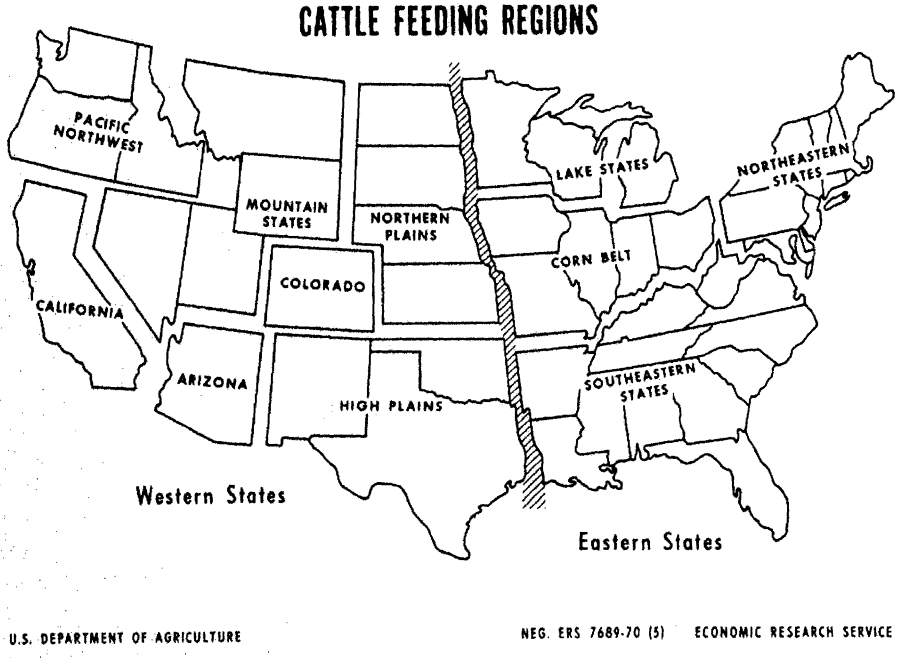


Figure 2

Number of Beef Cows

The number of beef cows in the United States has more than doubled in the last 20 years, increasing from 16.7 million in 1950 to 36.1 million in 1969 (table 1). The rate of growth has been greatest in the Eastern States.3/ The Lake States led all regions in rate of growth, with a 1969 inventory 279 percent above that in 1950. Only Arizona recorded a decrease in cow numbers over this period.

Actual increases were about equal in the Eastern and Western States; 9.7 million more beef cows each in 1969 than in 1950. The traditional range areas all recorded substantial increases. These areas have had most of the beef cows for many years, and although their share has decreased, they still hold a dominant position, with about three-fifths of the national total. The Southeastern States, however, are rapidly assuming a major position among cattle producers, with a 20-year increase of 6.0 million cows and a fourth of the present national total.

The rapid rate of growth in beef cow numbers in the Corn Belt, Lake States, and Northeast reflects a shift of resources from dairy to beef. As farms have gone out of dairying, the forages and facilities formerly used by dairy cattle have been devoted to small-scale beef cow enterprises. Expansion in numbers of cows in the Southeastern States has resulted largely from a shift in land use from row crops to pasture production, and from the reclamation of forest lands. Throughout the humid regions of the country, there seems to be an increasing awareness of the potential of improved pastures and of crop residues in the production of feeder calves.

Through time, the traditional range areas of the Western States have maintained operations near the capacity that was consistent with existing practices and technology. Increases in cow numbers have come largely from improvements in range resources and cattle management that have increased carrying capacity of land resources. The potential for further increases in productivity probably is less than in the humid regions.

Number of Milk Cows

Milk cows outnumbered beef cows in the United States by more than 7 million head in 1950 (tables 1 and 2). Since that date, and especially since 1960, their number has dropped rapidly. By 1969, they were only 59 percent of the 1950 count and were outnumbered, 2.6 to 1, by beef cows.

3/ The term Eastern States, as used here, refers to the 31 States east of the Plains States, the term Western States to the 17 States including the Plains States and those to the West (see fig. 2).

Table 1.--Number of beef cows on farms, January 1, 1950 and 1969, and percentage change, by regions 1/

Region	Number of beef cows		Percentage change
	1950	1969	
	1,000 head	1,000 head	Percent
Northeast	75	250	233
Lake States	231	875	279
Corn Belt	1,839	4,695	155
Southeastern	2,816	8,818	213
Northern Plains	3,121	6,287	101
High Plains	4,688	8,330	78
Mountain	1,639	2,925	78
Colorado	615	995	62
Arizona	393	367	-7
Pacific Northwest	704	1,617	130
California	622	973	56
48 States	16,743	36,132	116

1/ Beef cows and heifers 2 years and older.

Source: (38).

Table 2.--Number of milk cows on farms, January 1, 1950 and 1969, and percentage change, by regions 1/

Region	Number of milk cows		Percentage change
	1950	1969	
	1,000 head	1,000 head	Percent
Northeast	3,553	2,739	-23
Lake States	4,798	3,749	-22
Corn Belt	4,919	2,157	-56
Southeastern	4,767	2,406	-50
Northern Plains	1,903	834	-57
High Plains	1,778	579	-67
Mountain	307	166	-46
Colorado	192	110	-43
Arizona	49	55	12
Pacific Northwest	747	492	-34
California	840	848	1
48 States	23,853	14,135	-41

1/ Cows and heifers 2 years and older kept for milk.

Source: (38).

All regions except California and Arizona have experienced a decline in number of milk cows. Greatest percentage decreases were in the Corn Belt and Plains States, which have reduced milk cow numbers within their boundaries by more than half since 1950. These regions also top the list for actual declines in milk cow numbers, accounting for the loss of more than half the 9.7 million cows that had disappeared from inventory by 1969. The traditional dairy areas of the Lake States and Northeast have nearly 2 million fewer milk cows, but they still have over three-fourths as many as in 1950.

Expansion in beef cow numbers has been much less than the decline in milk cows in the Northeast and Lake States. In the Corn Belt, the changes nearly balance. In the Southeastern and Plains States and, except for California and Arizona, throughout the West in general, beef cow numbers have increased nearly three times as fast as milk cow numbers have declined.

Dairy animals provide a source of beef and a limited number of steer calves with a feedlot potential. Declines in milk cow numbers have cut into this supply, but beef production is increased as beef cows take the place of dairy animals. Continued substitution of beef cows for milk cows, coupled with the addition of new and improved resources for beef cows, can increase the domestic production of feeder calves. These shifts in regional supplies also affect the relative profitableness of cattle feeding in the various regions.

Major Types of Cow-Calf Enterprises

Beef cow enterprises vary greatly among regions as well as within regions. Types of enterprises range from small, supplemental beef cow operations on general crop-livestock farms to single-enterprise ranching operations with several thousand head of beef cows. The major British breeds--Angus, Hereford, and Shorthorn--predominate, but many other breeds and crosses of breeds, including dairy stock, are found in beef cow herds, especially in Southern and Southeastern areas.

Some enterprises may be large ranching operations with thousands of acres of grazing land where cattle get no shelter and only a little supplemental feed. Others have controlled-environment confinement facilities in which cows receive only harvested feeds. Most beef cow enterprises, however, use pasture, much of which is on nontillable land, and salvage crop residues otherwise wasted. The cattle receive only a little supplemental feed, other than protein, except during periods when pastures cannot be grazed. Shelter is usually minimal, and materials handling is commonly done with general purpose field machinery.

Beef cow systems include cow-calf, cow-yearling, and various combinations of the two, with a finishing program sometimes added on the same farm or ranch. Cow-calf enterprises are predominant. In the cow-calf enterprise, calves are usually sold at a weight of less than 550 pounds. In the cow-yearling enterprise, the calves are held longer and grown further on pasture or other crop roughages to weights as high as 800 pounds.

Beef cow enterprises average substantially larger in the Western States than in the Eastern States (table 3). Individual herds of 1,000 cows are not

Table 3.--Average number of beef cows per farm, by regions, 1964

Region	Average per farm
	Number
Northeast	8.8
Lake States	12.7
Corn Belt	15.7
Southeastern	17.3
Northern Plains	36.1
High Plains	32.4
Mountain	83.3
Colorado	57.0
Arizona	139.5
Pacific Northwest	32.0
California	52.5
48 States	26.3

Source: Computed from (44, table 12).

uncommon although average numbers are less. The large herds are generally single-enterprise operations utilizing native pasture and rangeland, with hay the only harvested crop.

In the eastern half of the country, beef cow herds on crop-livestock farms average fewer than 20 cows. Most herds are supplementary enterprises. Beef cow herds in the Corn Belt and Lake States depend largely on small acreages not suitable for cropping, hay from rotation cropland, and residues from field crops, especially corn. Enterprises in the Southeastern States are similar, but commonly depend more on pasture because of the longer growing season. In some of the coastal States of the region, some individual cow-calf enterprises with 100 or more cows are found.

Productivity of Beef Cows

The productivity of beef cows is reflected by number of calves produced in relation to number of cows and by weight of feeder calves sold per cow. Excellence in both is important in cow-calf operations because of high fixed costs, especially in land and cattle. But both may not be equally compatible with feedlot objectives. Although a greater number of feeder cattle would be generally desirable to feedlot operators, heavier weights per animal are not desirable for all types of feeding operations.

Available information credits beef cows in the United States with a relatively high calving rate.4/ The calf crop averaged 90 percent of cows on farms in 1969, a slight gain from 86 percent in 1950 (table 4). Further progress is likely to be

4/ These data provide only general guides, as calving rates have to be estimated on the basis of the combined beef-dairy cows. The shifting ratio of dairy to beef within a region may obscure the true relationships for either enterprise.

Table 4.--Calves born as a percentage of cows on farms, by regions, January 1, 1950 and 1969

Region	1950			1969		
	Cows 1/	Calves		Cows 1/	Calves	
		Number 2/	As percentage of cows 3/		Number 2/	As percentage of cows 3/
	1,000 head	1,000 head	Percent	1,000 head	1,000 head	Percent
Northeast	3,628	3,041	84	2,989	2,582	86
Lake States	5,029	4,515	90	4,624	4,151	90
Corn Belt	6,758	6,168	91	6,852	6,331	92
Southeastern	7,583	5,963	79	11,224	9,642	86
Northern Plains	5,024	4,497	90	7,121	6,659	94
High Plains	6,466	5,605	87	8,909	7,959	89
Mountain	1,946	1,706	88	3,091	2,851	92
Colorado	807	694	86	1,105	1,061	96
Arizona	442	349	79	422	350	83
Pacific Northwest	1,451	1,206	83	2,109	1,941	92
California	1,462	1,155	79	1,821	1,588	87
48 States	40,596	34,899	86	50,267	45,115	90

1/ All beef and milk cows and heifers 2 years old and older Jan. 1.
2/ Calves born during the year.
3/ Not strictly a calving rate. Represents calves born expressed as percentage of the number of cows and heifers 2 years old and over on farms and ranches, Jan. 1.

Source: (36, 38).

slow, as the practical maximum is probably near 95 percent, barring a technological breakthrough that increases multiple births.

Calving rates were stable between 1950 and 1969 in most regions, with established production areas having the highest rates. The rapidly growing number of beef cows in the Southeastern States, which now account for nearly a fourth of all beef cows, had a calving rate of only 86 percent in 1969. The rate in this region may offer one of the greatest opportunities for improvement.

Data are not available to measure productivity of beef cows by regions in terms of weight of feeder calves produced per cow. Some evidence, however, suggests that the Southeastern States again rank low, as many calves move out of the region at weights below 400 pounds. The region's low calving rates, lightweight feeders, and natural advantages suggest a great potential for future increase in production of feeder cattle.

New Technology for Cow-Calf Operations

New technology in existence or in the formative stage promises greater and more efficient production of feeder cattle in the future. Major areas for improvement seem to be in performance testing, hybrid vigor, reproduction, animal health, and forage production.

Performance testing leads to selection of desirable traits, especially higher calving rate, higher weaning weight, higher efficiency and rate of feedlot gain, and higher carcass merit. Such testing has already been used in a limited way and will receive more emphasis.

Hybrid vigor, especially that obtained by crosses of the major British breeds with Brahma and Charolais, produces larger, faster growing cattle. Such crossbreeding will be used increasingly.

Estrus synchronization and artificial insemination are also being tested. An economical means of estrus synchronization for beef cows would greatly facilitate artificial insemination. This method of breeding would permit wider use of superior sires, more uniform calving periods, and hence more uniform marketing weights. Further progress with artificial insemination depends on the development of proper beef cow-handling equipment, training of more insemination technicians and workers skilled in the detection of heat, and an adequate supply of semen from tested bulls.

Improved management of breeding herds--better nutrition, culling, pregnancy testing, crossbreeding, and use of animal health innovations--should help to increase calving percentages and weaning weights. Operators of beef cow enterprises are giving these and other improved management techniques wider use and acceptance.

Improvements in forage production could provide the main base for future increases in production of feeder cattle. Better pastures, of native and introduced grasses, can increase cattle-carrying capacity in many areas, particularly where legumes and a good fertilization program can be incorporated.

Improvements in harvesting, storing, and feeding forage crops and crop residues offer much promise for increases of feeder calf production in regions where row crops are produced. Cornstalk silage (with urea or other nonprotein nitrogen), in particular, could provide enough feed for a considerable expansion of beef cow numbers.

Many of these new practices are likely to be widely adopted. Some are best suited for use in a large operation as they have high fixed costs. Others, such as pasture improvement programs, can be readily used by producers with any size of herd.

Feeder-Calf Supply

The potential supply of feeder calves in any given year is something less than the total production of calves from all beef and milk cows, plus imports, less calves needed for other purposes. This supply can be estimated, but there is no way of precisely accounting for the actual number of calves raised and their final disposition. Until 1953, the dairy calf crop exceeded the beef calf crop (fig. 3). Since then, the beef calf crop has grown rapidly, and the dairy calf crop has declined. In 1968, the calf crop consisted of 31.3 million beef calves and 12.9 million dairy calves (15). Despite the continuing decrease in dairy calves, the total annual calf crop has increased by almost 10 million head since 1950. In addition, commercial calf slaughter has declined, from almost 10 million head in 1950 to 5.4 million head in 1968 (16). The increase in calf crop and reduction in commercial calf slaughter (from 28.6 to 12.3 percent of the calf crop) have provided the increased supply of feeder cattle needed for the rapid growth of the fed-cattle industry.

The 36.1 million beef cows on farms and ranches in the 48 States in 1969 are estimated to have produced about 32.4 million calves (38). The 14.1 million milk cows inventoried in 1969 produced about 12.7 million calves.

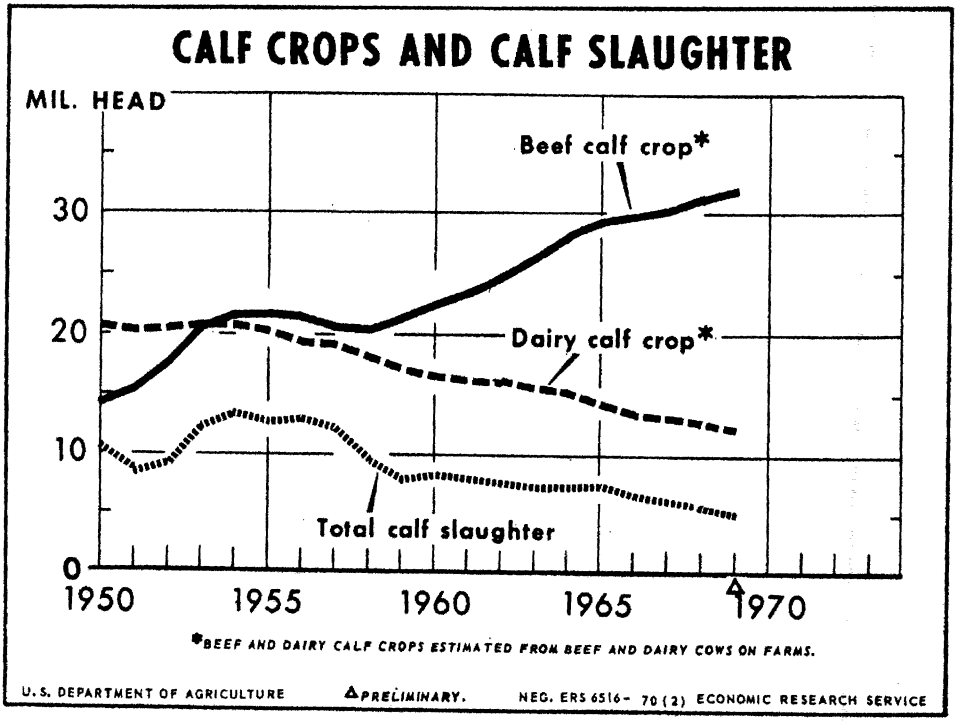


Figure 3

Only some of these calves are available for placement in feedlots. Beef heifers are needed for herd replacements and expansion. Relative prices and the stage of the beef cycle determine the degree of culling and the change in cow numbers. Dairy heifers are used for herd replacements and for veal. They have not entered the supply of feeder cattle very much and have generally been considered unsuitable for this purpose. Some male animals are needed for breeding purposes in beef and dairy operations, but the number required is small. The inventory of bulls amounts to about 5 percent of that of cows.

Many factors affect the number of cattle actually moving into the final feeder calf supply. Among these factors are: the number of beef and dairy calves slaughtered as nonfed beef; differences between estimated and actual rates of calving; the extent of culling; the need for breeding herd replacements; and death losses.5/

Imports of feeder cattle from Mexico and Canada add to the feeder cattle supply, but only to a limited extent. The volume of imports depends largely on domestic supplies and prices of feeder cattle, demand for fed beef, and import and export restrictions of the respective countries. Consequently, feeder cattle imports fluctuate from year to year. Since 1950, imports have varied from about 50,000 (1954) to more than 1.2 million head (1962) (16). In the 1960's, annual imports averaged about 900,000 head. About 80 percent of the feeder cattle imported weighed 200 to 699 pounds, 14 percent weighed less than 200 pounds, and 6 percent weighed 700 pounds and over.

It is difficult to estimate the supply of feeder calves by regions. The number of cows is increasing more rapidly in some regions than in others. Rates of culling differ among regions for this and other reasons, but detailed information on the variation is not available. Further, the distribution by source of heifers for replacement and expansion is not known. In fact, the number of cows within each region is the only available guide to the prospective supply of feeder calves from that region. Any estimates made from this number are subject to the many factors mentioned earlier.

The January 1 inventory provides a partial picture of relative change in the supply of feeder calves through time. This inventory increased from 12.5 million in 1950 to 28.0 million in 1969, for a percentage increase greater than that for beef cows in the same period (table 5). The sharp decline in the number of milk cows seemed to have little effect on this inventory, as many dairy calves are disposed of during the year without entering the feeder calf supply.

The composition of the feeder calf inventory has changed substantially since 1950. Heifer calves comprised only 31 percent of the total in 1950, but their share rose to 42 percent by 1966 (table 6). This change reflects the decreasing contribution of dairy cattle to the feeder calf inventory, which includes dairy steer and bull calves less than 1 year old but does not include dairy heifers.

5/ Preliminary estimates of the potential feeder cattle supply have been made by assuming an 89-percent calf crop, a 4-percent death loss, a 20-percent replacement rate, bull calves equal to 1 percent of cow numbers saved for breeding purposes, a 1-percent death loss in replacements and a rate of expansion (decline in dairy herds) equal to the 1950-69 average.

Table 5.--Number of all beef calves and male dairy calves on hand January 1, 1950 and 1969, and percentage change, by regions

Region	Number of beef calves and male dairy calves		Percentage change
	1950	1969	
	1,000 head	1,000 head	Percent
Northeast	108	180	67
Lake States	557	1,362	145
Corn Belt	2,690	5,940	121
Southeastern	1,553	4,080	163
Northern Plains	2,905	6,414	121
High Plains	2,431	5,057	108
Mountain	957	1,665	74
Colorado	421	851	102
Arizona	154	283	84
Pacific Northwest	473	1,183	150
California	267	957	258
48 States	12,516	27,972	123

Source: (38).

Table 6.--Percentage of feeder cattle produced, 48 States, 1950, 1955, 1960, and 1965-69

Year	Heifer calves 1/	Steer and bull calves 2/
	Percent	Percent
1950	31	69
1955	36	64
1960	37	63
1965	40	60
1966	42	58
1967	42	58
1968 3/	42	58
1969 3/	42	58

1/ From beef cows only.
2/ These are reported as "other calves" in the Jan. 1 livestock inventory. They include all male calves less than 1 year of age on Jan. 1, from both beef and milk cows.
3/ Preliminary estimates.

Source: (38, Feb. 1967).

Interregional Movement of Feeder Cattle

The 17 Western States have long been the leading source of feeder cattle for the feedlots of the Nation. Cattle moved from these range areas into feedlots of the Corn Belt. The present flow of feeder cattle, however, no longer maintains this well-defined pattern of the past. It has become a multiple flow of increasing complexity, from many surplus to many deficit areas.

Several factors help explain this changing movement of feeder cattle. Growth and shifts in population have changed the location and nature of consumption centers for fed beef. Cattle feeding is still a major, growing enterprise in the Corn Belt but it has developed more rapidly in other regions of the country. New sources of feeder cattle have developed concurrently, especially in the Southeastern and Corn Belt States. Other significant factors include a vastly improved interstate highway network and more efficient trucking equipment.

Shipments of feeder cattle among regions now form a rough clockwise pattern, which is reversed in some instances (table 7). Cattle from the Mountain States still move east to the Corn Belt, where there remains a preference for the British beef breeds. However, many cattle are siphoned off to the expanding feedlots of other regions, thus forcing Corn Belt feeders to seek alternative sources. Feeder cattle produced in the Southeastern States move into the High Plains in large numbers, while many of the High Plains feeder cattle move elsewhere for feeding.

The seemingly illogical movement of feeder cattle, both into and out of the High Plains, stems largely from past preferences of Northern feedlot operators for the British beef breeds. The mixed breeds of cattle, characteristic of production in the Southeastern States, perform well in feedlots of the High Plains and Southwest. The grades of finished beef produced from these cattle also meet consumer demand in the West. Thus inshipments and outshipments have both been profitable.

Corn Belt feeders are reappraising their purchasing operations because of competition for the total supply of feeder cattle, loss of some of the volume from traditional sources, and recognition of the feedlot potential of mixed types of cattle. Shipments of cattle from Southeastern States into the Corn Belt, especially into the eastern part, have risen rapidly in recent years. Much of the earlier movement westward from States along the Mississippi is now going northward, into areas of surplus grain production.

As cattle feeding expands in volume, more cattle feeders are likely to rate cattle on the basis of their slaughter potential and their ability to do well in the feedlot. Value of the carcass will become more important than breed preferences. Transportation costs and demands of cattle feeders from adjacent areas will become more significant in determining the direction and distance that cattle move to be fed.

Transportation of Feeder Cattle

Developments in transportation have had an important bearing on the location of cattle production and feeding and on overall costs of production. Railroad

Table 7.--Source of feeder cattle and calves as a percentage of supply in specified regions, selected years

Source	Destination					
	North Central States 1/	Western Corn Belt 2/	Oklahoma 3/	Texas 3/	Colorado 2/	California 2/
	Percent					
Northeast	---	---	---	---	---	---
Lake States	2	---	---	---	---	1
Corn Belt	12	20	---	---	---	---
Southeastern	7	7	15	13	3	14
Western Corn Belt	---	20	---	---	---	---
Northern Plains	39	28	2	---	9	---
High Plains	13	25	80	85	40	37
Mountain	20	9	---	---	8	---
Colorado	3	---	---	---	29	---
Pacific Northwest	2	---	---	---	---	5
California	---	---	---	---	---	31
Others	---	10	3	2	10	10
Imported	4/2	5/1	---	---	6/1	6/2
Total	100	100	100	100	100	100

1/ Direct shipments of stocker and feeder cattle and calves into selected North Central States (Ohio, Ind., Ill., Mich., Minn., Iowa, S. Dak., and Nebr.), calendar year 1968.(16).

2/ July 1, 1966-June 30, 1967 (7). Western Corn Belt comprises: Crop Reporting Districts 4 to 9, inclusive, in southern Minn.; 1, 2, 4, 5, and 7 in western Iowa; and 3 in northeastern Nebr.

3/ July 1, 1966-June 30, 1967 (12).

4/ Canada and Mexico.

5/ Canada.

6/ Mexico.

facilities and rail rate schedules largely determined the original routes of cattle movement from range areas to feedlots, and to some extent, the location of feeding areas. Railroads now carry so few cattle as to have little influence on location of production of either feeder or finished cattle. In 1919, trucks hauled less than 2 percent of all cattle shipped to major public markets (30). In 1950, trucks were hauling two-thirds of all cattle marketed, and by 1967, more than 97 percent.6/

The coming of good local highways, the new interstate highway system, and large capacity trucks means that trucking of cattle offers several advantages over

6/ Information supplied by Charles H. Gilbert, Transportation and Warehouse Div., Cons. and Mktg. Serv., U.S. Dept. Agr.

rail shipment. Most areas of the country, even those distant from towns or railroads, are now accessible to trucks, which can move rapidly from one region to another by interstate highways. Much handling, on- and off-loading, and time in transit are saved. Few hauls from range to feedlot now take more than 24 hours, compared with the several days that were often required by rail. The consequent reduction in shrinkage and stress on cattle has been important.

Improved coordination in the transportation system may bring further economies to the interregional movement of feeder cattle through better planned backhauls. Truckers who bring feeder cattle into grain surplus areas can offer lower rates if grain or other products are returned on the backhaul to the range area.

Purchasers of feeder cattle usually pay for transportation to the feedlot. The owners of feeder cattle pay for transportation to auctions or terminals, although in the Southeast, some auctions provide free or nominal cost transportation. Responsibility for transportation expenses is commonly set at time of purchase.

Preconditioning Feeder Cattle

The transition of calves from a cow herd in an open range environment to closely confined quarters, perhaps in a different climate hundreds of miles away, is a shock to the animals. This shock is a costly problem for cattle feeders.

Calves are under stress from a combination of such factors as weaning, medical treatment, rough handling, lack of feed and water during transit, strange environment, and change in feeds. Reduction or elimination of these factors lowers death loss, shrinkage, and time required to get cattle started on feed. Cattle feeders want cattle to reach their feedlots in the best possible condition. The practices involved in preparing cattle for the feedlot are often referred to as a preconditioning program.

Preconditioning is not well defined in terms of standardized practices and procedures. In fact, it is often confused with warmup feeding, which is discussed later in this report. Preconditioning may include dehorning and castrating well before weaning, providing necessary vaccinations and treatments for control of parasites, and weaning at least 3 weeks before shipment. In addition, calves should be familiarized with drylot confinement, feed bunks, and water troughs. Handling and rough treatment should be minimized, particularly just before and during loading for transit.

Feeder cattle can be preconditioned on ranches where they are produced or, in part, by operators who specialize in readying cattle for placement in feedlots. The relative costs and effectiveness of the two alternatives are unknown.

Even if a preconditioning program becomes standardized, its effectiveness will suffer until means of identifying cattle improve. Under present marketing arrangements, cattle often lose their identity between ranch and feedlot. Producers of feeder cattle cannot profit from a preconditioning program unless it can be translated into a higher price at the feedlot. And if feedlot operators cannot take

full advantage of preconditioned feeder cattle unless they know what has been done, they cannot offer producers the higher prices that make preconditioning worthwhile.

An additional problem stems from the lack of data on response to preconditioning. Few records are available for estimating differences in feedlot performance. Prescription preconditioning programs must somehow be coupled with means for maintaining the identity of cattle throughout marketing channels and for measuring their feedlot performance. Until this happens, price premiums can be assigned only on an arbitrary basis.

Preconditioning programs acceptable to both producer and purchaser may become a part of feeder cattle contracts in the future. They will be best adapted to direct ranch-to-feedlot movement. Larger scale feedlots are often concerned with achieving a high rate of turnover, to maximize utilization of feedlot capacity. These feedlots may be especially interested in fostering further development of preconditioning programs, either at ranches or in specialized operations. The possibilities warrant further investigation.

Prices of Feeder Cattle

Prices of feeder cattle in each region depend upon demand for and supply of different weights and grades of cattle, and cost of transportation. Average prices for 550 to 750 pound Choice and Good feeder steers in 1968 reflect these variations (figs. 4 and 5). Where a given grade of cattle was in demand, but in short supply, prices were highest. However, low prices do not necessarily reflect a large surplus, as for example in the Southeastern States, where relatively few Choice feeders are produced, but fewer still are placed in feedlots within the region.

Variations in average prices among regions for a given grade of feeder cattle also reflect differences in quality within that grade of cattle. Feeders coming from one region may typically fall in the higher portion of the grade, while those from another region may tend to be near the bottom of the same grade.

Prices also vary among regions between time periods, even on a day-to-day basis. As demands shift and pasture conditions change, regions may even reverse their price positions for a given grade of cattle. Further, one region seldom has the same relative price advantage for all types of feeder cattle. Proximity to areas of demand for the kind of cattle in question materially affects prices and regional relationships.

Differences in average prices for a specified grade of cattle do not always indicate a movement of cattle from one region to another. Much variation in price occurs within grade, such as between low Choice and high Choice feeder cattle. The same variation also occurs between lightweight and heavyweight feeder cattle. Further, preference for feeder cattle produced locally, and therefore not subject to the costs and stresses of long-distance transportation, can affect prices in a particular area. On the other hand, locally produced cattle of one grade may move out of the region for feeding, while another grade is brought into the region for feeding. Such a situation may be due to a local resource and demand situation. Because of these many variables, average prices in various regions present only a superficial view of interregional price relationships for feeder cattle.

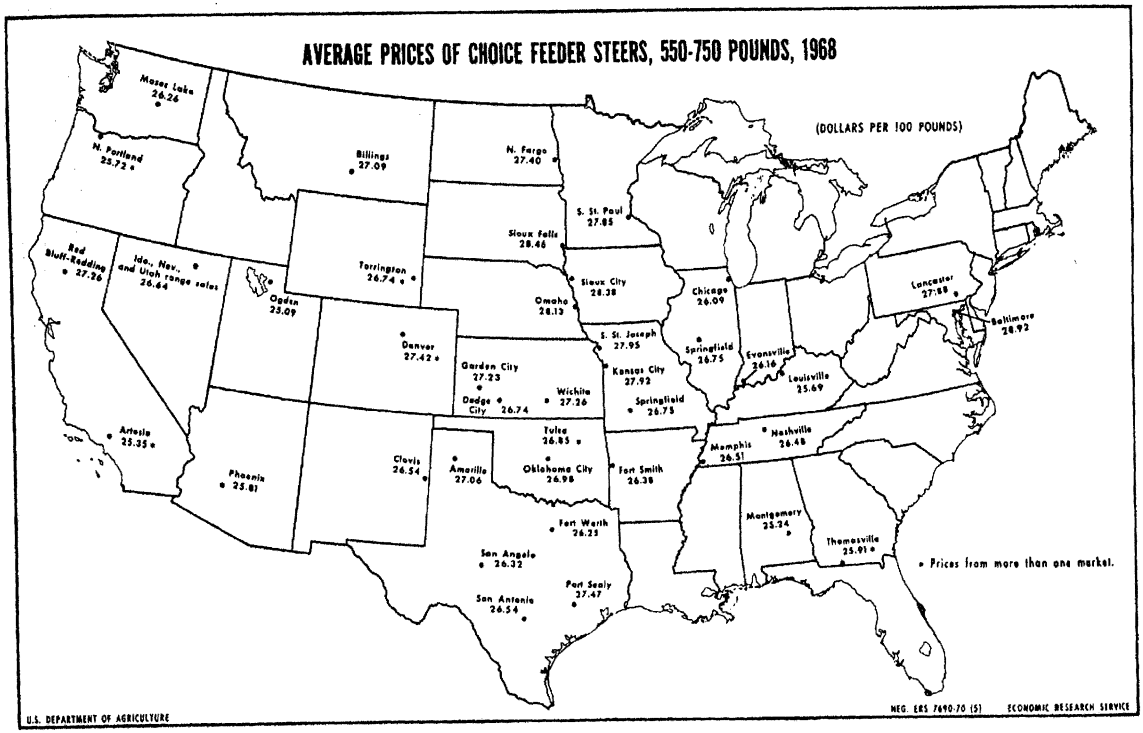


Figure 4

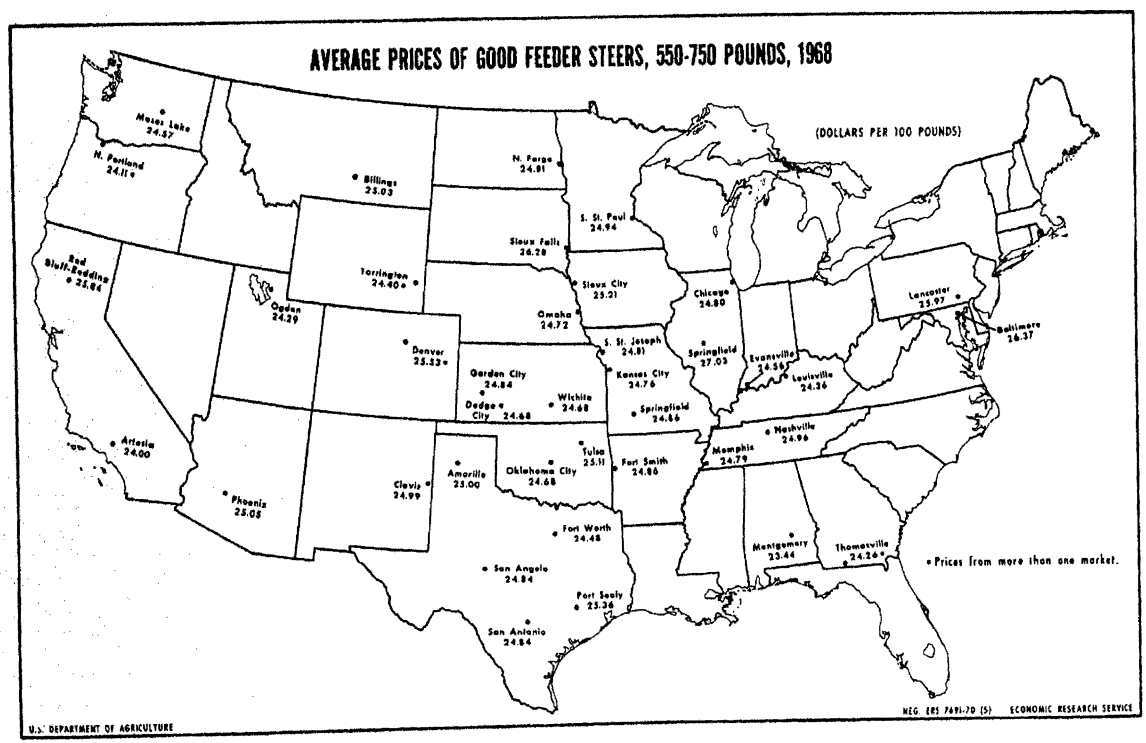


Figure 5

Feed Grain Production by Region

Adequate supplies of feeder cattle and feed grains are essential to successful cattle-feeding operations. To stay with cattle feeding, an area must produce one or both of these resources or be able to import them economically. Feed costs are the second largest item of expense in cattle feeding, after the cost of the feeder cattle themselves.

Feed costs, however, account for two-thirds to three-fourths of the total cost of putting gain on cattle. Purchases of concentrates comprise about two-thirds of the total cost of feed.

Based on the total disappearance of feed concentrates (feed grains and by-product feeds), it is estimated that cattle on feed received 18 percent of the total of all concentrates fed to livestock in the feeding year beginning October 1, 1967, an increase from 7 percent in 1949-51 (table 8). This estimate excludes some byproduct feeds that were consumed but were not currently included in the feed inventory. In addition, urea is now used extensively to replace oilseed meals, especially by operators of large feedlots.

In the 1967 feeding year (October 1, 1967, to September 30, 1968), feed grain production in the United States was about 50 million tons more than quantities fed (fig. 6). This excess was used for human consumption, export, and carryover. Feed grain production was greatest in the Corn Belt, Plains States, and Lake States--all of which had substantial surpluses. The Southeastern States had by far the greatest feed deficit of any region, although the Northeast, California, and Pacific Northwest also had large deficits.

The Corn Belt is the largest feed grain-producing region and, despite a concentrated livestock population, produces a large surplus of feed grains. Much of this surplus moves into the deficit areas of the Southeast and Northeast, and into export markets. California and Arizona rely mainly on the surplus feed grain production of the High Plains to supplement their own feed grain production. The Northern Plains is the primary source of feed grains for the Pacific Northwest and the Mountain States. Feed grain demands in Colorado are met largely from surpluses in the Plains States.

Production-use balances of feed grains have changed greatly since 1949-51. For the most part, the surplus or deficit positions of regions have intensified in magnitude. In 1967, the excess of feed grains produced in the Corn Belt above quantities fed to livestock was three times as much as in 1949-51. The excess was equivalent to nearly 95 percent of the 50-million-ton surplus produced in the whole country. Excess production of feed grains nearly doubled over this period in the Lake States and Northern Plains.

The High Plains region has moved from a nearly balanced position in the production and utilization of feed grains to one of substantial surplus (2). This movement was due chiefly to the rapid introduction of hybrid sorghum grain, which began in the late 1950's, the switch of several million acres of land from cotton to grain production, and extensive development of irrigation. Grain supplies have outrun the needs of the region's fast growing cattle-feeding business.

Table 8.--Total concentrates fed to all livestock and quantity and percentage fed to cattle on feed, by type of concentrate, feeding years 1949-51, 1959-61, and 1967 1/

Concentrates fed to livestock	1949-51 average			1959-61 average			1967		
	Total concentrates fed	Fed to cattle on feed		Total concentrates fed	Fed to cattle on feed		Total concentrates fed	Fed to cattle on feed	
		Quantity	Percentage of total		Quantity	Percentage of total		Quantity	Percentage of total
	1,000 tons	1,000 tons	Percent	1,000 tons	1,000 tons	Percent	1,000 tons	1,000 tons	Percent
Feed grains:									
Corn	67,523	6,725	10	80,361	9,223	11	97,581	17,260	18
Oats	18,816	110	1	14,564	143	1	10,738	473	4
Barley	3,256	144	4	4,064	1,552	38	5,129	2,120	41
Sorghum grain	2,913	73	2	8,932	2,250	25	14,873	4,500	30
Wheat and rye	3,170	20	1	1,655	23	1	4,630	1,791	39
Total	95,678	7,072	7	109,576	13,191	12	132,951	26,144	20
Byproduct feeds:									
Oilseed meal	7,858	694	9	10,730	1,138	11	12,648	1,163	9
Grain protein	1,606	35	2	1,731	43	2	2,297	126	5
Millfeeds	4,987	77	2	5,051	118	2	4,966	210	4
Other	3,717	410	11	5,254	1,082	21	7,346	1,314	18
Total	18,168	1,216	7	22,766	2,381	10	27,257	2,813	10
Total fed	113,846	8,288	7	132,342	15,572	12	160,208	28,957	18

1/ A feeding year begins Oct. 1 of the first year designated. For example, the 1949-51 average is for the 3-year period Oct. 1, 1949, to Sept. 30, 1952.

Source: Derived from data in (2).

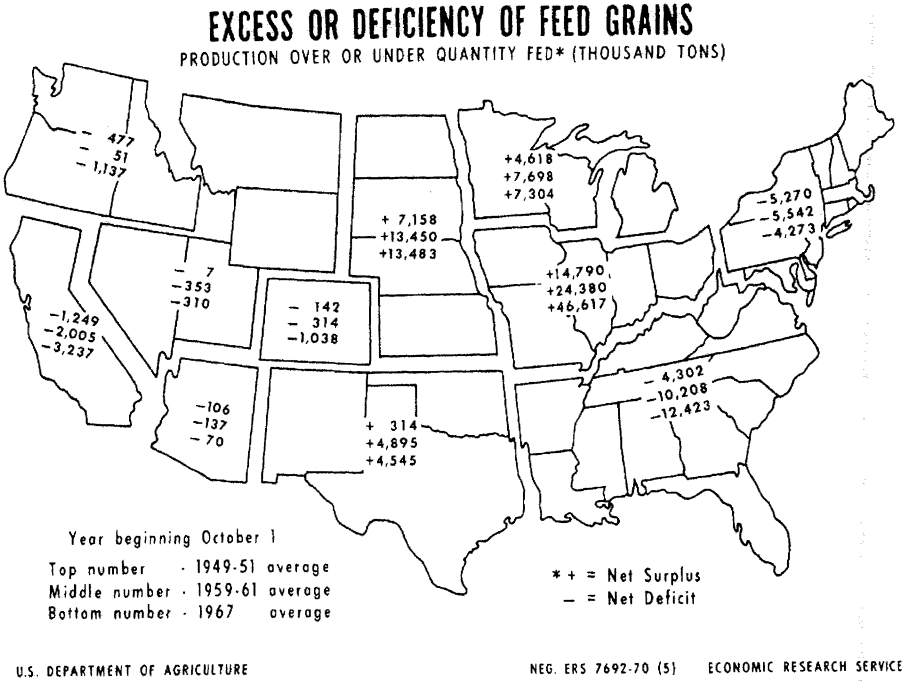


Figure 6

A deficit feed grain situation continues in other regions and has become especially marked in the Southeastern region. Over the last 20 years, corn acreage in the Southeast has dropped by more than half as cropland has been shifted to production of other row crops, pasture, and even timber. At the same time, production of livestock, especially poultry and beef cattle, has increased. The region now has a fourth of the beef cows in the United States. Coupling its increasing deficit in feed grains and growing output of feeder calves with the massive grain surplus in the Corn Belt suggests possibilities of future change in the pattern of resource use within and between these regions.

FED CATTLE PRODUCTION

Cattle feeding, a relatively old enterprise, has made exceptionally rapid progress since World War II. Since 1950, the number of fed cattle marketings has more than doubled, and the recent growth and adjustment trends show few signs of slackening.

The situation in the 1930's and 1940's is documented by limited quantitative information. Only in recent years has a rather thorough accounting of the cattle feeding business been attempted. Even now, much of the data needed to describe and understand the industry are incomplete. The chief objective here is to quantify and describe the present situation in cattle feeding and to illuminate the paths of change.

Cattle-Feeding Areas

Not long ago cattle feeding was almost synonymous with Corn Belt feeding. There the surplus grains were brought together with feeder cattle from the range areas. Then cattle feeding began to develop in other regions also. Areas in California, Arizona, the Plains States, and Colorado represent some of the better known centers of concentration of cattle feeding (fig. 7).

Cattle feeding remains dominant in major feeding areas where the combination of feed supplies, feeder cattle, markets, and other resources are balanced in its favor. Each of the major cattle-feeding regions fed substantial numbers of cattle in 1968. In each region, however, there are specific locations in which feeding operations are concentrated. Some of these locations cover broad geographic areas, as in the northern portion of the Corn Belt. In other regions, the industry is confined to small areas.

Nearly all parts of the country now have some cattle feeding. Such regions as the Southeastern and Mountain States account for hardly more than 2 or 3 percent of the number of cattle fed nationally, but each region has several areas of concentration. These areas are small, but their level of output is sufficient to make feeding of significance to the agricultural economy of the local areas.

Types of Cattle Feeders

Cattle feeders can be divided into two basic types: farmer feeders and commercial feeders. Operations vary, depending on location, agricultural organization, and other businesses in which the operator may be engaged.

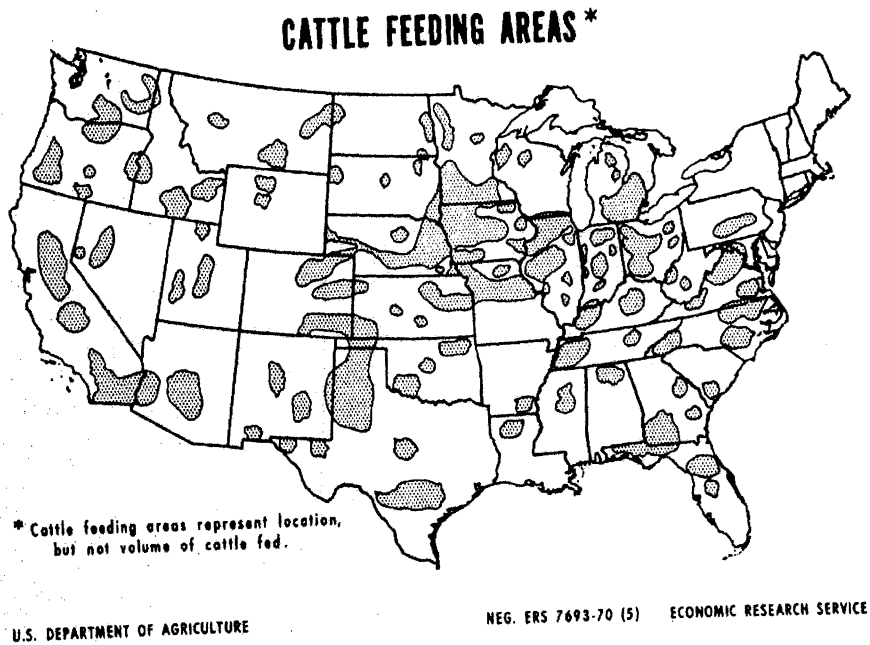


Figure 7

Farmer Feeders

In this study, farmer feeders are defined as operators of feedlots with capacity for less than 1,000 head (49).7/ Such feedlots comprised 99 percent of all cattle feedlots in 1968. They are a majority in most regions although most of them are in the Corn Belt, Northern Plains, and Lake States. They usually supplement other farming or ranching enterprises. In addition to cattle feeding, their activities commonly include production of field crops and other livestock, especially beef cows and hogs.

Entry into cattle feeding is easy as there are few barriers. A suitable level and kind of production technology can be adapted to fit small- as well as large-scale operators. Initial investment varies greatly depending on the degree of substitution of capital for labor. Feedlot facilities vary from makeshift pens, in which a few head are hand-fed, to elaborate buildings with controlled environments, slotted floors, and capacities up to 1,000 head.

Feedlots with capacities for less than 200 head commonly operate only during the noncropping season. Larger farmer feeders, who have feedlots with more specialized facilities, operate more nearly on a year-round basis.

The number of farmer feeders has been decreasing, but most of the decrease has come from the group of feedlots marketing less than 100 head annually. Farmer feeders with larger enterprises have been increasing their numbers and their total production of fed cattle.

The advantages of off-season labor, nonsalable roughage, and other low-cost inputs strengthen the farmer feeder's position compared with specialized, single enterprise feedlots. However, to remain competitive, he must utilize at least some of the new technologies and keep up with the pricing mechanisms of feedlot inputs and outputs. Possibly the most perplexing problem now facing the farmer feeder is that of coping with the new pricing and marketing mechanisms.

Commercial Feeders

Commercial cattle feedlots are defined in this study as feedlots with a capacity for 1,000 or more cattle (49). They are further broken down into independent feeders, custom feeders, packer feeders, and cooperative feeders. In 1968, commercial feedlots accounted for only 1 percent of all cattle feeders. But they have furnished two-thirds of the industry's growth since 1962 and now produce nearly half of all fed cattle. Farmer feeders are found primarily in the older, established feeding areas. Commercial feedlots generally dominate output in the newer cattle-feeding areas--the Plains States, Colorado, Arizona, and California.

Commercial feedlots are highly specialized production units, ranging in capacity from 1,000 to over 100,000 head. They may be single-enterprise operations, or they may be integrated with such other activities as grain production, feed manufacturing, feeder-cattle production, and meatpacking. The feedlot

7/ Capacity is defined as the maximum number of cattle that can be fed at one time.

operator may own the cattle fed or custom-feed them for others. Ownership of commercial feedlots ranges from sole-proprietorships to corporate farms, including cooperatives.

Commercial feedlots tend to be highly efficient operations. Internal and external economies of size have helped them grow. Most of them purchase all or most of their feeder cattle, feeds, and other inputs. They utilize up-to-date technology, modern equipment, and trained management. Feed-milling equipment and technology may approximate that of many feed companies. Feeds are commonly delivered to feed bunks by self-unloading trucks and other power equipment. Both cattle and feed are weighed to keep close account of gains, costs, and efficiency. Labor and equipment is specialized, with each employee commonly performing only one or two tasks. Many of the larger feedlots have their own veterinarians, nutritionists, buyers, and other trained specialists. They also maintain detailed records, often with electronic accounting systems.

Custom Feeders

Custom cattle feeders perform the service of feeding cattle for a fee, without taking ownership to the cattle. They are found chiefly in regions with large numbers of commercial feedlots--primarily California, Arizona, Colorado, and the Plains States. Their growth has paralleled that of commercial feedlots.

The method of operation in custom feedlots is about the same as that in other feedlots of similar size. Commonly, the operators combine custom feeding with feeding their own cattle. In fact, custom feeding has been an attractive means for rapid development of large-volume feeding operations. Individuals who do not have sufficient capital to build and operate a feedlot large enough to perform economically can acquire the necessary capital and volume by custom feeding cattle for others. In this way, part of the burden of providing capital for efficient operation of a large feedlot can be shifted to outside interests. Seldom do feedlots operate wholly on a custom basis. Success in attracting customers depends on performance and reputation.

Services rendered vary from feedlot to feedlot, and often differ among customers of a single feedlot. In some instances, services may be so complete that the customer never sees the cattle. The custom feedlot operator may buy the feeder cattle, feed them, market them, and send the customer a check for the balance after subtracting input costs, interest charges, and custom-feeding charges. Less complete services are usually available to suit the needs of the customer.

Although custom-feeding arrangements are numerous and are determined through mutual agreement, four systems are relatively common. In one, the custom operator buys the cattle in his own name. The client then executes an agreement to buy the cattle when they are ready for slaughter, paying a cost equal to the original purchase price of the feeder cattle, plus all feeding, handling, and interest charges (19). The client is usually required to make a downpayment of 20 to 30 percent of the purchase price of the feeder cattle.

Another plan, called the feed markup system, includes a basic feed charge, plus a markup to cover feed handling and grinding and labor costs. An additional assessment of $1.50 to $3.00 a head is made to cover vaccination, medication, branding, dehorning, and dipping (12). In this plan, the feedlot operator does not finance purchase of the cattle.

A third custom-feeding plan is based on a basic feed charge per ton of feed, plus an additional 5 to 6 cents per head per day to cover handling, yardage, feed grinding, and similar expenses. An additional $1.50 to $3.00 a head is charged as in the feed markup system to cover medication, vaccination, branding, dehorning, and dipping (12). Again, the customer finances purchase of the feeder cattle.

A fourth plan is based on a charge per pound of gain. Few feedlots use this arrangement, however, as rate and efficiency of gain of feeder cattle vary, as does the effect of uncontrollable factors such as weather and disease.

For a specified rate of interest on the balance, custom feedlots will often carry feed costs until the end of the feeding period. However, many operators do not charge interest on feed bills paid by a specified time each month. Feedlots charge interest to reduce capital needs and to safeguard against a situation where the market value added to the fed beef would not cover the custom and other charges. Financing helps attract clients, and feedlot operators are under pressure to keep their feedlots filled with cattle. Therefore, financing of cattle and feed by custom operators will probably continue to be an important source of funds to those who place cattle in these lots (19).

Custom feeding is usually correlated with feedlot size. In 1964, less than 4 percent of fed cattle sold by farmer feeders in 15 selected States were custom fed (table 9). The percentage of custom-fed cattle rose as capacity of feedlots rose, reaching 49 percent in the 10,000- to 14,999-head capacity feedlots. The percentage of custom-fed cattle remained near that percentage in feedlots of higher capacity, up to those with capacity above 50,000 head. Custom-fed cattle made up only 23 percent of total output of feedlots of over 50,000-head capacity. Data on 1966-67 operations in Oklahoma and Texas indicate a similar relationship between custom feeding and feedlot size (12).

Twenty-two percent of feedlots in Colorado and California did custom feeding during 1964 (table 10). In 1966-67, these percentages had declined to 18 and 27 percent (table 11). Although the percentage of feedlots engaged in custom feeding has decreased in Colorado, the number and size of feedlots has increased. The increase has combined with that in fed-cattle marketing to produce an absolute increase in volume of custom-fed cattle within the State.

Custom feedlots have been established in California long enough for feedlot operators to accumulate sufficient funds to finance a greater proportion of their own feeding operations. As a result, fed-cattle marketings remained about constant in 1964-68, but marketings of custom-fed cattle fell about 50 percent.

In Texas and Kansas-Oklahoma, 36 and 43 percent, respectively, of all fed cattle marketed in 1964 were custom fed. Numbers of commercial feedlots and

Table 9.--Percentage of cattle numbers marketed, by types of feeding arrangement, by capacity groups, sample data for 15 States, 1964 1/

Capacity group	Owned by feedlot	Custom fed	Other arrangements 2/	Unknown	Total
	Percent				
Farmer feeders	94.5	3.8	1.0	0.7	100.0
Commercial feeders:					
1,000-1,999	85.9	12.3	.4	1.4	100.0
2,000-4,999	74.9	21.0	1.9	2.2	100.0
5,000-9,999	55.7	40.2	3.1	1.0	100.0
10,000-14,999	48.9	48.8	.3	2.0	100.0
15,000-19,999	50.0	44.3	5.7	---	100.0
20,000-29,999	49.8	44.5	1.1	4.6	100.0
30,000-49,999	47.1	41.3	11.6	---	100.0
50,000 and over	48.5	23.1	28.4	---	100.0
Total (sample)	56.4	37.8	4.0	1.8	100.0

1/ The 15 States are Iowa, Nebr., Kans., Okla., Tex., Colo., Mont., Idaho, Wyo., Utah, N. Mex., Ariz., Calif., Oreg., and Wash.
2/ Consists primarily of partnership arrangements.

Source: (31).

production of fed cattle have increased rapidly in both areas since 1964 (table 10). By 1966-67, marketings of custom-fed cattle had increased to 48 percent of the total in Texas and 59 percent in Oklahoma (table 12). The desire to operate new feedlots as close to capacity as possible, despite limited owner capital, has probably been a chief reason for these increases.

In 1964, cattle feeders were the chief customers of custom cattle feedlots, accounting for over 45 percent of all cattle custom fed in such feedlots of over 1,000 head capacity (table 13). Farmers or ranchers accounted for about 28 percent of this total, and meatpackers and packer-buyers for 18 percent. During 1966-67, ranchers owned over 50 percent of the cattle being custom fed in Oklahoma and Texas (12). Packers owned about 12 percent, and retailers less than 1 percent. Cattle buyers, dealers, and various investors owned the remainder.

Packer-Feeders

Some cattle are fed in packer-owned feedlots or in custom feedlots for packers and associated interests. In 1965, packers owned about 7 percent of all fed cattle marketed, and packer-associated interests accounted for 4 percent, for a combined total of 11 percent (table 14). The Western States produced most of the packer-fed cattle in 1965, accounting for more than 80 percent of all cattle fed by packers and associated interests. Packers fed few cattle in the Lake States, Pennsylvania, or the Corn Belt.

Table 10.--Percentage of feedlot numbers and percentage of cattle marketings, by types of feeding arrangement, by States or areas, 1964

Type of feedlot by State or area	Percentage of feedlot numbers under feeding arrangements				
	All owned	All custom	Some custom 1/	Other 2/	Total
	Percent				
Farmer-feeders 3/	93.3	2.5	2.5	1.7	100.0
Commercial feedlots: 3/					
Iowa-Nebraska	71.4	2.5	21.0	5.1	100.0
Kansas-Oklahoma	47.9	22.9	27.1	2.1	100.0
Texas	54.1	4.0	35.5	6.4	100.0
Colorado	78.1	2.4	19.5	---	100.0
Northern Mountain	69.4	2.8	25.0	2.8	100.0
New Mexico-Arizona	53.1	4.1	32.6	10.2	100.0
California	47.1	9.1	33.1	10.7	100.0
Oregon-Washington	65.9	2.1	27.7	4.3	100.0
15 States	59.1	6.0	28.7	6.2	100.0

	Percentage of cattle marketings under feeding arrangements			
	Owned by feedlot	Custom fed	Other and unknown 4/	Total
	Percent			
Farmer-feeders 3/	94.5	3.8	1.7	100.0
Commercial feeders: 3/				
Iowa-Nebraska	58.1	30.1	11.8	100.0
Kansas-Oklahoma	55.9	43.0	1.1	100.0
Texas	57.6	35.8	6.6	100.0
Colorado	80.5	17.1	2.4	100.0
Northern Mountain	84.8	14.2	1.0	100.0
New Mexico-Arizona	58.1	38.8	3.1	100.0
California	47.5	45.3	7.2	100.0
Oregon-Washington	68.4	24.8	6.8	100.0
15 States	58.4	35.4	6.2	100.0

1/ Includes combination of custom and owned and custom and other.
2/ Includes other arrangements and combinations of owned and other.
3/ Sample data.
4/ Consists primarily of partnership arrangements.

Source: (49).

Table 11.--Percentage of custom and noncustom feedlot operations, selected regions, 1967

Region	Custom	Noncustom
	Percent	
Western Corn Belt	4	96
Colorado	18	82
California	27	73

Source: (7).

Table 12.--Ownership of cattle on feed, by size of feedlot, percentage of total in Texas and Oklahoma, 1966-67

State and ownership of cattle	Capacity group (head)					
	Less than 1,000	1,000 to 1,999	2,000 to 4,999	5,000 to 9,999	10,000 and over	Total
	Percent					
Texas:						
Feedlot	94.3	84.0	78.6	45.2	32.2	43.8
Members of feedlot corporation	---	---	3.4	8.0	10.3	8.4
Not feedlot owned	5.7	16.0	18.0	46.8	57.5	47.8
Total	100.0	100.0	100.0	100.0	100.0	100.0
Oklahoma:						
Feedlot	100.0	87.3	86.1	43.6	21.1	39.7
Members of feedlot corporation	---	---	---	---	3.0	1.7
Not feedlot owned	---	12.7	13.9	56.4	75.9	58.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: (12).

Table 13.--Percentage of cattle fed on custom basis, by principal occupations of owners, feedlots of 1,000 or more head capacity, 15 States, 1964 1/

Principal occupation of owner of custom-fed cattle	Percentage custom fed in feedlots 1,000 or more head
	Percent
Farmer or rancher	27.8
Cattle feeder	45.4
Nonfarm agricultural business	1.5
Meatpackers and packer-buyers	17.9
Other livestock marketing agencies	4.6
Food retailers	.6
Others 2/	2.2
Total	100.0

1/ For States, see table 9.
2/ Includes lending agencies, nonagricultural business firms, professional workers, and investors.

Source: (31).

In 1965, cattle fed by packers and associated interests were about a fourth of fed cattle marketed in California, Colorado, the Southeastern States, and the Pacific Northwest. Packer-feeders handled approximately a sixth of cattle fed in the Mountain States, High Plains, and Arizona. Despite the comparatively large volume of packer-feeding in the Northern Plains, packer output comprised less than 6 percent of total marketings in that region (table 14). In contrast, packer-feeding comprised nearly a third of total fed-cattle marketings in some eastern and southern States where volume of fed cattle is extremely low and seasonal.

The number of packers feeding cattle increased from 165 in 1954 to 204 in 1965, and then declined to 174 in 1968 (table 15). Their output of fed cattle increased from 565,000 in 1954 to 1,548,000 in 1967, and then declined to 1,397,000 in 1968. Packer-fed cattle as a percentage of fed-cattle marketings increased only slightly, however, because total marketings increased 146 percent during the period.

Packers engage in cattle feeding to have: (1) a reliable supply of slaughter cattle--particularly on Monday mornings--to utilize their labor force fully; (2) a source of particular grades and weights of cattle needed but sometimes not available on the open market; (3) a ready source of cattle for unexpected or exceptionally large orders; and (4) a supply of slaughter cattle during off-seasons. Some cattle feeders are concerned about the effect packer-feeding may have on market prices. They believe the packer has an extra advantage in buying slaughter cattle.

Table 14.--Marketings of fed cattle, volume of packer-feeding and packer-feeding as a percentage of fed cattle marketings, by regions, 1965

Region	Fed cattle marketings	Volume of packer feeding			Packer feeding as percentage of fed marketings		
		Packers	Associated interests 1/	Total	Packers	Associated interests 1/	Total
	1,000 head	1,000 head	1,000 head	1,000 head	Percent	Percent	Percent
Pennsylvania	116	0.4	3.8	4.2	0.3	3.3	3.6
Lake States	1,097	13.1	9.2	22.3	1.2	.8	2.0
Corn Belt	6,147	61.2	40.3	101.5	1.0	.7	1.7
Southeastern	559	79.5	80.4	159.9	14.2	14.4	28.6
Northern Plains	4,031	190.2	23.5	213.7	4.7	.6	5.3
High Plains	1,567	232.8	48.2	281.0	14.9	3.1	18.0
Mountain	379	29.2	40.3	69.5	7.7	10.6	18.3
Colorado	1,144	67.5	201.0	268.5	5.9	17.6	23.5
Arizona	650	81.9	12.6	94.5	12.6	1.9	14.5
Pacific Northwest	746	153.1	15.1	168.2	20.5	2.0	22.5
California	2,282	310.3	278.0	588.3	13.6	12.2	25.8
Other 2/	218	72.2	15.4	87.6	33.1	7.1	40.2
39 States 3/	18,936	1,291.4	767.8	2,059.2	6.8	4.1	10.9

1/ Feeding by packer-associated interests covers separate feeding by owners, directors, officers, employees, non-reporting subsidiaries, and affiliates of packers.

2/ N.Y., Md., Va., N.C., S.C., Ark., and La.

3/ Total is for 39 States and accounts for most fed marketings in the United States.

Source: Derived from (9, 32).

Table 15.--Number of packers feeding cattle and number of cattle fed compared with total marketings of fed cattle in 39 States, 1954-68

Year	Packers feeding cattle	Cattle fed by packers 1/	Fed cattle marketings in 39 States 2/	Packer feeding as a percentage of fed marketings
	Number	1,000 head	1,000 head	Percent
1954	165	564.9	9,482	6.0
1955	161	545.8	10,762	5.1
1956	157	520.8	11,331	4.6
1957	151	557.6	11,285	4.9
1958	176	729.1	11,787	6.2
1959	157	617.0	12,843	4.8
1960	165	856.7	13,621	6.3
1961 3/	206	919.2(1,251.2)	14,561	6.3(8.6)
1962	215	981.4	15,434	6.4
1963	211	1,175.6	16,808	7.0
1964	190	1,126.8	18,319	6.2
1965 3/	204	1,291.4(2,059.2)	18,936	6.8(10.9)
1966	202	1,473.7	20,597	7.2
1967	198	1,547.8	21,920	7.1
1968	174	1,397.3	23,286	6.0

1/ Feeding by packer-associated interests is not included except where noted. Packer feeding is reported on a fiscal year basis. The majority of packers report on the basis of a calendar year or a fiscal year ending Oct. 30.

2/ Estimates for 39 States are on a calendar year basis and account for most fed cattle marketings in the United States. Fed cattle marketings for 1960-65 are in accord with recent revisions.

3/ Numbers and percentages enclosed by parentheses include feeding by packer-associated interests. Data not available for other years.

Source: Cattle (including calves) fed by packers summarized from annual reports of packers filed with the Packers and Stockyards Admin. (32). Fed cattle marketings in 39 States from (9, 10).

Retail food chains have sometimes engaged in cattle feeding and slaughter, but they accounted for only a small part of all fed-cattle marketings from 1950 through 1964 (31). Retail food chains slaughtered 206,000 head in 1950 and 719,000 head in 1964. The latter amount was only a little over 2 percent of commercial cattle slaughtered during 1964. In that year, three major food chains accounted for most of the cattle slaughtered by food chains, but they fed only 64,000 head, less than half a percent of fed-cattle marketings in 39 States.

Cooperative Feedlots

Cooperative feedlots represent an extremely small sector of the cattle-feeding industry. On January 1, 1969, only seven cooperative feedlots were in operation. According to the Farmer Cooperative Service, these feedlots were located in Arizona, California, Utah, Montana, Oklahoma, Georgia, and South

Carolina. Total capacity of these feedlots was about 50,000 head, and they accounted for less than 1 percent of the total number of cattle fed. The feedlots were developed to coordinate production, feeding, and marketing of livestock and crops owned by members (27). Except for their member ownership, the overall operation of these cooperative feedlots resembles that of custom feedlots.

Number and Size of Feedlots

Some 236,000 cattle feedlots were in operation in the United States in 1962, the earliest date for which a fairly complete accounting is available (table 16). By 1968, the number had declined to about 209,000 but the change was spread unevenly among regions and among feedlot size groups.

In terms of total numbers, relatively small feedlots dominate the industry. As stated earlier, farmer feeders operate 99 percent of all feedlots. Most farmer feeders are in the Corn Belt, Lake States, and Northern Plains. The majority of feedlots in all regions but Arizona and California fall within this size group.

From 1962 to 1968, farmer feeders declined in number by more than 28,000. Most of the decrease was in the three regions where small feedlots are most numerous (table 16). Only the Southeastern States and Colorado showed an increase in the number of farmer feeders. However, the decline in number of small feedlots represents a restructuring of farm enterprises more than a decline in this group's productive capacity. Cattle-feeding enterprises large enough to command increased managerial skills of farmers seem to hold their own with other farm enterprises. Cattle feeding seems to be diminishing only in the very smallest size feeding enterprises. Farmer feeders in this size class either tend to drop the enterprise entirely or grow into a larger size category.

For example, in Iowa, the major small-capacity feedlot State in the 48 States, the total number of feedlots has dropped substantially in recent years (table 17). But all of the decline has come in the groups selling fewer than 50 fed cattle a year. Some of these operators may have expanded to a larger volume of cattle feeding, but it is likely that most of them have dropped the enterprise from their farming program, as the total number reporting has decreased considerably.

The number of Iowa cattle feeders marketing more than 100 head of fed cattle a year has increased more than half since 1959 (table 17). The most rapid rate of growth occurred in the number handling 500 or more each year, but the number of those selling between 100 and 499 annually also increased substantially.

Comparable data are not available for other States in the three regions dominated by small feedlots, but the pattern of change probably has been similar to that observed in Iowa. The very smallest feeding enterprises apparently are not yielding enough return to continue at their current size. Larger ones, however, seem viable, and this fact should not be covered up by placing all feedlots with less than 1,000 head capacity into a single group.

The increases in the number of feedlots with capacities of 1,000 head or more have influenced cattle production much more than have the increases in the

Table 16.--Number of cattle feedlots and percentage in two feedlot capacity groups, by regions, 1962, 1964, and 1968

Region	Feedlots with capacity under 1,000 head			Feedlots with capacity of 1,000 head and over		
	1962	1964	1968	1962	1964	1968
	Number					
Pennsylvania	6,000	6,000	5,997	4	4	3
Lake States	32,470	30,169	29,494	30	31	56
Corn Belt	129,394	124,861	115,216	106	139	284
Southeastern	3,614	3,981	4,100	37	50	39
Northern Plains	53,411	49,464	44,670	392	420	608
High Plains	3,855	3,308	2,736	266	317	388
Mountain	2,244	1,984	1,395	64	83	91
Colorado	1,200	1,150	1,263	80	83	97
Arizona	95	27	9	94	82	68
Pacific Northwest	2,058	1,846	1,433	144	136	158
California	305	281	203	300	323	288
32 States	234,646	223,071	206,516	1,517	1,668	2,080
	Percentage of feedlots with capacity under 1,000 head			Percentage of feedlots with capacity of 1,000 head and over		
	Percent					
Pennsylvania	99.9	99.9	99.9	0.1	0.1	0.1
Lake States	99.9	99.9	99.8	.1	.1	.2
Corn Belt	99.9	99.9	99.8	.1	.1	.2
Southeastern	99.0	98.8	99.1	1.0	1.2	.9
Northern Plains	99.3	99.2	98.7	.7	.8	1.3
High Plains	93.5	91.3	87.6	6.5	8.7	12.4
Mountain	97.2	96.0	93.9	2.8	4.0	6.1
Colorado	93.7	93.3	92.9	6.3	6.7	7.1
Arizona	50.3	24.8	11.7	49.7	75.2	88.3
Pacific Northwest	93.5	93.1	90.1	6.5	6.9	9.9
California	50.4	46.5	41.3	49.6	53.5	58.7
32 States	99.4	99.3	99.0	.6	.7	1.0

Source: (37, 40).

Table 17.--Farms marketing fed cattle and percentage in various marketing size groups, Iowa, 1959-67

Year	Farms reporting	Percentage of farm reporting, by number of head marketed					
		Under 25	25 to 49	50 to 99	100 to 299	300 to 499	500 and over
	Number	Percent					
1959	56,393	44	24	19	12	1	1/
1960	55,954	42	25	20	12	1	1/
1961	54,651	42	25	19	13	1	1/
1962	51,446	41	24	19	14	1	1
1963	51,788	39	24	20	15	1	1
1964	50,640	39	23	20	15	2	1
1965	48,991	37	23	20	17	2	1
1966	48,136	35	23	20	18	3	1
1967	46,085	34	22	20	19	3	2

1/ Less than 0.5 percent.

Source: (20).

number of small feedlots. These commercial feedlots increased by 563, or 37 percent, between 1962 and 1968 (table 16). The Corn Belt, Northern Plains, and High Plains supplied a major portion of the increase and their proportion of the national total of large feedlots rose from 50 to 62 percent over the period. The number of large feedlots remained relatively constant in other areas, with the exception of Arizona, which experienced a steady decline.

The regions in which commercial feedlot numbers have been expanding reflect substantial increases in number of feedlots with capacities between 1,000 and 7,999 head (table 18). In fact, three-fourths of the expansion in number of feedlots occurred in this size range. The Corn Belt and Northern Plains showed most activity in the lower portion of this size range, while the High Plains revealed moderate increases in numbers of feedlots in all size groups between 1,000 and 7,999 capacity. Both Arizona and California showed a substantially decreased number of smaller commercial feedlots. Some of these feedlots had moved into other size groups, while some had quit feeding cattle entirely.

Between 1962 and 1968, the highest rates of increase in numbers of feedlots occurred in those groups with capacities for 8,000 or more cattle. The number of feedlots in these sizes increased from 137 in 1962 to 275 in 1968. There are eighty feedlots in this range that can handle between 16,000 and 31,999 cattle at one time, and the 19 largest have capacities in excess of 32,000 head.

Such exceptionally large feedlots have not yet entered the Corn Belt to any extent. They have made substantial progress in the Northern Plains and show some increase in California, where nearly all other size groups have declined

Table 18.--Number of cattle feedlots with capacity for 1,000 head and over, by size group, 32 States, 1962, 1964, and 1968

Region	1,000 to 1,999			2,000 to 3,999			4,000 to 7,999			8,000 to 15,999		
	1962	1964	1968	1962	1964	1968	1962	1964	1968	1962	1964	1968
	Number											
Pennsylvania	4	4	1/3	---	---	---	---	---	---	---	---	---
Lake States	1/26	1/27	1/46	1/4	1/4	7	---	---	3	---	---	---
Corn Belt	1/95	117	1/201	1/8	1/19	1/60	1/3	1/3	1/19	---	---	4
Southeastern	1/28	1/37	1/27	4	9	1/8	1/5	1/4	1/4	---	---	---
Northern Plains	250	251	325	86	99	1/152	36	47	83	1/20	1/23	32
High Plains	121	133	153	82	102	99	1/44	57	62	1/19	20	44
Mountain	37	48	48	1/27	1/25	1/31	---	1/7	1/12	---	3	---
Colorado	31	31	21	19	25	30	16	12	20	1/14	10	16
Arizona	30	19	13	25	20	15	21	22	21	11	15	10
Pacific Northwest	88	62	66	33	41	41	1/23	1/30	31	---	3	17
California	106	111	75	100	89	85	41	59	55	37	39	45
32 States 2/	801	826	967	385	435	522	194	244	316	106	119	176

Region	16,000 to 31,999			32,000 and over			Total over 1,000		
	1962	1964	1968	1962	1964	1968	1962	1964	1968
	Number								
Pennsylvania	---	---	---	---	---	---	4	4	3
Lake States	---	---	---	---	---	---	30	31	56
Corn Belt	---	---	---	---	---	---	106	139	284
Southeastern	---	---	---	---	---	---	37	50	39
Northern Plains	---	---	1/13	---	---	3	392	420	608
High Plains	---	5	1/23	---	---	7	266	317	388
Mountain	---	---	---	---	---	---	64	83	91
Colorado	---	1/5	1/10	---	---	---	80	83	97
Arizona	7	6	1/9	---	---	---	94	82	68
Pacific Northwest	---	---	3	---	---	---	144	136	158
California	13	20	21	3	5	7	300	323	288
32 States 2/	26	36	80	5	8	19	1,517	1,668	2,080

1/ Derived from State data, in which lots from larger size groups were included to avoid disclosing individual operations.
2/ The 32-State total shows actual number of feedlots in each size group. The sum of the numbers shown by regions under any specific size group may not add to the 32-State total for that size group for the reason given in footnote 1.

Source: (37, 40).

in numbers. However, they have made the most striking gains in the High Plains, which had very few of the largest size feedlots in 1962 but led all regions in 1968.

Production of Fed Cattle

From 1955 to 1968, marketings of fed cattle in the 32 primary cattle-feeding States increased 116 percent from 10.6 million head to 23.0 million head (table 19). Nearly half of this increase has been recorded since 1962, when the accounting of number of feedlots by size began. Shifts in the relative importance of regions and types of producers have accompanied this rapid increase in fed cattle production. These shifts bring into sharper focus the significance of the changes in feedlot numbers and size.

Production by Region

Marketings of fed cattle were above 1955 levels in all regions of the country in 1968. The High Plains experienced the greatest relative growth over the period, a 553-percent increase. Production in Colorado, the Northern Plains, Arizona, and the Southeastern States also expanded more than the 32-State average of 116 percent. Thus these regions gained a larger share of the fed cattle industry than before.

Marketings in the remaining regions have increased less than the 32-State average. The Corn Belt and California, major production areas for fed beef, were among the lowest in terms of percentage increases over the period.

Table 19.--Number of fed cattle marketed and percentage increase, by regions, 1955 and 1968

Region	Fed cattle marketed		Percentage increase
	1955	1968	
	1,000 head	1,000 head	Percent
Pennsylvania	134	139	4
Lake States	745	1,350	81
Corn Belt	4,055	7,279	80
Southeastern	226	492	118
Northern Plains	2,236	5,562	149
High Plains	414	2,705	553
Mountain	261	386	48
Colorado	534	1,431	168
Arizona	313	703	125
Pacific Northwest	449	925	106
California	1,280	2,068	62
32 States	10,647	23,040	116

Source: 1955 derived from (10), 1968 from (37).

These changes, however, should not be interpreted as a sign of weakness in either the Corn Belt or California. Both regions began the period with large production bases--4.1 million head in the former and 1.3 million head in the latter. The relatively low percentage increases in these two regions still represent an absolute growth greater than total production in most other regions. Leading regions from the standpoint of total production of fed cattle in 1968 were the Corn Belt with 7.3 million head, the Northern Plains with 5.6 million head, and the High Plains with 2.7 million head. California followed closely with 2.1 million head.

Production by Size of Feedlot

The average number of cattle marketed per feedlot in the United States in 1968 was 110 head (table 20). This figure represented an increase of 46 head, or 72 percent, above the level of 1962. This comparison, however, obscures the dramatic production shifts that took place among the feedlots of various sizes.

Feedlots of less than 1,000 head capacity increased their average annual output from 41 to 59 head over the period. Average annual output of feedlots with capacity for more than 1,000 head rose from 3,700 to 5,203 head. Since averages within the larger size groups remained relatively constant, the rise in the overall average of large feedlots mainly reflects the increased number of very large feedlots. Feedlots in the largest size group market up to nearly 64,000 head a year.

Total output strongly reflects the greatly increased output of commercial feedlots and their growth in numbers. These feedlots handled 36 percent of total number of fed cattle in 1962 but increased their share of marketings to 47 percent of the total in 1968. Farmer feeders have maintained a strong position and have increased their absolute output, but commercial feedlots have provided much more of the growth in recent years. Only in the Southeastern States, a relatively unimportant feeding area, have farmer feeders increased their share of the market as compared with commercial feedlots (table 21).

More than 90 percent of fed cattle marketings in Arizona, California, and the High Plains are now from commercial feedlots. Output from commercial feedlots in the Pacific Northwest and Colorado is approaching that figure. Only in the Corn Belt, the Lake States, and Pennsylvania does the farmer feeder maintain a dominant position.

The largest percentage increases in cattle fed in commercial feedlots occurred in the Mountain, Pacific Northwest, Northern Plains, and High Plains. In these regions, marketings from commercial feedlots rose 14 to 27 percentage points from 1962 to 1968. Commercial cattle feeding gained only 3 percentage points since 1962 in the Lake States and Corn Belt, where farmer feeders still manage more than 90 percent of total output.

A substantial upward shift in size has taken place. All groups have increased since 1962, both in number and in total output, but the increase has been greatest in the largest feedlot size groups (table 22). Those with capacity for 16,000 or more cattle increased from 31 in 1962 to 99 in 1968, and their

Table 20.--Fed cattle marketed, feedlots, and cattle marketed per feedlot, by feedlot capacity groups, 32 States, 1962, 1964, and 1968

Feedlot capacity (head)	Fed cattle marketed		Feedlots		Fed cattle marketed per feedlot
	Number	Percentage	Number	As percentage of total feedlots	
	1,000 head	Percent		Percent	Number
1968					
Under 1,000	12,217	53.0	206,516	99.0	59
Over 1,000	10,823	47.0	2,080	1.0	5,203
1,000 to 1,999	1,214	5.3	967	.5	1,255
2,000 to 3,999	1,434	6.2	522	.3	2,747
4,000 to 7,999	1,970	8.6	316	.2	6,234
8,000 to 15,999	2,499	10.8	176	---	14,199
16,000 to 31,999	2,491	10.8	80	---	31,138
32,000 and over	1,215	5.3	19	---	63,947
32 States	23,040	100.0	208,596	100.0	110
1964					
Under 1,000	11,094	61.1	223,071	99.3	50
Over 1,000	7,050	38.9	1,668	.7	4,227
1,000 to 1,999	1,043	5.7	826	.4	1,263
2,000 to 3,999	1,147	6.3	435	.2	2,637
4,000 to 7,999	1,377	7.6	244	.1	5,643
8,000 to 15,999	1,772	9.8	119	---	14,891
16,000 to 31,999	1,153	6.4	36	---	32,028
32,000 and over	558	3.1	8	---	69,750
32 States	18,144	100.0	224,739	100.0	81
1962 1/					
Under 1,000	9,527	63.7	232,214	99.4	41
Over 1,000	5,432	36.3	1,468	.6	3,700
1,000 to 1,999	943	6.3	796	.3	1,185
2,000 to 3,999	860	5.7	384	.2	2,240
4,000 to 7,999	1,116	7.5	184	.1	6,065
8,000 to 15,999	1,681	11.2	81	---	20,753
16,000 to 31,999	636	4.3	20	---	31,800
32,000 and over	196	1.3	3	---	65,333
28 States	14,959	100.0	233,682	100.0	64

1/ 1962 includes only 28 States. Fla., Ky., Tenn., and Miss., were added in later years.

Source: Derived from data published in (37, 40).

Table 21.--Number and percentage of fed cattle marketed, by two feedlot capacity groups, by regions, 1962, 1964, and 1968

Region	Feedlot capacity					
	Under 1,000 head			1,000 head and over		
	1962	1964	1968	1962	1964	1968
	1,000 head					
Pennsylvania	134	115	130	8	8	9
Lake States	935	1,078	1,237	50	50	113
Corn Belt	4,975	5,713	6,691	250	324	588
Southeastern	1/101	259	287	224	249	205
Northern Plains	2,380	2,812	2,958	803	1,427	2,604
High Plains	226	230	203	845	1,177	2,502
Mountain	215	260	161	99	138	225
Colorado	233	307	321	582	644	1,110
Arizona	36	24	4	532	576	699
Pacific Northwest	250	246	198	377	446	727
California	42	50	27	1,802	2,011	2,041
32 States	2/9,527	11,094	12,217	5,432	7,050	10,823
	Percent					
Pennsylvania	94.4	93.5	93.5	5.6	6.5	6.5
Lake States	94.9	95.6	91.6	5.1	4.4	8.4
Corn Belt	95.2	94.6	91.9	4.8	5.4	8.1
Southeastern	31.1	51.0	58.3	68.9	49.0	41.7
Northern Plains	74.8	66.3	53.2	25.2	33.7	46.8
High Plains	21.1	16.3	7.5	78.9	83.7	92.5
Mountain	68.5	65.3	41.7	31.5	34.7	58.3
Colorado	28.6	32.3	22.4	71.4	67.7	77.6
Arizona	6.3	4.0	.6	93.7	96.0	99.4
Pacific Northwest	39.9	35.5	21.4	60.1	64.5	78.6
California	2.3	2.4	1.3	97.7	97.6	98.7
32 States	---	61.1	53.0	---	38.9	47.0

1/ Ala. and Ga. only.
2/ 28 States. Fla., Ky., Tenn., and Miss. were not available in 1962.

Source: (37, 40).

Table 22.--Number of fed cattle marketed from feedlots with capacity for 1,000 head and over, by size groups, 32 States, 1962, 1964, and 1968

Region	1,000 to 1,999			2,000 to 3,999			4,000 to 7,999			8,000 to 15,999		
	1962	1964	1968	1962	1964	1968	1962	1964	1968	1962	1964	1968
	1,000 head											
Pennsylvania	8	8	9	---	---	---	---	---	---	---	---	---
Lake States	1/29	1/30	1/64	1/21	1/20	24	---	---	25	---	---	---
Corn Belt	178	215	278	1/52	1/89	1/168	1/20	1/20	1/102	---	---	40
Southeastern	1/155	1/173	1/79	21	20	1/84	1/48	1/56	1/42	---	---	---
Northern Plains	244	335	495	126	292	1/546	148	313	566	1/285	1/487	501
High Plains	111	141	147	164	263	249	1/263	287	399	1/307	307	606
Mountain	32	41	41	1/67	1/62	1/110	---	1/35	74	---	---	---
Colorado	50	64	40	70	96	134	120	105	173	1/342	174	224
Arizona	23	15	8	44	44	35	109	118	120	145	192	166
Pacific Northwest	85	68	77	94	97	124	1/198	1/173	143	---	108	301
California	99	71	26	222	187	120	258	268	245	602	511	580
32 States 2/	893	1,043	1,214	839	1,147	1,434	1,141	1,377	1,970	1,523	1,772	2,499

Region	16,000 to 31,999			32,000 and over			Total over 1,000		
	1962	1964	1968	1962	1964	1968	1962	1964	1968
	1,000 head								
Pennsylvania	---	---	---	---	---	---	8	8	9
Lake States	---	---	---	---	---	---	50	50	113
Corn Belt	---	---	---	---	---	---	250	324	588
Southeastern	---	---	---	---	---	---	224	249	205
Northern Plains	---	---	1/356	---	---	140	803	1,427	2,604
High Plains	---	179	1/817	---	---	284	845	1,177	2,502
Mountain	---	---	---	---	---	---	99	138	225
Colorado	---	1/205	1/539	---	---	---	582	644	1,110
Arizona	211	207	1/370	---	---	---	532	576	699
Pacific Northwest	---	---	82	---	---	---	377	446	727
California	425	616	600	196	358	470	1,802	2,011	2,041
32 States 2/	862	1,153	2,491	314	558	1,215	5,572	7,050	10,823

1/ Derived from State data in which lots from larger size groups were included to avoid disclosing individual operations.
2/ The 32-State total shows actual number of cattle in each size group. The sums of the numbers shown by regions under any specific size group may not add to the 32-State total for that size group for the reason given in footnote 1.

Source: (37, 40).

combined marketings of fed cattle more than tripled (37). This small number of large feedlots now markets 16 percent of all fed cattle sold in the country and slightly more than a third of all cattle handled by commercial feedlots. The relative increase between 1962 and 1968 was progressively less in the capacity size groups closer to 1,000 head.

Most commercial feedlot cattle come from the Northern Plains, High Plains, Colorado, and California. These four regions marketed over 76 percent of all cattle fed in commercial feedlots in 1968.

The group of cattle feeders with capacity of less than 1,000 head has been seeing its large share of fed cattle production diminish rapidly. This trend may give the impression that farmer feeders are competitively weak. Although data on changes in size groups below 1,000 head are not available for all regions, some evidence is available to refute this notion.

Data from Iowa show substantial change among farmer feeders (table 23). Since 1959, those marketing fewer than 100 head annually have declined sharply in absolute numbers and as a percentage of total marketings. But all size groups marketing more than 100 head gained in both respects and accounted for 70 percent of all cattle sold in the State in 1967.

These relationships suggest a weakening position for very small farmer feeders, who are less able to take advantage of new technology. They also indicate the viability of one group of farmer feeders, especially those marketing 300 to 1,000 head annually. The expansion of production by such feedlots

Table 23.--Number of fed cattle marketed and percentage marketed by various marketing size groups, Iowa, 1959-67

Year	Fed cattle marketed	Percentage marketed by size groups (head)						
		Under 25	25 to 49	50 to 99	100 to 299	300 to 499	500 and over	Total
	1,000 head	Percent						
1959	3,009	10	16	24	34	8	8	100
1960	3,014	10	16	25	34	8	7	100
1961	3,034	10	16	24	34	8	8	100
1962	3,055	9	14	22	35	10	10	100
1963	3,290	8	13	21	37	10	11	100
1964	3,348	8	12	20	36	11	13	100
1965	3,521	7	11	19	36	12	15	100
1966	3,739	6	10	18	36	13	17	100
1967	3,952	5	9	16	36	14	20	100

Source: (20).

and the complementary characteristics of crop-cattle farming indicate need for a more thorough evaluation of the future potential of farmer feeder operations. More information is needed about actual adjustment processes in feedlots that cease production temporarily or permanently, those that remain relatively stable, and those that expand into larger size categories that are even beyond the farmer feeder classification.

Feedlot Capacity and Degree of Use

Information is available as to number of feedlots, their general size distribution, and their output of fed cattle. Less is known about their total capacity, 8/ the degree of utilization during the year, and the response of different sizes and types of feedlots to changing economic conditions. Available data provide only general indications of the actual situation.

The rapid growth in number and output of commercial feedlots suggests to some that the industry is confronted with a shortage of feedlot capacity and that further expansion must come largely from construction of new facilities. Some evidence suggests that this may not be so and points to a need for closer study of feedlot capacity and use.

Feedlots are not being used to full capacity, nor can they be so used on a practical basis throughout the year. Operation at less than capacity results from such factors as time lost in turnover of cattle, uneven performance of cattle, the need for pen cleaning and maintenance, variations in purchasing and marketing programs, bad weather, and competition from other enterprises for labor. It is obvious that some difference between actual utilization of feedlots and full capacity is unavoidable. A major unknown is the amount of unavoidable underutilization of capacity relative to that which is avoidable with right economic stimulus. Such information would be most useful in appraising the economic basis for the present rapid expansion of feedlots, especially large capacity feedlots, in some regions.

One explanation offered for the rapid increase in larger feedlots is the desire not to maximize profits, but to minimize losses (6, 47). It is suggested that these feedlots may now be covering only current operating expenses. Thus, if present expansion continues, and outruns the supply of feeder cattle, feeder cattle prices may be pushed to an extremely high level.

This rationalization may have some merit, but it is also possible that recent feedlot expansion has resulted largely from high consumer demand for beef and the profitableness of large-scale cattle feeding. In 1968, beef and veal consumption reached 113 pounds per capita (14). Even with large numbers on feed and large marketings, the margin between Choice-fed cattle prices at Chicago and prices of all feeder cattle at Kansas City remained positive throughout the year. Further, some new construction is necessary to take up the slack left by small volume operators who quit feeding cattle and to replace larger facilities that become obsolete because of antiquated materials-handling facilities. As a large

8/ As indicated earlier, capacity is defined as the maximum number of cattle that can be fed at one time.

increase is expected in demand for fed beef by 1980, construction of new feedlots will probably continue. Whether the rate of construction will be too rapid remains to be seen.

Data on feedlot capacities, degree of utilization, and reasons for underutilization must be improved before the economic implications of the expanding number of feedlots, particularly commercial feedlots, can be determined. These relationships may prove an important key to a better understanding of the entire beef industry from ranch to retail outlet. Now only fragmentary evidence is available to portray the situation.

The average percentage of cattle and calves on feed in 32 States in 1960-62 ranged from a high of 29 percent on January 1 to a low of 22 percent on July 1 and October 1 (table 24). By 1967-68, the spread had dropped to 5 percentage points--from 28 percent on January 1 to 23 percent on July and October 1. This variation gives some indication of the amount of unused capacity and the period during which underutilization occurs. Although the spread between peak and minimum quarters has narrowed slightly, facilities are still used most intensively during the winter and spring noncropping periods. Of course, it should not be inferred from these data that capacity is fully utilized even during the peak quarter.

Colorado cattle feeders made the most consistent year-round use of their feedlots in 1960-62, as cattle on feed varied only 5 percentage points between high and low quarters. In contrast, cattle feedlots in the Mountain and Southeastern States varied 20 and 18 percentage points, respectively.

Table 24.--Percentage of annual total of cattle and calves on feed at beginning of quarters, by regions, 1960-62 and 1967-68

Region	1960-62				1967-68			
	Jan. 1	April 1	July 1	Oct. 1	Jan. 1	April 1	July 1	Oct. 1
	Percent							
Pennsylvania	33	29	20	18	31	29	19	21
Lake States	30	30	22	18	30	28	22	20
Corn Belt	29	29	23	19	28	29	23	20
Southeastern	1/36	1/25	1/18	1/21	35	25	18	22
Northern Plains	30	28	20	22	29	27	21	23
High Plains	30	24	20	26	26	25	23	26
Mountain	37	28	17	18	34	27	19	20
Colorado	28	25	23	24	28	26	22	24
Arizona	30	25	22	23	27	25	24	24
Pacific Northwest	30	26	20	24	28	25	22	25
California	25	20	27	28	26	20	27	27
32 States	29	27	22	22	28	26	23	23

1/ Data available only for Ga. and Ala. and only for 1962.

Source: Derived from (36).

Regions will continue to differ in seasonal intensity of feedlot use because of such factors as climatic conditions and seasonal demand for labor outside the cattle-feeding enterprise.

Intensity of feedlot use has tended to vary directly with size of operation. Large feedlots, with their high fixed costs in facilities, equipment, and labor, try to operate as close to capacity as possible. Use is limited by pen cleaning and maintenance, inability to fully coordinate purchases and sales of cattle, and very wet or extremely hot weather, which necessitates reduced animal density. In small feeding operations, the cattle enterprise is often subordinated to other farm activities. It may even be restricted to the winter, leaving facilities unused in the crop season between May and late October.

Feedlot data from Colorado in 1964 indicate that larger feedlots utilized available feedlot capacity more fully than did smaller feedlots (25). Annual feedlot turnover ranged from 0.72 for feedlots with capacity for less than 500 head to 1.58 for feedlots having capacity for 5,000 head or more. Only a portion of the differences in rate of turnover can be attributed to the relatively shorter feeding period commonly used by the larger feedlots. In the same year, California farmer feeders were utilizing only 17.8 percent of their capacity on October 1, the date on which the State's total of cattle on feed was the highest (24). In contrast, feedlots with capacity for 10,000 head and over were utilizing 67.1 percent of their capacity. The average degree of utilization for all feedlots in California on October 1, 1964, was 53.9 percent.

Between 1958 and 1964, the number of feedlots in California with capacity for 10,000 head and over increased from 20 to 57. The increase came through construction of new lots and expansion of existing facilities (24). Average feedlot capacity increased from 15,700 to 17,579 head during the period. However, year-to-year utilization of feedlot capacity varied greatly, ranging from a high of 83.6 percent to a low of 58.6 percent. Average utilization for the 7-year period was 74.1 percent of capacity.

From October 1963 through January 1966, the number of commercial feedlots in Texas increased from 197 to 245 (47). In this period, the highest percentage of feedlots having cattle on feed during any particular month was 83 percent and the lowest, 65 percent. Of the reported total capacity of these feedlots, the degree of utilization on a month-to-month basis ranged from 30 percent to 60 percent.

The same general relationship between size of feedlot and degree of utilization appears in other regions. The larger feedlots in the High Plains, however, have been achieving a higher degree of utilization than have feedlots of similar size in other regions (11). This may be due to the same special characteristics of the High Plains that explain the rapid expansion of large commercial feedlots there. These characteristics include the recent increased production of hybrid sorghum grains, the availability of feeder cattle, and the year-round feeding made possible by the favorable climate. At the same time, small feedlots in the High Plains also have been utilizing a lower proportion of their capacity than have their counterparts in other regions.

Market Sources of Feeder Cattle

Substitution of direct purchase for purchase at terminal markets has been the major change in the relative importance of sources of feeder cattle. Direct purchase from farms and ranches is now second only to the auction market, which continues to be the primary source. In 1951-55, nearly 22 percent of all feeder cattle moved through terminal markets (43). In the year beginning July 1, 1966, this figure was down to about 7 percent in major cattle-feeding regions. About three-fifths of the feeder cattle in major cattle feeding regions were purchased at auctions in that year and about a third moved directly to feedlots from farms and ranches (table 25).

Table 25.--Percentage of cattle placed on feed, by types of market from which they came, in selected regions, July 1, 1966, to June 30, 1967

Region	Type of market			
	Farm and ranch	Terminal	Auction	Total
	Percent			
Western Corn Belt	46	8	46	100
High Plains	29	5	66	100
Colorado	48	5	47	100
California	23	9	68	100

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

Principal markets for feeder cattle differ considerably among regions. Auction markets hold the strongest position in the major feeding States of the West. In 1966-67, producers in California and the High Plains bought two-thirds of their feeder cattle through auction markets and about one-fourth directly from farms and ranches. Feedlot operators in the western Corn Belt and Colorado purchased about equal numbers of cattle from auctions and from farms and ranches.

In the Corn Belt and Lake States, purchases of feeders from terminal markets have declined sharply. These regions now obtain more cattle through direct contact with producers or through auction markets. Feeders with larger operations, here as elsewhere, tend to use direct purchases more than other alternatives.

A majority of farmer feeders in the Southeastern States raise part of the cattle they feed. A survey of Georgia cattle feeders in 1964 indicated that 79 percent of operators interviewed raised part or all of their feeder cattle.9/

9/ Saunders, Fred B., Selected Characteristics of Existing Cattle Feeding Operations, unpublished manuscript, Dept. of Agr. Econ., Univ. of Ga., 1964.

About two-thirds of feedlot operators in North Carolina raised some of their own cattle (18). Most of the cattle purchased by small Southeastern feeders were obtained at nearby weekly auction markets or were purchased directly from local cow-calf operators. Probably more than half of the commercial feeders in the region bought most of their cattle in one or more of three ways: at special feeder cattle sales arranged with the help of the extension service; direct from farmers; or from larger regional auctions.

Cattle feeders in the Mountain States buy a major portion of their cattle either directly from farmers and ranchers or at auctions. However, feedlot operator's raise up to a third of the cattle they feed.

Purchases from specific sources vary in the Pacific Northwest, depending on the time of year (24). From January through June, most cattle are purchased at auctions outside the region. From July through December, most are purchased direct within a 150- to 250-mile radius of the feedlot.

Nationally, available studies suggest that feedlots of different sizes use the several sources of feeder cattle about equally (7, 12). However, data relating size of feedlot to market source of cattle are fragmentary, so firm conclusions cannot be drawn.

Type of Buyer

Actual purchases of feeder cattle are made by feedlot operators themselves, salaried buyers, order buyers, commission firms, and cattle dealers. Feedlot operators once did more of their own buying. Since 1950, however, indirect agents, especially order buyers, have been used increasingly.

Use of specialized purchasing agents has accompanied the growth in feedlot size. Operators of larger feedlots now concentrate more of their effort on the managerial and financial aspects of cattle feeding; they have turned over more and more of the purchasing job to specialists--primarily order buyers. The future will probably bring an increasing degree of specialization and still more dependence on order buyers and salaried buyers, especially for the larger commercial feedlots.

In 1966-67, specialized buyers purchased around three-fourths of all feeder cattle in California, Colorado, and the High Plains (table 26). Feeder-cattle purchases in the Western Corn Belt were divided between operators and order buyers.

Most of the smaller Southeastern feeders bought their own cattle. The larger feeders depended about equally on purchases by themselves and by order buyers. Corn Belt and Lake States farmer feeders purchased cattle by various means, including commission firms, order buyers, operator visits to producing areas, local cattle dealers, and feeder cattle sales. Again the larger feeding operations tended to shift the responsibility for buying cattle to specialists.

Farmer feeders buy most of their cattle themselves (7, 12). Operator purchases of feeder cattle decrease as feedlot size increases and order buyers become more important. Salaried buyers also increase in importance as feedlot

Table 26.--Percentage of total cattle placed on feed, by type of buyer, in selected regions, July 1, 1966, to June 30, 1967

Region	Type of buyer				
	Operator	Salaried buyer	Order buyer	Other	Total
	Percent				
Western Corn Belt	45	---	55	1/	100
High Plains	30	18	52	---	100
Colorado	21	5	74	---	100
California	19	19	35	27	100

1/ Less than 1 percent.

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

size increases but are significant only among the 8,000-and-over capacity feedlots. This general pattern appears in most regions dominated by large-scale commercial feedlots. There are similarities between farmer feeder areas, but there are also some deviations.

Placements of Cattle on Feed by Seasons

For many years, placements of cattle and calves on feed have been greatest during the October-December quarter, and least during April-June (table 27). Since 1960-62, however, there has been a general leveling of quarterly placements.

Having feeder cattle available in the fall fits readily into farmer feeder systems. Most calves are born during the spring, and therefore are available for feeding in the fall. Farmer feeders, particularly those in the Corn Belt and Lake States, buy cattle in the fall and feed them until the following summer. The period of heavy forage feeding, which requires the most labor, then comes in winter, when labor demands from other farm enterprises are least. By the time spring crop work competes for labor, cattle are on a high concentrate ration, requiring relatively little labor even in a system with a low level of mechanization.

Feedlots in the High Plains, Colorado, and the Pacific Northwest have the most uniform quarterly placements of cattle on feed. This reflects a high proportion of commercial feeding operations and diversity in sources of feeder cattle. The High Plains and Colorado feed cattle produced in the High Plains and Southeastern States, where fall calving provides some feeder cattle for spring and summer placement.

Commercial feedlots in all areas, however, face the problem of uneven seasonal availability of feeder cattle. The large feedlots try to operate at capacity, with a high turnover to utilize their resources more fully. However, even in areas dominated by commercial feeding, placements are highest in fall. California is an exception, with maximum placements coming in the spring.

Table 27.--Cattle placed on feed in each quarter, percentage of annual total, by regions, 1960-62 and 1967-68

Region	1960-62				1967-68			
	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.
	Percent							
Pennsylvania	17	14	23	46	16	11	30	43
Lake States	19	10	18	53	19	11	21	49
Corn Belt	21	12	19	48	24	15	21	40
Southeastern	1/20	1/11	1/29	1/40	17	17	27	39
Northern Plains	21	14	24	41	23	17	26	34
High Plains	18	18	28	36	21	21	27	31
Mountain	15	10	23	52	18	13	23	46
Colorado	18	22	26	34	21	20	27	32
Arizona	16	22	23	39	17	24	25	34
Pacific Northwest	20	15	30	35	21	19	29	31
California	17	31	26	26	15	33	27	25
32 States	20	16	22	42	22	18	24	36

1/ Data available only for Ga. and Ala. and only for 1962.

Source: (37).

The Lake States, the Mountain States, Pennsylvania, the Corn Belt, and the Southeastern States, all with many farmer feeders, have the least uniform quarterly placements of cattle on feed. In 1967-68, these regions placed 40 percent or more of their cattle on feed in the October-December quarter.

Placements of Cattle on Feed by Sex

Relative placements of cattle on feed, by sex, were much the same in 1960-62 and in 1967-68 (table 28). About 70 percent of the placements were steers, nearly 30 percent were heifers, and less than 1 percent were cows and other cattle.

In 1967-68, more than 85 percent of cattle fed in Pennsylvania, Arizona, and California were steers. California fed the highest percentage of steers in the Nation, 93 percent. The proportion of steers among cattle fed was also slightly higher than the 32-State average in the Corn Belt and the Southeastern States. The High Plains fed the lowest percentage of steers, only slightly more than the number of heifers on feed.

The greatest increases between the two time periods in percentage of steers on feed were in the Mountain States, Arizona, Colorado, and California. In most other regions, there was a small increase in the percentage of heifers placed on feed.

Table 28.--Percentage of cattle on feed, by sex, in each region, 1960-62 and 1967-68

Region	1960-62			1967-68		
	Steers	Heifers	Cows and others	Steers	Heifers	Cows and others
	Percent					
Pennsylvania	88.4	8.3	3.3	86.4	10.1	3.5
Lake States	68.3	31.1	.6	69.6	29.8	.6
Corn Belt	74.4	25.3	.3	72.1	27.8	.1
Southeastern	1/84.5	1/15.3	1/.2	77.8	21.7	.5
Northern Plains	65.2	33.9	.9	66.0	33.7	.3
High Plains	52.7	46.0	1.3	51.6	48.0	.4
Mountain	51.7	44.9	3.4	56.7	41.6	1.7
Colorado	51.6	47.8	.6	59.4	40.5	.1
Arizona	77.3	21.3	1.4	86.1	13.0	.9
Pacific Northwest	69.5	28.3	2.2	69.6	29.4	1.0
California	85.1	13.9	1.0	92.8	7.0	.2
32 States	70.6	28.6	.8	70.0	29.6	.4

1/ Data available only for Ga. and Ala. and only for 1961 and 1962.

Source: Derived from (37).

Only in Pennsylvania, the Mountain States, the Pacific Northwest, and Arizona is the feeding of cows and other cattle (bulls and stags) of any significance. The relative importance of feeding of such cattle has declined in all regions except Pennsylvania.

In California and the High Plains, the proportion of steers to heifers increases as feedlot capacity increases (7, 12). In the Western Corn Belt, the larger feedlots also tend to feed a relatively higher proportion of steers than do the smaller ones, although the difference is slight. The reverse situation exists in Colorado, where the larger feedlots tend to feed a higher proportion of heifers.

Over the long run, relatively more heifers may be available for feeding as a result of improved calving percentages and longer productive life of beef cows. However, the year-to-year ratio of steer to heifer placements is mainly affected by the cattle cycle. More heifers are available for feeding as the beef cattle cycle levels out and decreases. When increased numbers of cattle are needed, a higher proportion of the heifers must be retained for the breeding herd. The extent to which demand for beef increases in years ahead will have a major influence on the use of heifers.

Placements of Cattle on Feed by Grade

Quality of feeder cattle has improved markedly over the years. Most feeder cattle now have potential to grade at least high Good when finished. Part of the increase in the proportion of higher grades of feeder cattle has resulted from improvement in quality of breeding herds. Part has resulted from reassessment of feedlot potential of many cattle formerly assigned to low grades. In 1966-67, 89 percent or more of cattle placed on feed in four leading regions graded Good or better (table 29). More than 40 percent graded Choice.

Feedlots in California and Colorado also report a relatively high percentage of Choice-grade feeder cattle. Western Corn Belt and High Plains feedlots handle more Good-grade feeder cattle. Western Corn Belt feedlot operators report a relatively high proportion of lower grade feeder cattle, possibly the result of slowness in reassessing the feedlot potential of some of the non-British breeds of feeder cattle.

Standard-grade feeder cattle are placed on feed in appreciable numbers in California and the High Plains, especially in the smaller feedlots. Cattle placed on feed in Arizona grade as follows: Choice, about 20 percent; Good and Standard, 75 percent; and Utility, 5 percent.10/ The majority of Good and Standard feeder cattle are upgraded to high Good and Choice during the feeding period.

Almost all cattle placements in the Corn Belt are Choice feeders and are capable of grading high Choice when fed. Some feedlots feed Prime-grade feeders. About 10 percent of feeder cattle are Utility grade, reflecting use of dairy beef. About 80 percent of placements in the Lake States grade Good and Choice, and because of the large number of dairy feeder steers in the region, about 20 percent grade Utility.

About 90 percent of feeder cattle placements in the Mountain States grade Good or better. The remaining 10 percent are Standard and Utility. Placements in this region usually grade lower than the feeder cattle produced there because many top quality animals are shipped to the Midwest, where they receive premium prices.

Some Choice cattle are placed on feed in the Southeastern States, but a majority of feeders grade Good or Standard. Cattle in this region are normally fed to high Good or low Choice slaughter grades. The placement of Choice or Prime feeder cattle is not great, relative to lower grade animals, because of less favorable price margins in relation to feedlot performance.

10/ Some of the unreferenced statements on this and succeeding pages are from unpublished data and informal judgments supplied by professional field employees of the Farm Prod. Econ. Div., ERS, and by the authors.

Table 29.--Grades of feeder cattle at time of placing on feed, percentage of cattle fed, in selected regions, July 1, 1966, to June 30, 1967

Region	Grade of placements				
	Choice	Good	Standard	Commercial and utility	Total
	Percent				
Western Corn Belt	43	54	3	---	100
High Plains	41	48	11	1/	100
Colorado	72	26	2	---	100
California	57	35	8	---	100

1/ Less than 0.5 percent.

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

Placements of Cattle on Feed by Breed

Before 1950, few cattle other than those of British beef breeds entered feedlots, except in California and Arizona. The majority of cattle placed on feed are still British beef breeds or crosses of these breeds. However, other kinds of cattle, especially Okies,11/ Brahmas, and dairy stock have made strong additions to the supply of cattle fed to slaughter weights.

Cattle feeders tend to feed more of the breeds of cattle most commonly raised in their own regions. Operators of small feedlots, many of whom produce some of their own feeder cattle, usually buy the remainder of their needs locally. However, the needs of larger commercial feedlots often cannot be met from production of local cow herds, especially during some seasons of the year. Purchases from other regions are necessary, therefore, and result in a mixture of cattle different from that produced within the region.

Okies first began to move into feedlots in substantial numbers during the late 1950's, as demand for feeder cattle built up. In the early 1960's, they reached a near dominant position in feedlots in Arizona and California (26). Then the rapidly expanding feedlot facilities in the High Plains began to absorb these cattle, forcing California operators to again feed to a higher proportion of British beef breeds.

Over 80 percent of feeder cattle placements in the Western Corn Belt are British beef breeds (table 30). Okies and a combination of dairy breeds and crosses contribute 7 percent each.

11/ Okies are beef cattle of mixed breeding, including some dairy but no noticeable Brahma or Charolais blood. Their mottled coloring reflects their mixed ancestry. They vary in quality from Choice to plainer feeders and are mainly Southern in origin.

Table 30.--Percentages of total cattle fed, by various breeds and cross breeds, in selected regions, July 1, 1966, to June 30, 1967

Region	Breeds and crossbreeds							
	British and British crosses	Brahma and Brahma crosses	Okies 1/	Dairy breeds and dairy crosses	Santa Gertrudis, Charolais and crosses	Mexican cattle	Other	Total
	Percent							
Western Corn Belt	83	1	7	7	2	---	---	100
High Plains	53	17	25	2	2	1	---	100
Colorado	85	3	6	4	1	1	2/	100
California	69	8	12	6	1	4	---	100

1/ Okie feeder cattle are cattle of mixed breeding, including some dairy, but not including any noticeable Brahma or Charolais blood. Their mottled coloring reflects their ancestry. They may vary in quality from well-muscled choice feeders to plainer cattle and are mainly Southern in origin.

2/ Less than 0.5 percent.

Sources: (7) for Western Corn Belt, Colo., and Calif.
(12) for High Plains.

About half of the cattle fed in the High Plains are British beef breeds. Okies, more often found in the larger feedlots, comprise a fourth of the total. Brahmas follow closely in importance. The latter are relatively more numerous in the southern part of the region because of the warmer climate.

Cattle fed in Colorado feedlots are about 85 percent British breeds or crosses, as are the cow herds in the State. Okies, dairy, and Brahma cattle comprise 6, 4, and 3 percent of the cattle on feed, respectively.

More than two-thirds of cattle fed in California are British beef breeds. About 12 percent are Okies; these are concentrated somewhat in the larger feedlots. The remainder are Brahma and dairy stock. In Arizona, approximately 50 percent of cattle fed are Okies. The remainder are divided about equally between British breeds and Brahmas. The latter are preferred by some operators because of their ability to withstand heat.

Cattle fed in the Southeastern States are primarily of British or Brahma breeding. In the tier of States along the Southern coast, 50 to 70 percent of cattle fed are Brahma or Brahma crosses. The rest are British breeds or crosses. In the remaining States, more than 70 percent of cattle fed are British breeds or crosses, with most of the others dairy breeds or crosses.

British breeds and crosses comprise about 80 percent of cattle fed in the Corn Belt. Cattle of dairy breeding and Okies each make up around 10 percent of the total.

Cattle feeders in the Lake States feed 75 percent British beef breeds and crosses but draw heavily on local dairy herds for steers. Dairy steers now make up about 20 percent of cattle fed in the region. Okies and a few Brahmas provide the remainder.

Ninety percent of cattle fed in the Mountain States are British breeds or crosses because of the large supply of these cattle produced in the region. Dairy breeds or crosses comprise most of the remaining 10 percent. Essentially the same situation exists in the Pacific Northwest.

Operators of feedlots with less than 1,000-head capacity feed a high proportion of British breeds and crosses (7, 12). Larger feedlots feed more non-English breeds, mainly Okies.

Placement of Cattle on Feed by Weight

Most feeder cattle now enter the feedlot at 500 to 700 pounds (table 31). They generally go on full feed easily and produce a finished animal of desired weight.

As increasing numbers of cattle have been fed in recent years, fewer heavy feeders have been available. Most feeder cattle are now placed on feed before they are yearlings. Heavier feeders usually cannot be properly finished until they weigh more than the desired 1,000 to 1,100 pounds. Furthermore, they make less efficient gains than lighter cattle.

Table 31.--Percentages of total cattle fed, by various weight classes at time placed on feed, selected regions, July 1, 1966, to June 30, 1967

Region	Weight of cattle placed on feed (pounds)						
	Under 400	400 to 499	500 to 599	600 to 699	700 to 799	800 and over	Total
	Percent						
Western Corn Belt	3	17	12	30	21	17	100
High Plains	20	23	26	22	9	---	100
Colorado	4	6	18	51	20	1	100
California	8	19	29	38	4	2	100

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

Western Corn Belt feeders purchase more than 60 percent of their feeder cattle at weights under 700 pounds. They buy 17 percent at weights of 800 pounds and over (table 31).

Cattle feeders in the High Plains and California purchase about 90 percent of their feeder cattle at weights less than 700 pounds. Feeder cattle weighing 700 to 800 pounds comprise most of the other 10 percent of purchases.

In Colorado, about 80 percent of feeder cattle are purchased weighing under 700 pounds. Most of the remaining 20 percent weigh 700 to 800 pounds.

Probably 70 percent of all cattle fed in the Corn Belt and Lake States weigh less than 700 pounds when purchased. Twenty percent are 700- to 800-pound yearlings, and the remaining 10 percent weigh more than 800 pounds.

It is estimated that Pacific Northwest cattle feeders purchase about 55 percent of their cattle at 650 to 800 pounds, and 40 percent at less than 650 pounds. Most of the heavier cattle are yearlings wintered on a high roughage ration.

Yearling cattle weighing 550 to 650 pounds are the most important group of feeder cattle in Arizona. Most other feeder cattle are bought as calves weighing less than 550 pounds.

Cattle placed on feed in Southeastern feedlots are for the most part either 350- to 500-pound calves or 550- to 650-pound yearlings.

Generally, a direct relationship exists between size of feedlot operation and weight of cattle placed on feed (7, 12). To achieve a high rate of turnover, commercial feedlots buy cattle in the medium weight ranges that can be quickly placed on full feed. Feeder calves weighing less than 500 pounds tend to go on full feed slowly and often have health problems, resulting in lower rates of gain and a longer feeding period. On the other hand, many of the smaller feedlots prefer lighter cattle, which allow them to make use of existing farm resources,

especially roughages, in a growing program. The main deviation from this pattern occurs in California, where the majority of small volume feeders buy feeder cattle weighing 800 pounds or more.

Programs for Feeding Cattle

Feeding plans differ from region to region, depending on feed and livestock resources available, specialization of cattle feeding, and size of feeder cattle needed. The total feeding plan may divide into warmup feeding and finishing. Both tend to be done by the same operator in farmer-feeder situations, but are sometimes handled by separate specialized units within the large commercial feedlot sector.

Warmup Feeding

Warmup feeding has developed largely as a service for the larger commercial feedlots. Most of these feedlots try to approach full capacity operation, but as the feeder cattle supply is seasonal, they have found this difficult to do. Special warmup cattle feeders serve as a source of feeder cattle of desirable weights.

Warmup cattle feeders usually buy feeder calves weighing less than 500 pounds and feed them on a high roughage ration to 700 to 800 pounds. Generally, these cattle are then sold to large-scale finishing feedlots. This type of feeding plan also suits many small operators who have roughages but lack the resources to finish cattle.

Warmup operations fall into two basic categories: beef herd-warmup-sell and buy-warmup-sell. Both types appear in all regions, but their relative importance differs among regions.

Beef herd-warmup-sell operations include cattle producers who place weaned calves in their own feedlots or in specialized, custom warmup feedlots where they are fed a high roughage ration. This system enables producers of feeder cattle to take advantage of the relatively cheap and efficient gains made by lightweight feeder cattle, to utilize homegrown roughages, and to sell a heavier feeder calf at a time when feeder cattle are in short supply. If prices of fed cattle are favorable, or warmup cattle prices are unfavorable, some producers place their cattle in custom finishing lots. Usually, however, the cattle are sold to commercial feedlots, where they are finished. This beef herd-warmup system should not be confused with a stocker operation, where the feeder calves merely remain on pasture until they are yearlings.

Buy-warmup-sell operators either purchase calves and later sell them to larger commercial feedlots or perform the warmup service on a contract basis. These operations have developed primarily in fringe areas between feeder cattle supply centers and large commercial feedlots. The high roughage rations used consist of silage, green chop, or hay and are usually produced by the warmup operator. Most warmup feedlots have a capacity for less than 1,000 head, but operations of up to 10,000-head capacity exist.

The future of warmup feeding is not clear. In some areas, larger cattle feedlots place a premium on warmed-up cattle, and in other instances, a discount.

Properly warmed-up cattle are normally well received by finishing lots. Some cattle, however, are not only warmed-up, but are "burnt out." Burnt-out cattle are those that have been fed too high a proportion of concentrates relative to roughages. Such cattle usually make lower rates of gain in the finishing lot and tend to finish to slaughter grade at lighter weights.

Most finishing feeders prefer a feeder weighing not over 800 pounds and ready to go on full feed immediately and finish to slaughter grade at 1,000 to 1,100 pounds. Such cattle have recovered from the initial shock of weaning and removal from the cow herd, have received their shots, have been wormed and dehorned, and are accustomed to feedlot conditions. Those that have been fed on a high roughage ration, with practically no concentrates, are preferred. The finishing lot can then achieve maximum rates of gain and high turnover. Feeder calves coming straight from a cow herd usually do not go on full feed for 15 to 30 days after arriving at a feedlot.

Conventional farmer-feeder systems in the Midwest and elsewhere are in the process of being reappraised. Farmer feeders as a whole have not fared well in marketing small numbers of slaughter cattle. Average returns over time have been relatively low, and large-volume operators may have a distinct advantage, especially in the marketing process. These operators may also have an advantage in formulating finishing rations and in achieving low nonfeed costs.

Farmer feeders who cannot remedy their problems through some revision in methods of assembly, production, and marketing may find it advantageous to restructure their feeding operations to provide facilities for warming-up cattle. They may retain advantages inherent in the resource situations common to general crop-livestock areas. These include: a supply of low value, nonsalable feed; unused labor during slack seasons; greater feed production per unit of land; and the services of existing buildings and general purpose farm equipment.

Farmer feeders who change to warmup feeding will have the options of selling feeder cattle to a finishing feeder, placing them in a custom feedlot, or perhaps organizing a cooperative feedlot. At this time, however, there is only limited interest in warmup feeding in areas dominated by farmer feeders.

Finishing Programs

Finishing programs vary greatly, depending on kinds of feeds available, ration formulation, age and weight of cattle on feed, size of feedlot, and finish grade. Farmer feeders may feed lightweight cattle on a combination of grain and pasture for as long as a year. Larger volume commercial operations, on the other hand, move some of their heaviest cattle after no more than a 60- to 90-day feeding period.

Cattle are fed fewer days now than in 1961-65, but more days than in 1951-53 (26). Cattle were not finished to as high a grade in the earlier period as they are now; also, cattle placed on feed were heavier and older, thus requiring

shorter feeding periods. Today most cattle are placed on feed at lighter weights. Virtually no 2-year-old cattle are fed. Commercial feedlots now use higher concentrate rations, achieve more efficient rates of gain, and finish cattle to slaughter grade in a shorter period of feeding.

Most of the fed cattle in the Western Corn Belt and Colorado are on feed for 120 to 180 days (table 32). Nearly two-thirds are on feed for less than 150 days. However, cattle on feed for 180 days or longer represent one-fifth of the cattle in Western Corn Belt feedlots, a higher proportion of long-fed cattle than in any region outside the major farmer-feeder areas. Length of time on feed tends to vary inversely with size of feedlot (7).

Most cattle in California and the High Plains are on feed between 90 and 150 days. Less than 10 percent are fed for 150 days or more. One-third go to market after a 90- to 120-day feeding period.

In California, smaller commercial feedlots have longer feeding periods (7). Feedlots with capacity for 1,000 to 1,999 head fed 90 percent of their cattle for 150 to 180 days. Feeding periods are shorter for the larger commercial feedlots. The farmer feeders in California, however, fed for extremely short periods, marketing nearly three-fourths of their cattle in less than 90 days. This short feeding period reflects the high proportion of cattle placed on feed at weights of 800 pounds or more. In the High Plains, no clear relationship exists between length of feeding period and size of feedlot (11).

Corn Belt and Lake States cattle feeders vary their feeding plans according to weight and grade of cattle fed. Calves weighing less than 500 pounds are usually purchased in the fall and fed a high roughage ration for about 120 days. Then they are fullfed on roughages and concentrates for an additional 130 to 150 days (42). Lower quality feeder cattle are usually fed longer on a high roughage ration than are high quality cattle and on a ration higher in roughage. Some calves may be pastured for 30 to 60 days before being placed in the feedlot.

Table 32.--Percentage of cattle fed, by length of time on feed, in selected regions, July 1, 1966, to June 30, 1967

Region	Days on feed					
	Under 90	90 to 119	120 to 149	150 to 179	180 and over	Total
	Percent					
Western Corn Belt	---	17	40	24	19	100
High Plains	9	35	48	7	1	100
Colorado	4	16	46	27	7	100
California	9	35	46	7	3	100

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

Differences in intended final grades and in weights also affect length of the feeding period. For example, yearling cattle are generally placed on a high roughage ration consisting chiefly of silage for 60 days and then are fullfed in the feedlot for 120 days. The few 2-year-old cattle that are placed on feed are fed roughages and concentrates for about 120 days and then are fullfed on concentrates for an additional 60 to 90 days.

Feeding systems in the Northern Plains consist mainly of three basic plans (22). In the first plan, calves are fed for about 330 days, of which about 200 days consist of a long deferred stocker-growing period on pasture and nonsalable roughages. The calves then go for about 130 days on full feed. In the second, yearlings are fed for an average of 185 days. This system consists of 3 to 4 weeks on pasture or roughage and about 160 days on full feeding. In the third plan, 2-year-old feeding systems are used. Cattle are fullfed for about 115 days, without a deferred or stocker-feeding period.

Feeding systems in the Pacific Northwest take from 210 to 360 days for calves, depending on the percentage of concentrates in the ration. The normal finishing period for yearling steers is 120 to 150 days. Yearling heifers are usually finished in about 10 days less time.

In the Mountain States, calves are fed for as much as 300 days, but most feeding periods do not exceed 200 days. As in other regions, steer calves are fed longer than heifers. Yearling steers are typically fed for 145 to 170 days, and yearling heifers for 135 to 160 days.

Feeding plans in Arizona are influenced strongly by the preference in California markets for slaughter steers weighing about 1,050 pounds and grading low Choice. Steer calves weighing 400 to 500 pounds are placed on a growing ration for about 140 days and are then fed a finishing ration. Heifer calves put on feed at 400 to 500 pounds are fed around 180 days. Yearling steers weighing 550 to 650 pounds are fed for 150 to 160 days. Yearling heifers weighing 550 pounds are usually fed 125 days.

Southeastern cattle feeders use several systems, depending on age of feeder cattle and availability of feedstuffs. Most feeders who purchase calves buy them in the fall and use a high roughage ration for about 150 days, or until the cattle weigh 600 to 700 pounds. The cattle are then full-fed in drylot for 120 to 180 days or fed on pasture for about 90 days, followed by 60 to 90 days on full feed in the feedlot.

Feeding plans for yearlings vary in the Southeast, from full feeding for 150 to 180 days to combination pasture-drylot systems. In the latter systems, the cattle are fed a light ration of concentrates for 90 days, and then are full-fed for an additional 90 days in drylot. Another system of increasing importance is one in which the cattle are fed a high roughage ration for 180 days in the feedlot.

Small numbers of cull cows and bulls are fed in some areas. The usual feeding period is 75 to 80 days on a ration relatively high in roughage.

Composition of Rations

The composition of rations fed in finishing operations depends largely on types of feeds produced locally and on weights and grades of feeder cattle. They range from high-roughage, low-energy rations to high-energy rations composed almost entirely of concentrates.

Corn and corn silage are the main feeds in the Corn Belt and Lake States. Soybean meal is the major source of protein, but urea is being used to an increasing extent. Hay and hay silage are also fed to some extent.

Smaller feedlots tend to feed a higher proportion of roughages than do larger lots. Producers feeding fewer than 100 head of cattle a year commonly feed relatively more hay, as silage is usually more costly to grow and handle in small quantities. The proportion of corn silage and hay silage used relative to hay increases with size of operation. Larger feedlots commonly feed rations higher in concentrates because these feedlots must produce heavier cattle in a shorter feeding period than do small-scale producers.

Lightweight and low-grade feeder cattle are usually fed high roughage rations. The ration for yearling cattle and for the latter portion of feeding programs for cattle being finished to a high grade is high in concentrates, chiefly corn.

Grazing on meadow aftermath and cornstalks, accompanied by limited feeding of harvested feeds at the beginning of feeding programs, is common throughout the Corn Belt and Lake States, especially for calves. Feeding programs that involve intensive feeding of cattle on pasture are followed only to a limited extent, and their use is decreasing.

Corn, corn silage, and legume hay are the leading feeds in the Northern Plains, although sorghum grain is fed extensively in some areas (22). Cattle receive available pasture, cornstalks, and small grain stubble and a wintering ration of 3 to 5 pounds of grain a day, plus all the hay and silage they will consume. They are then finished on a high concentrate ration consisting primarily of corn. Yearling cattle get fullfed on a high concentrate ration after a short period of deferred feeding; 2-year-old cattle are fullfed a heavy concentrate ration consisting primarily of corn.

The major cattle feeds in Colorado are corn, sorghum grain, barley, corn silage, legume hay and silage, and beet pulp (7). The larger feedlots also use some other grains, such as wheat, oats, millet, and rye. Some sorghum silage and vegetable residues are also fed.

In the Mountain States, corn, barley, and sorghum grain are the main concentrates fed. Alfalfa hay, green chop, and corn silage are the major roughages.

Pacific Northwest feeds consist mainly of barley, byproduct feeds, corn silage, hay silage, and hay. A wide variety of byproduct feeds are fed, including apple pomace, grape pomace, pea-vine silage, potato wastes, and sugarbeet byproducts. These byproduct feeds are used chiefly by the large feedlots.

Feeder cattle weighing less than 650 pounds are usually fed a growing ration of 30 to 45 percent concentrates, with the balance consisting of alfalfa hay, corn silage, and some byproduct roughages. In finishing rations, the percentage of concentrates is increased to a minimum of 60 percent and may go as high as 95 percent, with the remainder composed of roughages. Finishing rations with 80 to 90 percent concentrates are used to achieve maximum rates of gain.

Barley, sorghum grain, alfalfa, straw, cottonseed hulls, molasses, and crop residues are the principal cattle feeds in California and Arizona. Three basic rations are used in these States, with use depending on the age of the feeder cattle. A starting ration consisting of 50 to 60 percent concentrates is fed for 14 to 80 days. An intermediate ration of 70 to 75 percent concentrates is fed for 30 to 70 days. A finishing ration containing 85 to 90 percent concentrates is fed for 60 to 90 days. How long the rations are fed depends on condition of the animals. Feeding is adjusted so that cattle will weigh about 1,050 pounds and grade low Choice at market time. Lower quality cattle are fed to grade Good rather than Choice. Calves and short yearlings receive all three rations, yearlings only the intermediate and finishing ration, and older cattle on the finishing ration. Brahma crossbreeds and low-quality cattle are usually fed an intermediate ration.

A typical finishing ration in California consists of: roughage, 15 percent; feed grains, 55 percent; high energy byproducts, 14 percent; molasses, 6 percent; fat, 5 percent; and protein and minerals, 5 percent. A similar ration in Arizona is comprised of: roughage, 15 percent; feed grains, 69 percent; molasses, 5 percent; fat, 4 percent; and protein and minerals, 7 percent.

In the High Plains, sorghum grain, barley, wheat, corn and sorghum silage, cottonseed hulls, and alfalfa hay are the primary feeds. Typical starting rations contain about 55 percent concentrates. Intermediate rations contain 65 to 70 percent concentrates, and the proportion of concentrates in finishing rations often exceeds 90 percent (12).

Ingredients in rations used in the Southeastern States include corn, sorghum grain, small grains, corn silage, hay, cottonseed hulls, molasses, and citrus pulp. The latter is used chiefly in Florida. Cottonseed meal and urea are the primary sources of protein. Rations for calves are usually 75 to 80 percent corn silage or hay, 15 to 20 percent corn, and 7 to 8 percent protein supplement. These calves as well as yearlings are then placed on a ration consisting of 60 to 70 percent corn, 20 to 30 percent cottonseed hulls or hay, and 10 percent protein for finishing.

A ration in which corn silage with a high grain content is fortified with urea, limestone, and phosphate at harvest appears to be gaining in popularity in the Southeast. The corn plant is cut high enough to yield a 40- to 50-percent content of grain by weight.

Various systems for processing grains form an integral part of ration formulation for cattle in all regions. All are designed to decrease waste and increase digestibility. Processing methods include such practices as grinding, rolling, steaming, flaking, and even popping. The effectiveness of sorghum grains is improved substantially by processing. Most grains are still handled in dry form,

but high moisture grains, achieved either by harvesting early or reconstituting dry grain with water, are increasing in popularity.

Economies of Size

Economies of size associated with cattle feedlots have created much interest. Structural changes in any industry that result in a marked uptrend in average size of firm suggest that significant economic gains can be achieved through large-scale organization. Advantages from increases in size of firm may come through ability to obtain higher prices or buy at lower costs, or management may simply want more units to increase total income. An increase in efficiency is not essential to make a large operation more attractive to management than a smaller one.

Economies, and diseconomies too, result from internal, size-determined input-output ratios and external, size-related factors that nevertheless have a direct bearing on feedlot success. Commonly, these relationships are characterized as internal and external economies of size, but often there is no clear distinction between the two. In this discussion, size-related economies are considered in three categories: in-plant economies, buying and selling economies, and other economies.

In-Plant Economies

Aside from the feeder cattle themselves, the inputs used in cattle feeding divide broadly into feed and nonfeed inputs. Many studies have clearly demonstrated that unit cost of nonfeed inputs decreases as size of feedlot increases. Efficiencies arise from more complete utilization of facilities, greater specialization of labor, and substitution of mechanization for labor.

An Oklahoma study showed that, for 700-pound steers fed for 120 days, nonfeed costs per pound of gain were more than a third less in a feedlot of 15,000-head capacity (4.2 versus 6.8 cents) than in a feedlot with capacity for only 300 head (49). A study in California in 1962 revealed a drop in nonfeed costs from 7.2 to 5.6 cents per pound of gain as feedlot capacity increased from 3,760 head to 22,560 head (23). More recent research there showed nonfeed costs per unit of gain for feedlots feeding fewer than 4,000 head to be more than 80 percent higher than those for operations in the 10,000- to 26,000-head range (19). Recent investigations in Texas-Oklahoma found nonfeed costs per pound of gain to be 4 cents higher for feedlots of 200-head capacity than for feedlots with capacity for 35,000 head (12). For feedlots of 1,000-head capacity, the extra cost amounted to 2.6 cents a pound.

Data from the above studies were estimated on the basis of full utilization of capacity or an equivalent intensity of use by feedlots of various sizes. Full capacity can seldom be achieved by any feedlot, regardless of size, but the larger feedlots have a history of coming closer to it than do the smaller ones. They, therefore, have an even greater advantage in unit nonfeed costs than some of the studies referred to here reported.

Increases in unit nonfeed costs can be expected if a feedlot becomes too large. These diseconomies arise for many reasons, chief of which are: a weakening of

coordination among the many feedlot activities; a higher proportion of time needed for travel within the feedlot complex; and a tendency to outgrow managerial capacities.

Some analysis has considered the size of feedlot at which diseconomies might begin. Such research shows that most economies in nonfeed costs are realized by commercial feedlots of rather modest size. For larger feedlots, the costs level out, but no significant diseconomies appear in any of the sizes that have been subjected to analysis.

Most economies in nonfeed costs appear to have been achieved at feedlot capacities between 5,000 and 7,500 head. The 1962 California study indicated that at a capacity of 7,250 head a feedlot achieved 65 percent of the economies of size in 3,760- to 22,560-head capacity feedlots. In the Oklahoma study, 88 percent of the economies were achieved at a capacity of 5,000 head.

A later California study found the greatest economies to be in feedlots feeding 10,000 to 26,000 head and found some evidence that diseconomies arose in larger ones. However, the per unit increase in nonfeed costs for feedlots with a capacity over 26,000 head was small (19). And investigations in Texas and Oklahoma in 1966-67 showed no diseconomies of size in feedlots up to 35,000-head capacity (12).

Feed costs overshadow nonfeed costs, sometimes accounting for as much as 80 percent of total cost of production when purchases of feeder cattle are excluded. But feed costs do not seem to be related to differences in size of operation as closely as do nonfeed costs. The limited information suggests that larger operations may have little advantage in terms of physical conversion relationships and in some instances may be at a disadvantage (22). Large feedlots, however, may have some cost advantages in buying and formulating rations.

Comparisons of feed efficiency among feedlots of different sizes become difficult if operations are not homogeneous as to region, kind of cattle, and feeds. Some erroneous conclusions have been drawn when these factors have not been adequately considered. However, additional efforts directed to this question may yield useful information in the future.

Buying and Selling

The variation in ability of operators of feedlots of different sizes in buying inputs and selling fed cattle is probably the most important single determinant in establishing the true picture of economies of size. Superiority in these activities very likely has had a greater bearing on the rapid growth of large commercial feedlots than have in-plant economies. Yet, these abilities are also the least understood factors in feedlot growth and the most difficult to measure.

The operator of a large feedlot has many opportunities to outdo his smaller counterpart in buying and selling. But how they actually compare is unknown. For example, producers of large numbers of fed cattle are continuously in the market for feeder cattle on a broad geographic basis, either personally or with specialized purchasing agents. Their knowledge of prices, availability of cattle,

and feeding and slaughter potential of different cattle should be superior to that of the occasional buyer who operates a small feedlot. On the other hand, the pressure to keep a large feedlot operating at capacity may compel the large-volume feeder to take less desirable cattle. In addition, his costs of acquisition may be high during seasons when the supply of feeder cattle is low.

Savings may also be made by purchasing feeds in large quantities--through volume discounts, reduced transportation rates, and having adequate storage at the feedlot, which permits bypassing commercial feed dealers. Producers with sufficient volume often contract to advantage with local farmers for specification production of silages, hay, and other feeds. However, the progressively higher transportation costs involved in moving feeds of high bulk or water content may raise their costs to a prohibitive level as purchases increase with size of feedlot and nearby supplies are exhausted.

The larger producer may also realize price advantages in the purchase of other inputs. Direct purchase of equipment and supplies in volume may cut unit costs. Also, services of a veterinarian should cost less as he spends relatively more of his time at the feedlot than in traveling to and from it. Even capital needs may cost less in terms of lower handling charges and the possibility of attracting investors who wish to invest large sums of money.

The advantage of size may be even greater in marketing of slaughter cattle than in purchase of inputs. Continuous operations in the market provide the large-volume feeder with a better knowledge of market conditions on a day-to-day basis; further, the lows of fluctuating slaughter prices are less damaging to him than to the producer who sells only a few times each year.

Large commercial feedlots normally have some cattle ready for slaughter throughout the year. Individual pens of cattle of varying weights, grades, and sex are usually available. Therefore, a packer with a specific need can often obtain cattle on short notice at a premium price to the feedlot. Once the feedlot establishes a reputation, transactions can often be made without inspection of the cattle at the feedlot, thus cutting marketing costs to the advantage of both feeder and packer. Feedlots with large numbers of cattle can attract more buyers and thus obtain more competitive prices for their cattle.

Other Economies

Differences in feedlot size affect the extent to which feeding operations can profitably be associated with related activities. The larger the feedlot, the more the opportunities to coordinate vertically with firms at other stages of the industry, such as feed processors, firms yielding byproduct feeds, special transport systems, packing plants, and even retail outlets. Further, the feedlot that develops a reputation for efficiency and is large enough to instill confidence in investors may be able to improve its own operation by custom-feeding cattle for others.

Disposal of manure looms as a virtually undisputed diseconomy for the larger feedlots. Once a valuable byproduct of cattle feeding, manure is now a costly waste-disposal problem. Even the farmer feeder finds manure a less valuable

commodity as the cost of commercial nitrogen fertilizers continues to decline. The need to avoid pollution of water and air is a constant worry for cattle feeders. The larger and more concentrated the operation, the more serious the problem.

Financing Cattle-Feeding Operations

Cattle feeding is a capital-intensive operation. Although capital needs vary with the size and type of feedlot, investments are large. Judging from the rapid growth of cattle feeding, particularly in feedlots with 1,000-head-and-over capacity, capital does not seem to be a limiting factor. Adequate capital has been available, especially where the borrower was a top-level manager capable of finishing cattle efficiently.

Long-Term Investments

Financing the physical plant for a feedlot may require a large outlay of capital. Needs vary, depending on size of feedlot and region. They may range from a few hundred dollars for a small farmer feedlot to several million for a large commercial feedlot. In Illinois, the estimated initial investment for a 100-head capacity feedlot with mechanized materials-handling equipment was estimated at about $150 a head, or $15,000 for the feedlot (48). In contrast, the initial investment in a 15,000-head capacity feedlot in Oklahoma in the early 1960's was $28 a head, or $420,000 for the feedlot (50).

Operating Capital

Once feedlot facilities are financed and often before construction on them begins, financing for purchase of feeder cattle, feed, and nonfeed variable costs must be obtained. Capital needs for annual operating expenses vary considerably, depending on many factors, including: length and number of feeding periods; weight and price of feeder cattle; feed costs; and nonfeed inputs such as labor, power, interest on capital, and medical expenses. In all cases, however, annual operating costs far exceed initial capital costs of physical facilities.

Compare, for example, a 300-head capacity feedlot and a 15,000-head capacity feedlot, each feeding 700-pound steers for 120 days (50). Initial investment for the small lot might total about $40,000, while the large one might cost in the neighborhood of $750,000. The latter amount is a lot of money, but operating costs are much more. Annual operating expenses for the 300-head capacity feedlot going at full capacity approach $200,000. Similar expenses for the 15,000-head capacity feedlot are near $9.25 million--$6.3 million for purchase of feeder cattle, $2.4 million for feed, and upward of $0.5 million for nonfeed inputs. Operation at less than capacity reduces total operating costs but results in higher costs per hundredweight of beef produced.

Sources of Credit

Commercial banks, production credit associations (PCA's), Federal land banks, and insurance companies are the usual sources of capital to finance cattle feeding (7, 12, and 34). Commercial banks are the leading source, although in some areas PCA's rank high. Internal capital is also an important source, particularly for small feedlots.

For operating capital, feedlot operators rely almost entirely on commercial banks. PCA's supply most of the remainder, usually less than 10 percent of borrowings. In smaller feedlot operations, the feedlot operator often finances himself, but this occurs to a much lesser degree as feedlot size increases.

Commercial banks are also the primary source of capital for fixed investments in physical facilities. However, feedlot operators are less dependent on commercial banks for fixed investment capital than for operating capital. PCA's, insurance companies, and internal capital are used more as a source of financing fixed investment than as sources of operating capital.

Vertical Coordination in Cattle Feeding

Vertical coordination is the general term for all the ways of harmonizing the vertical stages of production, from calf growing to marketing of fed beef. The market-price system, vertical integration, contracting, and cooperation, singly or in combination, are some of the alternative means of coordination (29).

Information on vertical coordination in cattle feeding is limited. Many different arrangements exist, and they differ among regions and even among States. Much of the discussion about vertical coordination is now centered around commercial feedlots and means of improving marketing efficiency. For a rancher, coordination may involve forward integration into cattle feeding, packing, and distribution. For a supermarket, it involves backward integration into packing, cattle feeding, and ranching, or various combinations of these alternatives. Contracting for inputs or for sales of finished beef is also a form of vertical coordination.

The current trend in cattle feeding is toward advance purchase of inputs and advance sale of cattle. Fluctuations in supplies and large price changes are costly to all sectors of the beef industry, as well as to related industries. Greater coordination throughout the supply, production, and distribution processes will increase efficiency and reduce the uncertainty that has long been characteristic of the industry. As cattle feeding develops larger, more highly specialized operations, it will be increasingly necessary to assure both an adequate supply of inputs for production and a market for the finished product.

To protect their commitments for resources, some feedlot operators have turned to contract agreements with packers to buy their fed cattle at future delivery dates on specified terms.

Principal Occupations of Cattle Feeders

The study of cattle feeding conducted by the National Commission of Food Marketing covered 15 States, mainly in the West, and concentrated on commercial feedlots with capacity for 1,000 or more head. Packers owned nearly 19 percent of the fed cattle marketed by these feedlots in 1964. Farmers and ranchers owned 31 percent. The extent of such vertical integration varied, depending on whether it was measured by ownership of feedlots or by ownership of cattle on feed. For commercial feedlots alone, the percentages of ownership by principal occupation of the owner are shown in table 33 (31).

Table 33.--Principal occupations of feedlot and cattle owners (commercial feedlots in 15 States)

Principal occupation	Ownership of--	
	Feedlot	Cattle
	Percent	
Farmer or rancher	38.5	30.7
Cattle feeder	40.3	42.9
Nonfarm agricultural business	4.1	2.4
Meatpackers and packer-buyers	8.8	18.8
Livestock-marketing agencies	1.3	1.7
Food retailers	.5	.7
Others	6.5	2.8
Total	100.0	100.0

Source: (31).

Measured in either of the ways mentioned, farming and ranching were still closely linked to feeding, even in the large feedlots. Many commercial cattle feeders had farming and ranching interests, either as the main business or secondary to the feedlot. Farmers and ranchers also placed some cattle in commercial feedlots to be custom fed on contract.

Meatpackers and packer-buyers are more interested in owning cattle than in owning feedlots. For reasons already outlined, they did custom feeding on a considerable scale. Less than 1 percent of cattle fed in the 15 States were owned by food retailers. In the past, integration of retailing with cattle feeding has been slightly more in periods of shortage. However, such integration was negligible in 1964.

The "others" class included lending agencies, nonagricultural business firms, professional workers, and investors. Feed companies were also in this group. There was obviously a minimum tie-in between feed companies and cattle feeding so far as the 15 States in the study were concerned. A recent study of cattle feeding in Texas and Oklahoma showed that feed companies were engaged in cattle feeding only to a slight extent, the involvement being somewhat more in Texas than in Oklahoma (12). Many large feedlots, however, have integrated feed processing into their principal enterprise, cattle feeding, to meet their own needs.

A recent enumeration of all corporations (including family corporations) having agricultural operations provided additional knowledge on primary and other business activities of corporate firms that operate feedlots (table 34). In 1968, there were 1,989 corporations feeding cattle in the 48 States. Sixty percent of them had no business activities other than farming, ranching, or cattle feeding. The remainder maintained one or more other business interests. Nearly half engaged in a variety of local businesses. Next in importance among business

Table 34.--Business interests of corporations feeding cattle, by number of fed cattle marketed, 48 States, 1967 1/

Business interests	Corporations marketing (head)								
	Less than 500	500 to 999	1,000 to 3,999	4,000 to 7,999	8,000 to 15,999	16,000 to 31,999	32,000 to 59,999	60,000 and over	Total
	Number								
Farming only	792	149	165	35	32	28	7	5	1,213
Farming plus other business	480	93	123	24	25	17	7	7	776
Total reporting	1,272	242	288	59	57	45	14	12	1,989
Farm related business:									
Farm machinery	44	7	14	4	1	0	0	0	70
Feed	72	15	18	7	5	7	5	0	129
Fertilizer	61	10	16	5	3	4	0	1	100
Meat processing	60	14	23	6	11	6	5	3	128
Livestock marketing	39	10	10	2	3	3	0	1	68
Grain marketing	25	10	11	3	2	1	2	0	54
Fruit and vegetable marketing	16	1	2	0	1	1	0	0	21
Miscellaneous crop marketing	24	1	1	3	0	1	0	1	31
Nonfarm related:									
Local business	228	42	56	10	8	7	0	0	351
Nonlocal business	10	3	5	0	4	0	0	0	22
Land use 2/	19	3	4	2	0	0	0	0	28
Local professional	31	2	3	0	0	0	0	0	36
Not identified	23	6	5	3	1	0	0	1	39
Total reports other than farming 3/	480	93	123	24	25	17	7	7	776
Farming rank: 4/									
1	100	22	27	7	4	7	0	1	168
2	273	48	67	9	15	6	2	5	425
3	42	7	11	2	2	1	4	0	69
4	11	1	5	2	2	3	0	0	24
5, 6, and 7	3	1	1	0	0	0	0	0	5
Did not know	51	14	12	4	2	0	1	1	85
Total reports	480	93	123	24	25	17	7	7	776

1/ Except Calif. data were for 1968.
2/ Mining, manufacturing, and other ultimate use, with farming as an interim venture to reduce holding costs.
3/ Individual items add to more than the totals shown because many corporations had several of the listed businesses.
4/ How sales of farm products (including fed cattle) ranked among sales of products from the various business interests of each corporation.

Source: Data from unpublished study of corporations with agricultural operations, Farm Prod. Econ. Div., Econ. Res. Serv., U.S. Dept. Agr.

activities were feed sales and manufacture, meat processing, and fertilizer sales and manufacture.

Coordination With Producers of Feeder Cattle

Farmers and ranchers carry on a major share of cattle-feeding operations and control the coordination of feeder-cattle supplies so far as they produce their own calves. The extent of the ties between feeder-cattle production and cattle feeding, when the two are not on the same farm, is unknown.

There are some vertically integrated operations of substantial size, but most coordination is achieved by more flexible means. A common approach is through contracts. Arrangements are usually determined on a year-to-year basis between the feedlot and the feeder-cattle producer. Seldom is an intermediary involved. It may be mutually advantageous to fix price, sale weight, and approximate time of delivery early in the production period.

Recently, preconditioning operators and warmup cattle feeders have begun to enter the production scheme. They add a new dimension to the vertical stages of production. They commonly attempt to contract with the feeder-cattle producer for a supply of calves and with the cattle feeder to assure a profitable outlet. Without a contract, these warmup operators might encounter periods when their services would find little or no market. Custom feeding is another means for coordinating calf production with cattle feeding.

Coordination With Producers of Feed

Farmer feeders, almost by definition, vertically integrate feed production with the feedlot. In many instances, grain production is their primary enterprise. Virtually all feeds used, with the exception of a protein source, are produced on the farm.

As size of feedlot expands, an increasing proportion of the feed used is purchased. The larger commercial feeders purchase nearly all feeds. Most operate their own feed mills as an integrated part of their cattle-feeding business.

Large feedlots commonly maintain a 30- to 60-day supply of feed in storage at the feedlot. Future supplies are usually known with an acceptable degree of certainty, and procedures for hedging are well developed. Advance contracts between feedlots and feed grain producers and dealers are used only to a limited extent.

Supplies of roughages, however, are often contracted far ahead of the planting season. This practice applies particularly to silage, which cannot be hauled economically over a long distance. Silage producers normally grow only enough for their own needs, plus quantities for which they have an assured market at a nearby feedlot. Contracts for silage, usually corn silage, commonly specify price, variety, and time of harvest.

Some hay is also produced under contract. However, hay can be shipped economically over greater distances than can silage, so feedlot operators are under less pressure to assure their supplies in advance of the production period.

Protein feeds are sometimes contracted for in advance. Price expectations have usually been the determining factor. Such contracting has been used mainly for soybean meal and cottonseed meal. With the large quantities of urea now being fed, and its nonseasonal industrial production, less protein feed may be purchased on contract in the future.

Coordination With Packers 12/

Probably more interest has been expressed about packer feeding of cattle than about any other phase of vertical coordination in the cattle industry. Packer involvement may occur in all stages, from feeder cattle production to the supermarket. The most common form of integration, however, is that between packer and feedlot. This form is most prevalent in the Western States and in deficit cattle-feeding areas.

In deficit areas, some packers have vertically integrated certain of their operations to achieve economies from a more orderly flow of number and quality of animals. Integration helps to assure that these packers will have weights and grades of cattle that will produce beef and beef products to meet the specifications of their customers (28).

Contracting for fed beef for limited periods in advance of delivery is another means of vertical coordination by which the packer insures an orderly flow of fed beef. In 1964, packers controlled or owned nearly 28 percent of total commercial marketings for 8 days or more prior to shipment (49).

Contracting with packers may be advantageous to cattle feeders in reducing uncertainty and getting prices that provide a sufficient return on investment. Contracts may also help feedlot operators plan for an optimum flow of cattle through their feedlots. The length of time over which these contracts extend may vary, from a few days to longer than the entire finishing period. Some cattle are contracted for delivery to a packer before they are even purchased as feeders.

Uncertainties in Cattle Feeding

The many uncertainties in cattle feeding, its highly specialized nature, and the large investment in fixed facilities and variable costs make it an unusually high-risk enterprise. Although they arise for a number of reasons, the uncertainties can be reduced in many ways. In general, there are three broad groups of uncertainties: technical, price, and others.

Technical uncertainties are those related to the physical aspects of production. These include uncertainties about production decisions (such as rations, rates of gain, medicines, and pesticides), weather conditions, technological innovations, and disease or other adverse developments. Technical uncertainties, in general, affect costs of production, but they may also alter gross returns by affecting the quantity or quality of output.

12/ Packer feeding of cattle is also discussed in the section on Types of Cattle Feeders.

Price uncertainties are those resulting from changes in prices of inputs and outputs. Reduced earnings, and even losses, can result from adverse changes in unit input costs or product prices since a substantial timelag exists between placing cattle on feed and finishing. Substantial change in the price of slaughter cattle is by far the most important factor affecting net returns of cattle feeders.

The category of "other uncertainties" contains a large number of items. For example, a change in monetary policy can affect interest rates and costs of operation. Personal accidents or illnesses and actions of other people associated with a feedlot can affect its operation. Most of the uncertainties in this category affect business results of an enterprise in either a technical or price sense.

Income Variability

Price fluctuations are the major cause of income variability in cattle feeding. Over time they produce variations in costs and gross sales and lead to highly variable net returns.

Net returns from cattle feeding are largely dependent upon achieving two favorable margins. The first, a feeding margin, is the difference between the cost of feed and the price received for the gain put on cattle. This margin can be adversely affected by an increase in price of feeds or a decrease in price of slaughter cattle. The level of technical efficiency achieved also has a bearing on this margin. The second, a price margin, is the difference between purchase and selling prices per hundredweight. A drop in market price for slaughter cattle can be disastrous for operators who buy heavy feeder cattle and then must bear the burden of a negative price margin on 75 to 80 percent of the weight of the animals they sell.

A negative price margin does not necessarily indicate a loss, as it may be more than compensated for if liveweight gains are a high proportion of final sale weight and the feeding margin is favorable. Conversely, positive price margins may not reflect a profit if they are offset by a poor feeding margin. Nevertheless, the price margin is a good indicator of variability in income from cattle feeding over time.

Comparing monthly prices of Choice slaughter steers at Chicago with average prices of all feeder steers at Kansas City 5 months earlier gives an idea of the extent of variation (fig. 8).13/ Negative price margins per 100 pounds, ranging from -$0.02 to -$2.57, prevailed in 26 months of the period 1960-68. Margins were positive in 82 months, ranging from $0.02 to $8.08. Margins and absolute prices are highly variable over time. Profits have been fabulous in some years, while in others the market value of fed cattle has been less than the cash outlay for feed and feeder cattle.

The very nature of production and management in the feedlot, as in any business, confronts operators with some uncertainties that they must accept. Means exist, however, by which uncertainties can be minimized.

13/ Note that the price margin is called "feeding margin" in figure 8. Both terms are used by different writers.

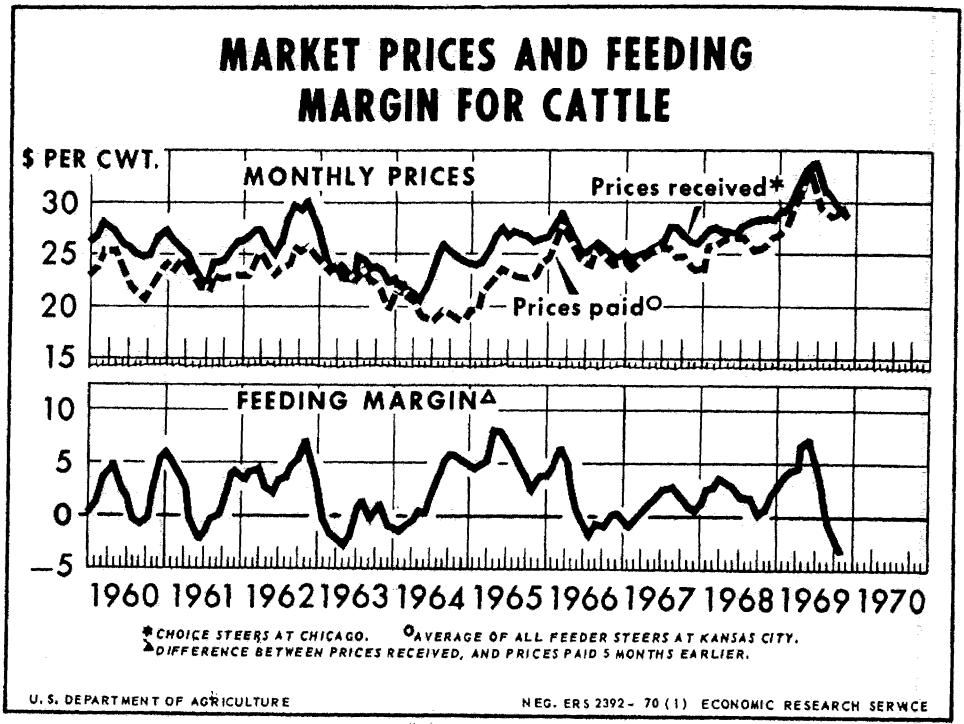


Figure 8

Improved knowledge is probably the best way of reducing technical uncertainty, which arises largely from variability in operators' knowledge of technical coefficients of production. Improved methods of measuring quality and quantity of inputs, such as laboratory analysis of feeds and records of gaining and grading qualities of slaughter cattle, open the way for more effective selection and use of inputs. More accurate measures of physical relationships form a necessary foundation for more precise economic evaluation of resource combinations. Price information alone is not enough.

Price uncertainties can be reduced through improved market information. Price, demand, and supply data are available from many sources such as news media, USDA, State universities, and producer associations. Mass communication networks make such information available nationally, almost without delay. Information is also available on present and future demand and supply situations, to aid cattle feeders in longrun planning while making shortrun market decisions.

Some uncertainties in cattle feeding may also be guarded against through horizontal expansion or through vertical coordination. By horizontal expansion--increasing the size of operation--cattle feeders may realize both technical and price economies.

Larger size of operation often reduces the likelihood of loss from the cost side, by making possible the use of lower cost-input combinations. Organizations with sufficient volume may obtain discounts on the purchase prices of inputs. On the marketing side, they may be in position to bargain for higher prices. In addition, larger sized operations can spread production more evenly over the year, thus insuring that their average market conditions are similar to the average for

all purchases and sales. In this way, they may avoid extreme losses due to single transactions in an unfavorable market. On the other hand, diversification, which is common in farmer feeding operations, lessens the impact of unfavorable results from cattle feeding on the total farm business. Thus, these farmers suffer less, even though year-to-year variation in income from cattle feeding may be greater than it is in larger, more highly specialized operations.

Vertical coordination provides numerous possibilities for reducing uncertainty. Some of the possibilities affect technical aspects of production, but many relate to market factors. The forms of coordination are many. Three that seem to be particularly relevant to cattle feeders are direct marketing, forward contracting, and trading of live cattle futures. They may be used singly or in combination to counter uncertainties in cattle feeding.

These means of vertical coordination are chiefly aimed at reducing the uncertainty of future product prices. Each to some degree, however, affects product quality, the collection and dissemination of market information, input pricing, and the financing of production.

Direct marketing may provide the producer with lower marketing costs, an improved bargaining position, and more accurate information on the feedlot performance of his cattle. To be most effective, however, producers using this method of marketing must have more accurate information than is available through terminal or auction markets (17). Uncertainty may even be increased if competitive bidding is absent or if volume is too low to generate a firm set of prices. Direct marketing may be of limited use in reducing price uncertainty unless it is combined with a degree of forward contracting.

Forward contracting essentially eliminates the feeder's uncertainty concerning the price he will get for his cattle. Under such arrangements, feeder and packer reach a firm agreement on the quantity, quality, delivery date, and price of cattle to be marketed. The advantages and disadvantages of direct marketing are usually present in such arrangements, but both parties to the contract may benefit from advance knowledge. And, of course, further protection against future changes in market conditions can be achieved if the feeder contracts for inputs and the packer contracts for sale of processed beef.

Live Cattle Futures Market

Futures markets for beef commodities may not only reduce or shift uncertainties of future product prices but may avoid some difficulties of forward contracting and direct marketing, while retaining major advantages of each. However, use of futures markets by cattle feeders only potentially achieves these results, which require many conditions to be met. Among these conditions are:

1. A large number of buyers and sellers--a "heavy" rather than "thin" volume of futures trading.
2. Involvement of hedgers and speculators, along with packers and feeders.

3. Clear and reasonable contract specifications that can be met by producers.

4. An understandable, stable, and predictable basis for differences of location, kind, and type of cattle.

Under these conditions, pricing will more likely be unbiased and efficient. The relationship between cash and futures will be known (or predictable) and the feeder can forward-price cattle for future direct delivery at low cost with very complete price information. Fluctuations in cash prices will be dampened. The feeder can change his mind, get in and out of futures, hedge selectively, and be more flexible than with forward contracts.

In short, use of futures markets in conjunction with direct marketing may eventually become the best means of reducing price uncertainties in cattle feeding.

In general, we can say that those participating in the futures market are hedgers and speculators. Hedgers are feeders, packers, or others actually involved in production, processing, or marketing of fed beef. Their primary objective is to establish future prices and costs so that operational decisions can be made on the basis of known relationships. Speculators are those who assume these uncertainties in the hope of profiting from increases or decreases in futures prices.

A cattle futures contract is a legal agreement to deliver or accept delivery of a specified number, weight, and grade of cattle at a specific location. Time of delivery and price are stated in the contract. Contracts are traded for specific months and may be bought or sold up to a year or more in advance of delivery date.

Hedging is based on the expectation that cash and futures prices will be nearly the same at the time the contract is due. Hedging decreases the possibility of windfall losses and gains. The hedger takes an opposite position in the futures market to that in the cash market. Therefore, at the time cattle are placed on feed, the cattle feeder sells a futures contract for the month nearest the time the cattle will be finished. When he sells the fed cattle, he buys back a futures contract, thereby cancelling his previous futures market contract. If cash prices drop, profit on the futures contract will offset part of the loss. Windfall gains that would result from increases in fed cattle prices are likewise offset by losses on the futures contract. A hedge, therefore, reduces the effect of price variation in both directions.

The effectiveness of hedging depends directly on the relevant cash prices, which for individual cattle feeders, may be very different from the Chicago cash price. Geographic differences in cash prices for cattle of a given quality are primarily due to transportation and other marketing charges and to differences in local supply-demand conditions. The relevant cash price may also differ from the Chicago cash price because of differences between the kind and quality of cattle (age, weight, sex, breed, grade) produced and the kind and quality to which the Chicago price refers. All of these differences introduce elements that may cause the relevant cash-futures basis to behave differently from the Chicago cash-futures basis.14/

14/ Basis is the difference between the local cash price of fed cattle and the futures price.

Variances in the cash-futures basis and unfamiliarity with the futures market are the primary obstacles against hedging for many cattle feeders. In many areas, particularly those some distance from the Chicago terminal market, cattle feeders find that the basis between the Chicago futures price and their own relevant price is so variable that it is not possible to make an effective hedge. Some cattle feeders believe they can hedge effectively at some periods during the year but not at others. Cattle feeders sometimes find that the difficulty of defining a meaningful basis means that they must devote too much time to following the market to protect their hedges.

Some analysts have hypothesized that the futures market will serve as a price guide for the future. However, the same problems and factors that affect estimates on the cash market affect the futures price on distant contracts. In addition to the factors affecting the cash market, the influence of hedgers and speculators may separate the futures market from basic supply and demand conditions. Many cattle feeders think that the futures market is not an adequate market indicator of cattle prices and does not serve the function of price discovery as the terminal markets once did.

Possibly, as the basis between markets is further analyzed and better understood, and as individuals within the beef industry become more futures-market oriented, the use of the hedge may become more effective. With present trends toward larger, more highly specialized feedlots with needs for large amounts of credit, the problem of price variation is becoming increasingly important. Many of the large feedlots, particularly the newer ones, are highly vulnerable to price fluctuations because of the large scale of operation and smallness of the owner equity in the feedlot, which in itself, serves as only a small base in comparison to operating expenses. As feedlots continue to grow in size and as cattle feeding is practiced on a year-round basis, fed cattle prices and numbers on feed should level out over the year. Margins may become even smaller. If this proves to be so, the need for a means to stablize prices will become more important. At present, the cattle futures market holds great promise as a means for reducing price uncertainty. However, if it is not successful, feedlots will use more forward contracting and other methods.

MARKETING FED CATTLE

The feeding and marketing phases of the cattle-feeding business are closely related. No clear-cut separation can be made in many instances, and the division is mainly one of convenience in exposition. The present section considers such matters as methods of marketing, grades and weights, transportation, and prices. Obviously these subjects are closely connected with production problems.

Methods of Marketing Fed Cattle

During the 1950's, when cattle feeding was just entering its period of rapid growth, the terminal public market was the most widely used outlet for slaughter cattle in the United States. In 1955, over 38 percent of all fed cattle moved through terminal markets, with the proportion running to 54 percent in the North Central States, where farmer feeder operations were concentrated (43). Auctions,

coming next, provided an outlet for nearly a third of all cattle marketed. Auctions were the leading outlet in the South and the Northeast in 1955. Sales direct to packers accounted for only about 12 percent of the national total and were of greatest significance in the commercial feeding areas of the West.

The same general pattern continued through the early 1960's with terminal markets leading in cattle sales in the Corn Belt and sales direct to packers in the West (26). Auctions remained well behind both of these methods, with less than 10 percent of total marketings. Most recently, direct sales have increased at the expense of other outlets, especially terminal markets.

In 1966-67, direct-liveweight sales were the most popular type of selling arrangement, accounting for about three-fourths of fed cattle marketed in the Western Corn Belt, Colorado, and the High Plains (table 35). About nine-tenths of cattle marketed in California were sold in this way. Grade and carcass-weight sales direct to packers were second in importance, accounting for 10 to 28 percent of sales. Auctions, terminals, and consignments were of importance only in the Western Corn Belt, where they comprised 14 percent of sales.

Cattle feeders in the Corn Belt and Lake States have a choice of methods and places to sell cattle. Nearly three-fourths of fed cattle are marketed through auctions and terminal markets. Direct movement from farm feedlots to slaughter plants accounts for about a fourth of marketings, while sales to truckers, traders, and others only account for a nominal percentage. The larger the feedlot the more likely that cattle will be sold directly to the packer.

Table 35.--Percentage of cattle marketed, by type of selling arrangement, selected regions, July 1, 1966 to June 30, 1967

Region	Type of selling arrangement			
	Direct liveweight	Grade and carcass weight	Other 1/	Total
	Percent			
Western Corn Belt	72	14	14	100
High Plains	77	22	1	100
Colorado	71	28	1	100
California	89	10	1	100

1/ Auction, terminal market, and consignment.

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

In the Northern Plains, about 75 to 80 percent of fed cattle are marketed through terminals, 20 percent direct, and the remainder through auctions and other marketing channels (22). Operators of larger feedlots tend to move more cattle direct to packers than through auctions or terminal markets.

Commercial feedlot operators in the Mountain States sell about three-fourths of their fed cattle direct to the packer. Farmer feeders rely more on terminal markets and auctions than do commercial cattle feeders.

Pacific Northwest cattle feeders sell about 76 percent of their fed cattle direct to the packer, 15 percent through auctions, and 9 percent through other marketing agencies. Larger feedlots sell about 85 percent of their fed cattle direct. Smaller feeders sell 27 percent through auctions and move 15 percent through other marketing outlets.

Some 92 percent of fed cattle marketed in Arizona now go directly to packers. Neither the method of marketing nor the near total dominance of commercial feedlots, which characteristically deal directly with packers, has changed for several years.

Cattle fed in the Southeast move through a variety of outlets, including packer-buyers at the feedlot, packing plant, or special buying stations, and through local auctions and terminal markets. Small farmer feeders sell most of their cattle through weekly auction markets, whereas most of the cattle from the large feedlots are sold directly to packers.

Direct-liveweight, and grade- and carcass-weight sales increase as feedlot capacity increases (7, 12). Commercial feedlots, with their large volume of fed cattle marketing, can attract buyers to the feedlot. Farmer feeders, particularly the smaller ones, cannot attract buyers to the feedlot and therefore must still rely on auctions and terminal markets.

Generally, auctions and terminal markets provide the industry with a gathering place for small lots of fed cattle. Packer-buyers can then more effectively assemble cattle into lots that are larger and more uniform with respect to grade and weight. Need for some such means of assembling cattle will remain as long as cattle are fed in small numbers by farmer feeders. If the proportion of the total number of cattle fed that is accounted for by these feedlots continues to decrease, the need for intermediate means of assembling cattle will decline accordingly.

Feedlot operators acted as their own major selling agency in 1966-67 (table 36). The feedlot owner or operator sold 80 percent of the fed cattle in the Western Corn Belt and 70 percent in the High Plains and Colorado. In California, feedlot operators handled 39 percent of the fed cattle, and salaried salesmen 29 percent.

As feedlot capacity increased in California and the High Plains, the proportion of owner sales decreased and those by salaried salesmen increased (7, 12). However, in the Western Corn Belt and Colorado, the opposite situation occurred, as owner sales increased with feedlot capacity at the expense of sales by salaried salesmen.

Table 36.--Percentage of cattle marketed, by selling agency, in selected regions, July 1, 1966 to June 30, 1967

Region	Selling agency			
	Owner	Salaried salesman	Other	Total
	Percent			
Western Corn Belt	81	---	19	100
High Plains	68	30	2	100
Colorado	69	13	18	100
California	39	29	32	100

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

Cattle Quality

Grades of Fed Cattle Marketed

Fed cattle have improved in grade markedly since the early 1960's (16), when only a little over half of the fed cattle graded Choice, and almost all of the rest graded Good or below.

U.S. Choice is now the most prevalent grade of fed cattle marketed, accounting for about two-thirds of the combined total in six selected regions (table 37). The only major deviations from this pattern occurred in Colorado, where nearly 90 percent of cattle marketings graded Choice in 1966-67, and in the High Plains, where about half were Choice. All of these regions except Colorado also had substantial U.S. Good marketings. Marketings of Prime cattle were 4 percent or less in all six selected regions except the Corn Belt, where they were 9 percent.

Two major markets in the Lake States received a higher percentage of Standard and lower grade fed beef than did markets in the adjoining farmer-feeding regions. The higher percentage of inferior grades there is probably due to increased feeding of dairy cattle.

Larger feedlots marketed a greater proportion of cattle of higher grades than did smaller lots (7, 12). In California, Colorado, and the High Plains, the percentage of Choice cattle marketings increased with feedlot size. Smaller feedlots in Colorado marketed about 7 percent of their cattle in U.S. Prime grade.

Weights of Fed Cattle Marketed

The average weight of fed steers and heifers at 15 specified markets was about 1,050 pounds in 1968, a drop of about 50 pounds a head since the early 1950's (16). Average liveweights of Choice steers and Choice heifers at 15 specified markets in 1968 were 1,124 pounds and 935 pounds, respectively.

Table 37.--Percentage of cattle marketed, by market grades, in selected regions, July 1, 1966 to June 30, 1967

Region	Grades of cattle marketed			
	Prime	Choice	Good	Standard
	Percent			
Lake States	2	60	28	1/10
Corn Belt	9	67	20	1/ 4
Northern Plains	3	64	29	1/ 4
High Plains	1	52	41	6
Colorado	4	87	8	1
California	1	67	24	8

1/ Standard and lower.

Sources: (16) for Lake States, Corn Belt, Northern Plains. (7) for Colo. and Calif. (12) for High Plains.

Variation does exist among regions (table 38). Fifty-three percent of fed cattle marketed in the Western Corn Belt in 1966-67 weighed more than 1,100 pounds. In contrast, Colorado cattle feeders marketed 69 percent of their cattle at weights under 1,100 pounds, and California and High Plains feeders marketed more than 90 percent below that figure.

Most of the fed cattle marketed in Arizona weighed less than 1,100 pounds. Steers are commonly marketed at weights of 1,000 to 1,050 pounds, and heifers at about 850 pounds.

Pacific Northwest cattle feeders market their steers at about 1,000 to 1,100 pounds. Heifers go at weights of 900 to 1,050 pounds.

Choice steers received at five major Corn Belt terminals averaged 1,132 pounds in 1968, while heifers averaged 930 pounds.15/ At four major markets in the Northern Plains, Choice steers averaged 1,115 pounds and heifers weighed 938 pounds.16/

Marketing Practices

Prices of Fed Cattle

Area differences in prices for similar weights and grades of slaughter cattle and beef are related to differences in transportation costs and in local demand and supply situations. During 1968, prices for Choice steers were highest in the Corn Belt, Lake States, and Northeast, and on the West Coast (fig. 9). Prices were lower in most of the Southeast and the High Plains.

15/ Chicago, Cincinnati, Indianapolis, St. Louis NSY, and Sioux City (16).
16/ Kansas City, Omaha, Sioux Falls, and West Fargo (16).

Table 38.--Percentage of cattle marketed, by weight group, in selected regions, July 1, 1966 to June 30, 1967

Region	Weight of cattle marketed (pounds)					
	Under 900	900 to 999	1,000 to 1,099	1,100 to 1,199	1,200 and over	Total
	Percent					
Western Corn Belt...	---	17	30	34	19	100
High Plains.....	52	13	28	6	1	100
Colorado.....	4	50	15	28	3	100
California.....	8	31	56	5	---	100

Sources: (7) for Western Corn Belt, Colo., and Calif. (12) for High Plains.

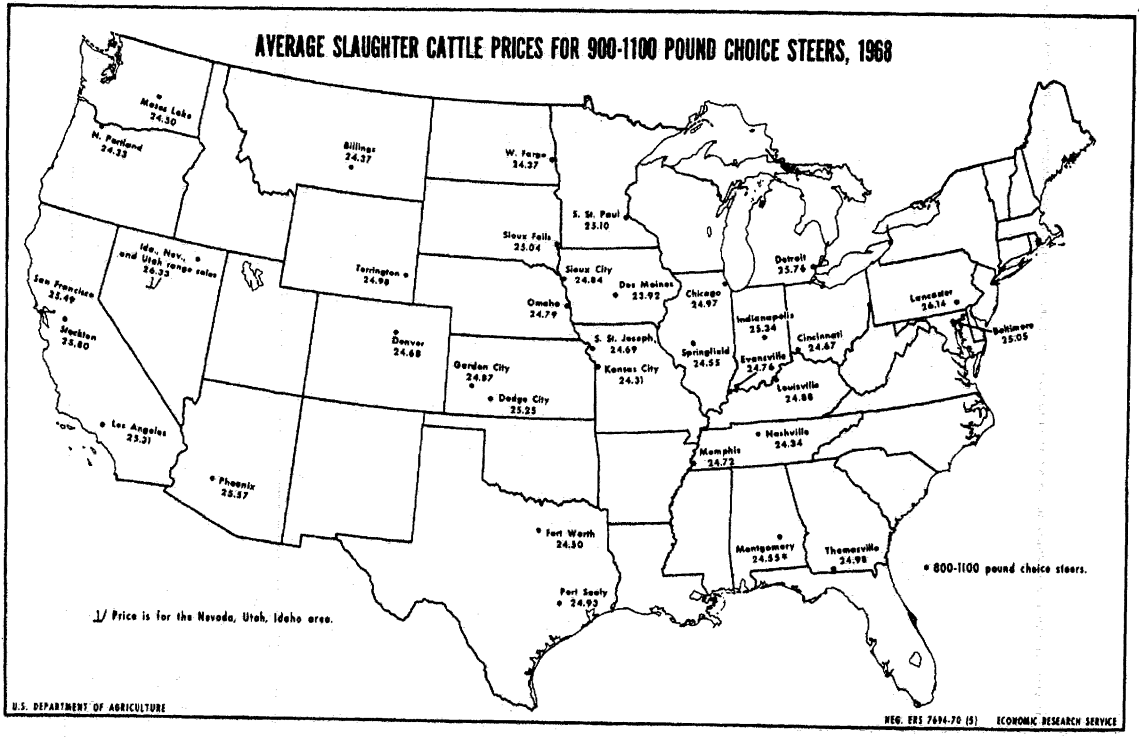


Figure 9

High slaughter cattle prices are expected in deficit beef production areas such as the Northeast and West Coast. However, the high prices in the central Corn Belt, an area of substantial beef production, and the lower prices in deficit areas such as Alabama and Georgia seem to contradict this expectation. The anomaly stems from the Corn Belt's nearness to centers of heavy industry, which have large populations with relatively high incomes. Despite the Corn Belt's large supply of fed beef, these centers raise demand enough to generate high prices. Further, there probably is a substantial spread in quality of fed beef produced in the Corn Belt and Southeastern States, even within the Choice grade, the Corn Belt having the higher quality.

Sources of Information on Fed Cattle Prices

Cattle feeders rely on many sources of market information, often in combination, to determine slaughter cattle prices (7, 12, and 25). Primary sources are live cattle quotations (newspaper, radio, television), market new reports, dressed market quotations, and commission men. Market newsletters issued by USDA, outlook information released by colleges of agriculture and producer marketing groups, the National Provisioner yellow sheet, and other supplementary price information are also used. Futures market quotations are apparently little used as a source of market price information.

Operators of small feedlots have less specific and less timely price information on slaughter cattle than do commercial cattle feeders. Commercial feeders market cattle continuously and have sufficient volume to justify specialization in this phase of the business. As a result, they tend to develop knowledge of the market on an immediate and continuing basis, and can evaluate cattle correctly in relation to that price information.

Transportation of Fed Cattle

A large proportion of all fed cattle are now transported to market by truck. Improvement of the highway system has greatly facilitated the marketing of fed cattle. As stated earlier, less than 2 percent of cattle shipped to major public markets were hauled by truck in 1919 (30). By 1950, two-thirds of all cattle and calves marketed were shipped by truck, and by 1967 the proportion was more than 97 percent. 17/ Many packing plants have moved to areas of production and many cattle are sold directly to the packing plant. The flexibility of truck routes and the chance to avoid additional handling at both ends of the haul have been the primary reasons for increased use of farmer-owned trucks and commercial trucking in shipping fed cattle.

The seller pays for transportation on about 90 percent of fed cattle marketed. Small feedlot operators pay transportation on almost all of their fed cattle, whereas purchasers from larger feedlots do so only sometimes.

17/ Information supplied by Charles H. Gilbert, Transportation and Warehouse Div., Consumer and Mktg. Serv., U.S. Dept. Agr.

Shrinkage, bruises, and other injuries are problems in all modes of transportation. Long hauls, excessive delays, and improper handling and overhandling all contribute to such losses. Shrinkage commonly runs from 3 to 5 percent on hauls of about 150 miles. The feedlot operator is usually required to absorb this loss, whether it is based on an estimated or an actual shrink.

CATTLE SLAUGHTERING

Commercial cattle slaughter has almost doubled since 1950, rising from nearly 18 million head in that year to more than 35 million head in 1969 (table 39). At the same time, the proportion of cattle slaughtered under Federal inspection increased and now comprises 87 percent of commercial slaughter. Further increases in Federal inspection may result from passage of the Wholesome Meat Act in 1968, which provides for Federal cooperation with appropriate State agencies in inspection programs.

Livestock slaughtering has had three distinct centers in this country. The industry moved from its origin, in the populated areas of the East, to the large terminal markets and then to the fed beef production areas. These location changes resulted from new and improved technology and a need to increase efficiency. The shift from the consumption centers of the East to the terminals of the Midwest was first made possible by development of refrigerated railroad cars to ship meat. Movement to beef production areas resulted from further improvements in technology and greater mechanization of slaughter plant operations, along with the economy of shipping carcasses and cuts of beef rather than live cattle. Development of improved highway systems and refrigerated trucks facilitated the transition.

The changing number of federally inspected livestock-slaughtering establishments in each region reflects the recent decentralization of beef slaughtering toward production areas (table 40). Generally, the growth in slaughter plants parallels regional increases in cattle feeding. In 1960, the Corn Belt, the Northeast, and the Southeast were the leading regions in number of slaughter plants under Federal inspection. The Corn Belt now has a smaller percentage than in earlier years, while from 1960 to 1969, the Northeast experienced an absolute decline. During this period, national growth in slaughter was 33 percent.

The Corn Belt and Northern Plains have long been the leading regions in commercial cattle slaughter (table 41). Increases since 1960 in slaughter of cattle have been above the 48-State average in Arizona, the High Plains, the Northern Plains, Colorado, the Mountain States, and the Pacific Northwest. The greatest relative growth occurred in Arizona, where cattle slaughter rose 159 percent. Most of this growth came in the early part of the sixties but it was continuous. Increases in the High Plains amounted to 99 percent of the 1960 level, with most of the increase coming after 1965. Cattle slaughter continues to grow rapidly in the Northern Plains and High Plains.

Many of the new plants are highly automated for greater efficiency. Their operations encompass the entire meat preparation process, from slaughtering, cutting, and trimming to packaging cuts of meat for direct shipment to retailers.

Table 39.--Number and percentage of cattle slaughtered commercially, by class of slaughter, 48 States, 1950-69

Year	Federally inspected	Other	Total 1/	Federally inspected	Other
	1,000 head	1,000 head	1,000 head	Percent	Percent
1950	13,103	4,798	17,901	73	27
1951	11,879	4,497	16,376	72	28
1952	13,165	4,691	17,856	74	26
1953	17,629	5,976	23,605	75	25
1954	18,476	6,541	25,017	74	26
1955	19,055	6,667	25,722	74	26
1956	20,186	6,676	26,862	75	25
1957	19,454	6,778	26,232	74	26
1958	17,642	5,913	23,555	75	25
1959	17,458	5,472	22,930	76	24
1960	19,394	5,830	25,224	77	23
1961	19,968	5,666	25,635	78	22
1962	20,339	5,745	26,083	78	22
1963	21,662	5,570	27,232	80	20
1964	25,133	5,685	30,818	82	18
1965	26,614	5,733	32,347	82	18
1966 2/	27,319	6,408	33,727	81	19
1967	27,780	6,089	33,869	82	18
1968	29,592	5,434	35,026	84	16
1969	30,536	4,700	35,236	87	13

1/ Total based on unrounded data.
2/ Data after 1965 not fully comparable with earlier years because of change in definition to include custom slaughtering in plants for farmers as part of commercial slaughter. Before 1966, custom slaughter for farmers was included as part of farm slaughter.

Source: (16).

These new processes are increasing output per unit of labor as well as profit margins (43).

New slaughtering establishments also tend to be highly specialized. They specialize in slaughtering a single species of livestock, whereas older plants were usually designed to slaughter several species with the same equipment. This resulted in inefficiency in switching from one species to another. Also multi-purpose equipment is not ideally suited to any given species of livestock. New plants have equipment designed to handle slaughter and processing of a single species as efficiently as is technically and economically possible.

Table 40.--Number of livestock slaughtering establishments and percentage change, by regions, March 1960 and 1969 1/

Region	Under Federal inspection		Percentage change	Other commercial 2/		Percentage change
	1960	1969		1960	1969	
	Number	Number	Percent	Number	Number	Percent
Northeast	97	94	-3	550	1,326	141
Lake States	35	47	34	247	871	253
Corn Belt	128	143	12	458	1,916	318
Southeastern	66	93	41	650	1,567	141
Northern Plains	52	68	31	114	752	560
High Plains	34	99	191	277	945	241
Mountain	14	18	29	59	143	142
Colorado	14	21	50	30	72	140
Arizona	1	5	400	16	32	100
Pacific Northwest	30	48	60	154	170	10
California	59	68	15	59	26	-56
48 States	530	704	33	2,614	7,820	199

1/ Includes all plants with an output of 300,000 pounds or more of liveweight annually.
2/ Not federally inspected.

Source: (39)

From 1960 to 1965, the number of federally inspected slaughter establishments increased 8 percent (table 42). The number of plants slaughtering all livestock species (cattle and calves, hogs, sheep, and lambs) decreased 14 percent. The number of plants slaughtering only cattle and calves increased 26 percent.

Many plants that slaughter only cattle further specialize in processing. Some ship entire carcasses in uniform lots to specialists or wholesalers, who break them into the desired cuts for direct movement to retail markets and to the hotel, institutional, and restaurant trade. Other plants slaughter and break the carcasses into primal cuts, then ship these cuts to firms in different areas, thus moving each kind of meat to the area where it is most in demand.

Table 41.--Number and percentage of total cattle slaughtered by each region, 1950, 1960, and 1968 and percentage change, 1950-68 and 1960-68

Region	Number slaughtered			As percentage of total			Percentage change	
	1950	1960	1968	1950	1960	1968	1950-68	1960-68
	1,000 head	1,000 head	1,000 head	Percent	Percent	Percent	Percent	Percent
Northeast	1,860	2,072	1,813	10	8	5	-2	-12
Lake States	2,404	3,120	3,896	13	12	11	62	25
Corn Belt	5,350	6,884	9,379	30	27	27	75	36
Southeastern	1,683	2,557	3,135	9	10	9	86	23
Northern Plains	2,498	3,739	6,277	14	15	18	151	68
High Plains	1,284	1,902	3,791	7	8	11	195	99
Mountain	192	363	529	1	1	2	176	46
Colorado	490	1,046	1,574	4	4	4	221	50
Arizona	75	161	417	1	1	1	456	159
Pacific Northwest	583	905	1,296	3	4	4	122	43
California	1,482	2,476	2,919	8	10	8	97	18
48 States	17,901	25,225	35,026	100	100	100	96	39

Source: (16).

Table 42.--Number of federally inspected slaughtering establishments specializing in particular combinations of kinds of livestock and percentage change, 48 States, March 1960 and 1965

Kinds of livestock slaughtered	Federally inspected establishments		Percentage change
	1960	1965	
	Number	Number	Percent
Cattle and calves, hogs, and sheep and lambs	126	108	-14
Cattle and calves only	185	234	26
Cattle and calves and hogs	93	87	-6
Cattle and calves and sheep and lambs	82	71	-13
Hogs only	41	64	56
Hogs, and sheep and lambs	2	3	50
Sheep and lambs only	1	3	200
Total	530	570	8

Source: (41).

BEEF CONSUMPTION

Over the last 20 years, developments in the beef industry may have been more favorable to producers and consumers alike than developments in any other sector of the livestock economy. In 1950, consumption of all red meats totaled 145 pounds per capita (fig. 10). By 1968, per capita consumption had risen to 183 pounds. Beef (including veal) accounted for all of the increase in per capita consumption by rising from 71 to 113 pounds over the period. Beef now accounts for nearly two-thirds of all red meats consumed in this country.

Cattle feeding is almost wholly a domestic industry, so consumers could not have so shifted their diets without some sort of response from the U.S. cattle industry. More than twice as much beef was produced in 1968 as in 1950 (table 43). Total 1968 output neared the 21-billion-pound mark. Because of strong consumer demand, producers were able to make the adjustments needed to achieve this increase in output under relatively favorable price relationships. The situation contrasts sharply with that of pork and lamb production, where adjustments have had to be made in the face of a constant or even declining demand for these meats.

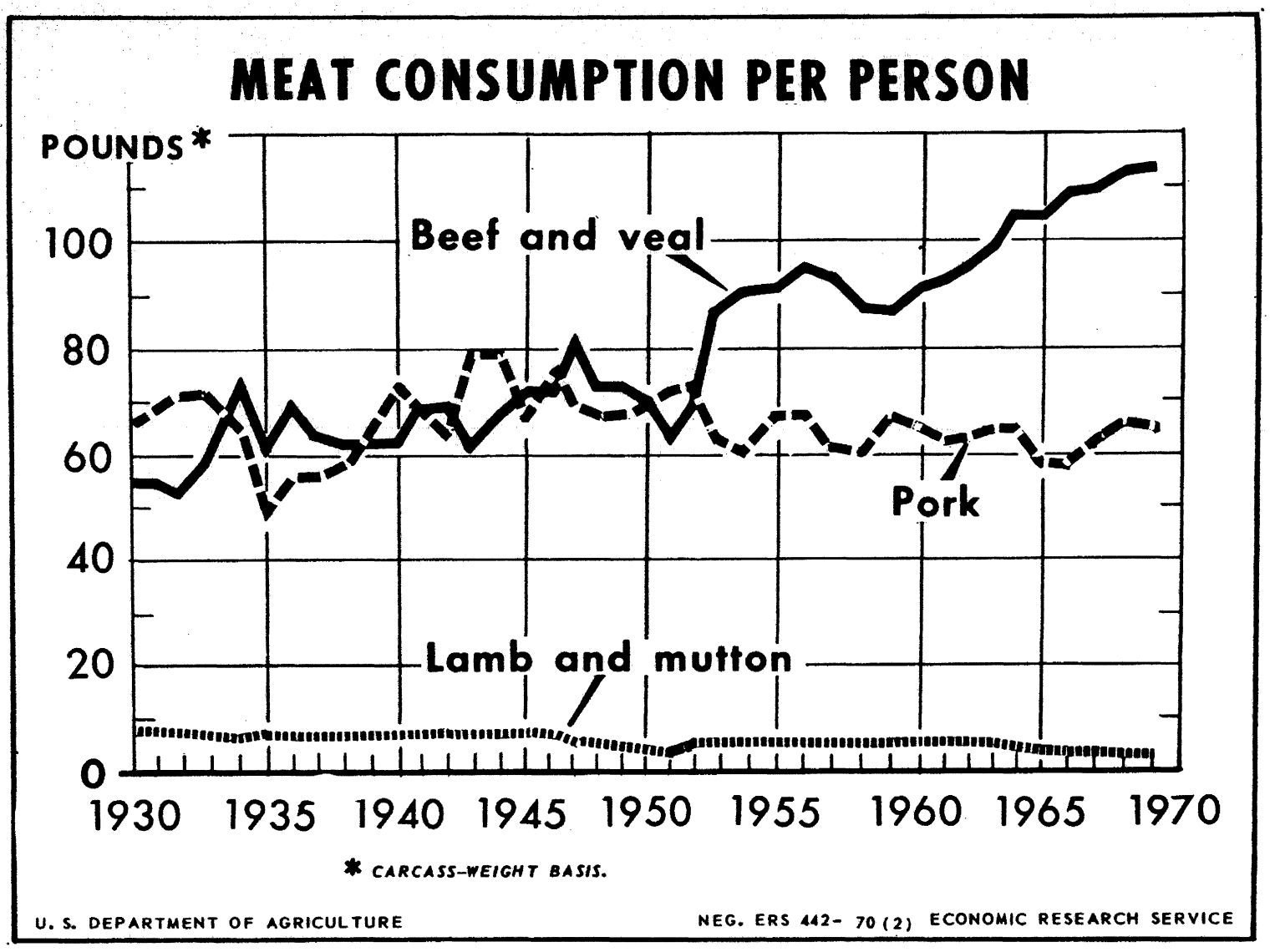

MEAT CONSUMPTION PER PERSON
POUNDS*
100
80
60
40
20
0
Beef and veal
Pork
Lamb and mutton
1930
1935
1940
1945
1950
1955
1960
1965
1970
* CARCASS-WEIGHT BASIS.
U. S. DEPARTMENT OF AGRICULTURE
NEG. ERS 442- 70 (2) ECONOMIC RESEARCH SERVICE

Figure 10

Table 43.--Total beef production and percentage distribution by kind and grade and quantity of fed beef, selected years, 1950-68

Year	Total beef production 1/	Percentage of total by kind			Percentage of total by grade							Fed beef	
		Steer	Heifer	Cow 2/	Prime	Choice	Good	Standard	Commercial 3/	Utility	Canner and cutter	Quantity	Percentage of total
	Mil. lbs.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Mil. lbs.	Pct.
1950	9,534	57	9	34	7	34	19	---	14	15	11	4,446	47
1953	12,407	59	10	31	5	34	19	---	16	13	13	5,254	42
1956	14,462	56	13	31	4	33	21	---	16	13	13	6,536	45
1959	13,580	60	19	21	4	36	27	---	14	10	9	7,818	58
1962	15,324	61	20	19	3	47	18	11	4	9	8	9,896	65
1964	18,456	62	19	19	3	49	17	10	4	8	9	12,049	65
1965	18,727	56	21	23	4	47	17	8	4	8	12	12,038	64
1966	19,726	56	24	20	4	49	18	7	4	8	10	13,207	67
1967	20,219	58	24	18	5	51	17	7	5	7	8	14,075	70
1968	20,875	57	25	18	4	52	18	6	5	7	8	14,909	71

1/ Includes commercial and farm slaughter, excludes veal.
2/ Includes bull and stag beef.
3/ Includes standard and commercial grades through 1960.

Source: (15), May 1967 and (16).

Imports of beef and veal, which have been comprised largely of boneless beef used in processed and manufactured meat products, have contributed to the supply available to consumers (16). But the level of these imports remained well below 10 percent of beef consumed in the United States between 1950 and 1968, although it has been higher in recent years than in earlier ones. A high domestic demand, relatively favorable prices for beef, and expanded production in foreign countries, especially Australia and New Zealand, brought this increase in imports. Regulation of the quantity and composition of beef imports has been accomplished through 1964 legislation establishing a beef import quota.

Consumers have been supplied beef of an increasingly higher quality. Less than half of the beef consumed in 1950 was from grain-fed cattle (table 43). But by 1968, having increased by nearly 10.5 billion pounds, fed beef production supplied more than 70 percent of the total. This increase, in fact, is equal to most of the gain in total output of beef during that period.

In 1950, 57 percent of beef production came from steers, 9 percent from heifers, and about 34 percent from cows and other cattle. By 1968, these percentages were 57, 25, and 18 percent, respectively, production from heifers having increased at the expense of that from cows and other cattle.

The changes in the percentage of slaughter beef assigned to higher grades also reflects an upgrading in quality. The primary shift in percentage of total beef in each grade has been an increase in Choice beef slaughter and a decrease in Commercial, Utility, and Canner and Cutter slaughter. Slaughter of Prime and Good grade cattle has remained fairly constant as a percentage of total production. Choice-grade production has increased 18 percentage points, from 34 percent of the total in 1950 to 52 percent in 1968. The proportion of Choice beef will probably continue to increase, largely at the expense of the lower grades of beef, but to some degree at the expense of the Prime grade.

SELECTED REFERENCES 1/

(1) Agricultural Research Service.
1969. Feasibility of a Physical Distribution System Model for Evaluating Improvements in the Cattle and Fresh Beef Industry. U.S. Dept. Agr., ARS 52-36. Nov. (Prepared under contract by A. T. Kearney and Co., Inc.)

(2) Allen, George C., and Devers, Margaret.
1969. Livestock-Feed Relationships 1909-63. Supplement for 1968. U.S. Dept. Agr., Statis. Bul. 337. Jan.

(3) Armstrong, Jack H.
1968. Cattle and Beef: Buying, Selling, and Pricing Handbook. Purdue Coop. Ext. Serv., Unnumb. May.

(4) Aspelin, Arnold and Engelman, Gerald.
1966. Packer Feeding of Cattle--Its Volume and Significance. U.S. Dept. Agr., Mktg. Res. Rpt. 776. Nov.

(5) Breimyer, Harold F.
1961. Demand and Prices for Meat--Factors Influencing Their Historical Development. U.S. Dept. Agr., Tech. Bul. 1253. Dec.

(6) _____
1964. Public and Private Implications of Changes in Cattle Feeding. In Proc. of Res. Workshop on Cattle Feeding, Denver. Mar.

(7) Burke, Ronnie L.
1969. Characteristics of Beef Cattle Feedlots. California, Colorado, and Western Corn Belt. U.S. Dept. Agr., Mktg. Res. Rpt. 840. Mar.

(8) Consumer and Marketing Service.
1968. Livestock Market News. U.S. Dept. Agr., Vol. 36.

(9) Crom, Richard J.
1967. Revised Estimates of Marketing and Placements of Cattle on Feed. U.S. Dept. Agr., Livestock and Meat Situation, LMS-155, pp. 30-32. May.

(10) _____ and Walters, Forrest.
1965. Marketings and Placements of Cattle on Feed. U.S. Dept. Agr., Livestock and Meat Situation, LMS-145, pp. 31-35. Oct.

(11) Dietrich, Raymond A.
1969. Costs and Economies of Size in Texas-Oklahoma Cattle Feedlot Operations. Texas Agr. Expt. Sta., Bul. 1083. May.

1/ For additional references see especially two extensive bibliographies in (1) and (3).

(12) Dietrich, Raymond A.
1968. The Texas-Oklahoma Cattle Feeding Industry. Texas Agr. Expt. Sta., Bul. 1079. Dec.

(13) Economic Research Service.
1969. Farm Income Situation. Supplement to July 1969 issue. U.S. Dept. Agr., FIS-214.

(14) _____
1968. Food Consumption, Prices, Expenditures. U.S. Dept. Agr., Agr. Econ. Rpt. 138. July and later editions.

(15) _____
1969. Livestock and Meat Situation. U.S. Dept. Agr., LMS-169. Oct. and earlier issues.

(16) _____
1969. Livestock and Meat Statistics. Supp. for 1968 to U.S. Dept. Agr. Statis. Bul. 333. July and earlier issues.

(17) Ehrich, Rollo L.
1967. Futures Trading, Direct Marketing, and Efficiency of the Cattle Marketing System. Wyo. Agr. Expt. Sta., Res. Jour. 9. May.

(18) Gilliam, Henry C., Ihnen, Loren A., and Toussaint, William D.
1962. General Characteristics of Beef Cattle Feeding in North Carolina--January 1962. N.C. State Univ. Dept. Agr. Econ., Misc. Pub. 5. Dec.

(19) Hopkins, John A. and Kramer, Robert C.
1965. Cattle Feeding in California. Bank of America, San Francisco. Feb.

(20) Iowa Crop and Livestock Reporting Service.
1969. Number and Size of Farms. State Farm Census. Supplement V. Des Moines.

(21) Johnson, James B. and Vaile, Richard E.
1968. Characteristics of the Pacific Northwest Beef Industry. Oreg. Agr. Expt. Sta., Spec. Rpt. 256. May.

(22) Johnson, Ralph D. and Eckert, Alfred R.
1968. Cattle Feeding Costs in Nebraska by System of Feeding and Size of Operation. Nebr. Agr. Expt. Sta., SB 496. Jan.

(23) King, Gordon A.
1962. Economies of Scale in Large Commercial Feedlots. Calif. Agr. Expt. Sta., Res. Rpt. 251. Mar.

(24) Logan, Samuel H. and King, Gordon A.
1966. Beef Cattle Feeding and Slaughtering in California. Calif. Agr. Expt. Sta., Bul. 826. Aug.

(25) Madsen, Albert G., Hummels, Kenneth, and Capener, Wm. N.
1967. Colorado's Cattle Feeding Industry. Colo. Agr. Expt. Sta., Pop. Bul. 528S. Apr.

(26) Marousek, Gerald E.
1967. The Western Cattle Feeding Industry: Structural and Marketing Changes, 1952-62. Idaho Agr. Expt. Sta., Statis. Bul. 481. July.

(27) McDermott, Elroy C. and Davidson, Jack R.
1965. Feasibility of Cooperative Cattle Feeding and Slaughtering in Montana. Mont. Agr. Expt. Sta., Bul. 597. July.

(28) McPherson, William K.
1969. Fed Cattle, Feeder Cattle, Vertical Coordination. In Proc. of Workshop on Vertical Coordination in Livestock Mktg., Houston. Mar. 11-14.

(29) Mighell, Ronald L. and Jones, Lawrence A.
1963. Vertical Coordination in Agriculture. U.S. Dept. Agr., Agr. Econ. Rpt. 19. Feb.

(30) Moser, David E.
1968. Changes in Transportation and Their Implications for the Livestock and Meat Industry. In Proc. of NCR-61 Seminar on Long-Run Adjustments in the Livestock and Meat Industry--Implications and Alternatives, Farm Foundation, Chicago. Nov. 6-7.

(31) National Commission on Food Marketing.
1966. Organization and Competition in the Livestock and Meat Industry. Tech. Study No. 1. June.

(32) Packers and Stockyards Administration.
1968. Packers and Stockyards Resume, Vol. VI, No. 10. U.S. Dept. Agr.

(33) Pawson, Walter W.
1964. Emerging Patterns of Feedlot Management in the Southwest, and Interregional Competition in the Location of Cattle Feeding. In Proc. of Research Workshop on Cattle Feeding, Denver. Mar.

(34) Saunders, Fred. B., Rhodes, John A., Wise, James O., and Brannen, S.J.
1966. Capital Requirements and Financing for Alternative Cattle Feeding Systems in Georgia. Ga. Agr. Expt. Sta., Bul. N.S. 177. Dec.

(35) Statistical Reporting Service.
1969. Agricultural Statistics. U.S. Dept. Agr.

(36) _____
1970. Calf Crop. U.S. Dept. Agr. Annually, Feb. 1970 and earlier.

(37) _____
1969. Cattle on Feed. U.S. Dept. Agr. Quarterly, Jan. 1969 and earlier.

(38) Statistical Reporting Service.
1970. Livestock and Poultry Inventory, January 1, Number, Value, and Classes. U.S. Dept. Agr. Feb. 1970 and earlier.

(39) _____
1970. Livestock Slaughter, U.S. Dept. Agr. Annually, Apr. 1970 and earlier.

(40) _____
1968. Number of Cattle Feedlots by Size Groups and Number of Fed Cattle Marketed, 1962-1967. U.S. Dept. Agr., SRS-14. July.

(41) _____
1965. Number of Livestock Slaughter Plants, Mar. 1, 1965. U.S. Dept. Agr., SRS-8. June.

(42) Suter, Robert C. and Washburn, Samuel H.
1962. Feeder Cattle Systems of Management: Budgeted Costs and Returns. Purdue Agr. Expt. Sta., Bul. 744. Aug.

(43) Trock, Warren L.
1963. Cattle Feeding in the Northern Great Plains. Mont. Agr. Expt. Sta., Bul. 576. Jan.

(44) U.S. Bureau of the Census.
1967. Census of Agriculture. 1964. Statistics for States and Counties.

(45) U.S. Department of Commerce.
1968. U.S. Industrial Outlook, 1969. Dec.

(46) Upchurch, M.L.
1970. Farm Production Capacity in the 1970's. Talk before a conference on Farm Program Choices Affecting Urban Interest and Rural Goals in the 1970's, sponsored by The Center for Agricultural and Economic Development, St. Louis. Jan. 29, 1970.

(47) Uvacek, Edward, Jr.
1966. Economic Trends in Texas Cattle Feeding. Tex. Agr. Expt. Sta., Bul. 1055. Aug.

(48) Van Arsdall, Roy N.
1965. Resource Requirements, Investments, Costs, and Expected Returns From Selected Beef-Feeding and Beef-Raising Enterprises. Ill. Agr. Expt. Sta., AE-4075. Sept. (Mimeographed.)

(49) Williams, Willard F.
1966. Structure and Conduct of the Commercial Cattle Feeding Industry. Supp. Study No. 1 to Tech. Study No. 1, Organization and Competition in the Livestock and Meat Industry. National Commission on Food Marketing. June.

(50) _____ and McDowell, James.
1965. Costs and Efficiency in Commercial Dry-Lot Cattle Feeding. Okla. Agr. Expt. Sta., Proc. Ser. P-509. June.