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Feed Manufacturing by Cooperatives

Abstract

Feed Manufacturing by Cooperatives

This is a study of the number, capacity, and production of cooperative feed manufacturers in the U.S. formula feed industry. Cooperative mills with a capacity of 10,000 tons per year or more increased both the number of mills and total output. Number of establishments and production decreased for smaller mills. Formula feed production rose from 20 million tons in 1975 to 24 million tons in 1984. This production remained centered in the Corn Belt and Lake States regions. However, the Southeast saw the greatest increase in production by cooperatives and also the strongest market share of formula feed by cooperatives. Meal remains the most common feed form produced by cooperatives and dairy the most common livestock consumer group.

Keywords: Cooperatives, feed, feed manufacturing, capacity, utilization, distribution.

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Preface

This report is based on a 1985 and 1986 survey by the Economic Research Service (ERS), U.S. Department of Agriculture. Data was compiled by the ERS in 1987 and 1988. The authors thank Mark Ash for his efforts in compiling cooperative data and Phillip Friend for sorting the raw data. This publication highlights the cooperative market sector and compares it's performance to the feed manufacturing industry as a whole. The ERS publication "The U.S. Feed Manufacturing Industry, 1984" released in January of 1989 provides a comparative analysis of the entire U.S. feed industry.

Contents

Highlights

Cooperative market share of feed produced increased to 22 percent in 1984 from 20 percent in 1975. Cooperative capacity utilization remained roughly equal at 70 percent during this time period, while industrywide capacity utilization declined from 80 percent to 66 percent.

In 1984, cooperative ownership of feed mills totaled 1,913, accounting for 29 percent of the total feed mill establishments in the United States. Cooperatives produced 23.9 million tons of feed, up 17 percent from 1975's production level of 20.5 million tons.

The largest mills, those with annual capacity of more than 100,000 tons, produced 31 percent of the output while representing only 6 percent of all cooperative mills. Of the 122 mills producing 100,000 tons or more, 43 were in the Southeast region and accounted for 67 percent of that region's output.

Primary feed was manufactured by 1,341 cooperative plants. They produced 18.424 million tons of primary feed or 77 percent of total feed output. Cooperatives produced 19 percent of complete feed, 21 percent of supplement feed, 25 percent of feed premix, and 28 percent of all super concentrate marketed.

Cooperatives accounted for 25 percent of the total wholesale formula feed distribution, 29 percent of the retail distribution, 49 percent of custom grind and mix, 10 percent of the output going to own livestock, and 2 percent of custom feeding.

The average cooperative feed establishment employed 5 persons in production and had a total of 12 employees. Output for cooperatives was 2,654 tons per production employee, slightly lower than the industry average of 2,963 tons per production employee. A larger percentage of cooperative feed mills provided full services than did noncooperative mills.

Feed Manufacturing by Cooperatives

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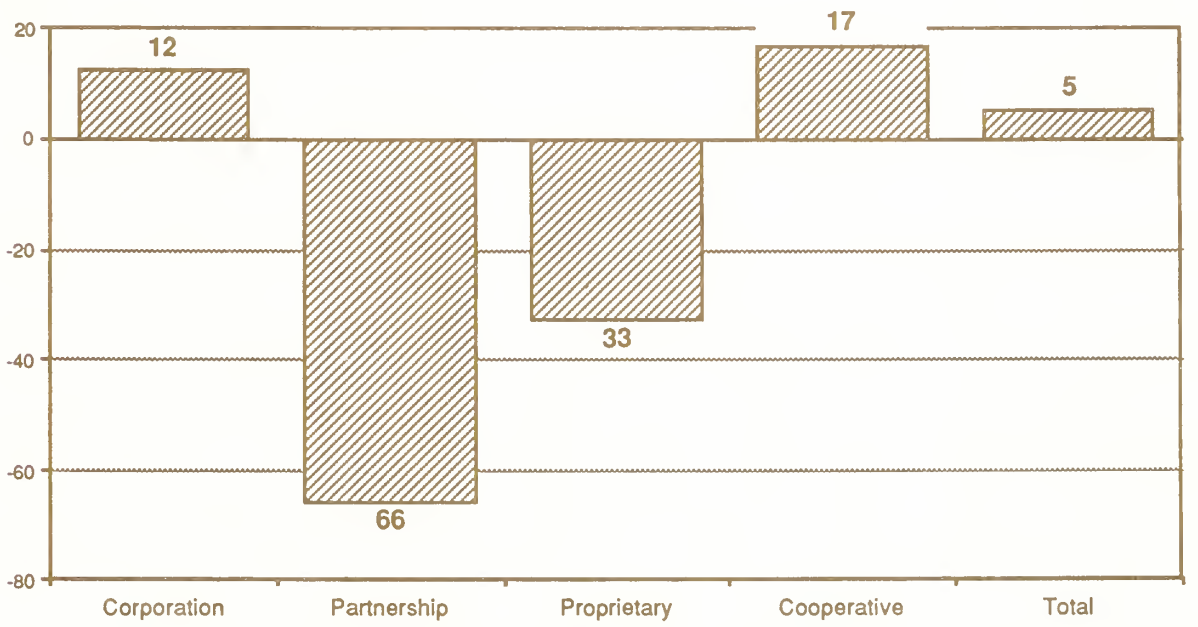
Cooperatives continue to be an important supplier of feed to farmers for livestock, swine, and poultry production with feed historically the first or second highest U.S. farm input expenditure. In 1987, nearly 3,000 farm supply cooperatives provided nearly $3 billion of feed to their owner members. The number of cooperative feed mills has grown 18 percent over the past decade, from 1,623 in 1975 to 1,913 in 1984, with expansion of mill capacity and feed production increasing proportionately.

Cooperative market share of feed produced has also increased during this same time frame, from 20 percent to 22 percent. Cooperative capacity utilization remained roughly equal at 70 percent in 1975 and 1984 while industrywide capacity utilization declined from 80 percent to 66 percent. Stable utilization of cooperative capacity has enabled cooperatives to increase feed production by 17 percent over the past decade, one bright spot in an industry plagued with chronic overcapacity (fig. 1).

Types of Formula Feed

Feed production has become specialized for different animal groups' physiological and environmental needs. The resultant feed that is produced according to exacting specifications is called formula feed. Formula feed is made in

Figure 1—Feed Manufactured by Type of Firm, Percent Change from 1975 to 1984



two major types of feed manufacturing; primary and secondary.

Primary—Primary feed manufacturing is the processing and mixing of individual feed ingredients (feed grains and oilseed meals), often with the inclusion of a premix that is added at the rate of less than 100 pounds per ton of finished feed.

Feed produced through primary feed manufacturing is usually classified further into four kinds: complete, supplement, super concentrate, and premix. Complete feeds are as they sound, they contain all the nutrients needed for animal production, although roughage may be added separately for a balanced diet.

Supplements are added to other feed ingre-

Table 1—Production of cooperative feed mills by region, 1969, 1975, and 1984

Region	Year	Total mills	Quantity of feed produced	Percent change in quantity from 1975 to 1984, and from 1969 to 1975	Cooperative market share
			--- 1,000 tons ---	*---------- Percent ----------*	
Northeast	1984	212	2,846.5	-0.9	30.8
	1975	177	2,871.5	-11.1	24.1
	1969	181	3,231.6		32.1
Lake States	1984	411	4,868.0	4.4	36.2
	1975	318	4,660.9	23.4	44.9
	1969	373	3,776.4		39.3
Corn Belt	1984	585	5,184.9	9.1	25.4
	1975	538	4,750.4	-22.7	24.6
	1969	663	6,146.1		28.0
Northern Plains	1984	344	1,973.3	-10.5	18.1
	1975	323	2,203.8	7.0	23.0
	1969	309	2,060.5		21.5
Appalachian	1984	113	2,025.3	95.9	28.1
	1975	86	1,034.0	-4.3	13.7
	1969	92	1,080.5		13.2
Southeast	1984	77	3,642.5	150.4	37.2
	1975	43	1,454.4	20.6	15.3
	1969	26	1,205.5		13.1
Delta	1984	28	570.2	-43.3	9.3
	1975	27	1,005.7	42.6	16.4
	1969	24	705.3		10.7
Southern Plains	1984	60	1,365.0	165.8	9.5
	1975	33	513.6	-21.9	4.1
	1969	56	657.8		6.1
Mountain	1984	51	929.0	71.5	16.1
	1975	49	541.6	17.2	6.7
	1969	40	462.1		6.6
Pacific	1984	32	452.1	-68.8	3.7
	1975	29	1,450.2	1.0	15.0
	1969	46	1,435.3		16.4
Total U.S.	1984	1,913	23,856.9	16.5	21.8
	1975	1,623	20,486.1	-1.3	19.6
	1969	1,810	20,761.3		16.4

dients to improve the nutritional balance of the diet. Supplements can be fed separately in small amounts or mixed with other ingredients to provide a complete feed.

Super concentrates are added to feed grains and oilseeds to provide a balanced ration. They are usually added at a rate of more than 100 pounds per ton of finished feed.

Premixes are usually added to finished feed at a rate of 100 pounds or less per ton. Premixes contain vitamins, trace minerals, or drugs that are mixed with an edible diluent or carrier.

Secondary—Secondary feed manufacturing is processing and mixing formula feed supplements with one or more feed ingredients, such as feed grains and oilseed meals. Depending on the protein content of the supplement or the desired protein content of the finished feed, supplements are usually added in secondary feed manufacturing at the rate of 300 pounds or more per finished ton of feed.

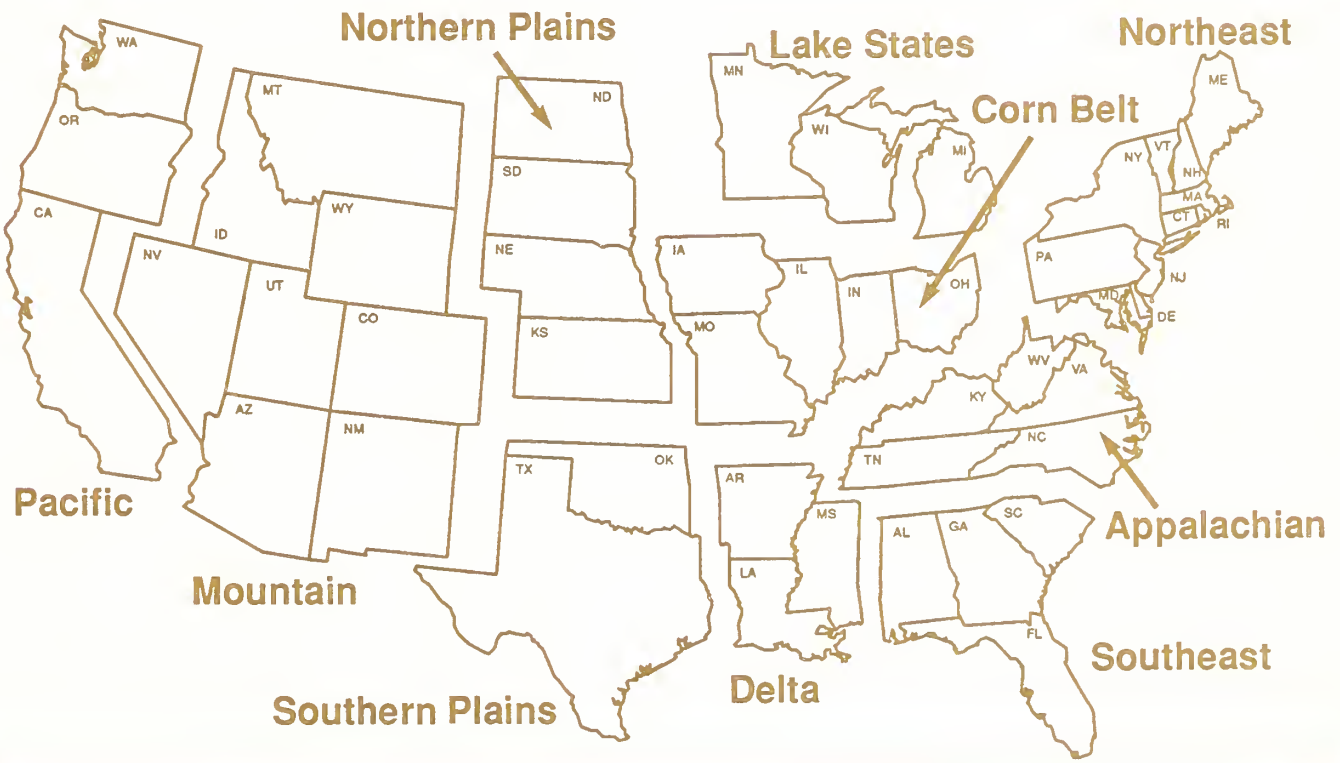
COOPERATIVE FEED MANUFACTURING

There have been numerous changes in the structure and composition of the feed industry since an earlier study by Agricultural Cooperative Service in 1973. Continuing vertical integration in poultry production and parallel institutional changes in swine and cattle production are of great concern for cooperatives' feed mill future. Locational shifts in animal agriculture's centers of production and its growout system have altered the characteristics of demand for feed and therefore its production.

Establishments

In 1984, cooperative ownership of feed mills totaled 1,913, accounting for 29 percent of the total feed mill establishments in the United States (table 1). The number of cooperative feed mills was up from 1,810 in 1969 and 1,623 in

Figure 2—Regional Breakdown of the United States



1975. All 10 regions (fig. 2) had net positive increases in cooperative feed mills. The Corn Belt, with 585, had the most feed mills.

Feed manufacturing was the major activity for 818 of the 1,913 cooperative feed mills in the United States (table 2). Feed manufacturing was the most common major activity by source of gross income for both cooperatives and the industry net of cooperatives.

Cooperatives' second most common major activity was grain storage, merchandising, and handling, with more than 35 percent falling into these categories. Cooperative feed manufacturers were more than twice as likely to be involved in some form of grain handling for their major source of income than noncooperatives. A higher percentage of noncooperatives had as their major source of income some form of animal production or feeding.

Production

Cooperatives produced 23.8 million tons of feed in 1984, up 17 percent from 1975's production level of 20.5 million tons (fig. 3). While cooperatives comprised 29 percent of feed mill establishments, they produced only 22 percent of the total feed output by all firms that year.

Cooperative production averaged 12,471 tons per establishment, compared with 16,300 tons per establishment for the entire industry. Average cooperative output is down from the 1975 level of 12,622 tons per establishment, but up from the 1969 average output of 11,470 tons.

The Corn Belt has traditionally produced the most cooperative formula feed, with more than 4 million tons in 1984, 1975, and 1969 (fig. 4). The Lake States had the next highest production during this same time. The largest growth in cooperative volume is in the Southeast.

Cooperative market share was up from previous levels of 20 and 16 percent of total output for 1975 and 1969, respectively (fig. 5). Cooperatives had the largest share of total production in the Southeast with 37 percent, followed by the Lake States with 36. The Southeast also had the largest gain in market share, up from 15 percent in 1975. Pacific region cooperatives accounted for the smallest percentage of total feed production with 4 percent.

Size of Output

Slightly more than half of cooperative production came from mills with a total capacity of more than 50,000 tons per year (fig. 6, table 3). The largest mills, those with annual capacity of more than 100,000 tons, produced 31 percent of the output while representing only 6 percent of all cooperative mills. Of the 1,913 cooperative mills, 42 percent produced less than 10,000 tons annually, and 71 percent produced less than

Table 2—Major activity of cooperative feed manufacturers by major source of gross income, 1984

Major source of gross income	Cooperatives		Industry, net of cooperatives	
	Number	*Percent of total*	*Number*	*Percent of total*
Feed manufacturing	818	42.74	2,464	51.23
Pet food	6	0.30	33	0.69
Grain:				
Storage	60	3.16	95	1.97
Merchandising	593	31.02	637	13.24
Processing	20	1.05	88	1.83
Farm supply	161	8.44	256	5.31
Milk production	20	1.02	28	0.59
Cattle feeding	20	1.05	289	6.01
Hog production	27	1.41	141	2.93
Turkey production	10	0.51	61	1.27
Broiler production	38	1.97	212	4.41
Egg production	9	0.48	135	2.80
Purchased product	96	5.02	281	5.84
Other	35	1.83	90	1.87
Total	1,913		4,810	

Figure 3—Cooperative Production of Formula Feed, Primary and Secondary, 1984 and 1975

Million tons

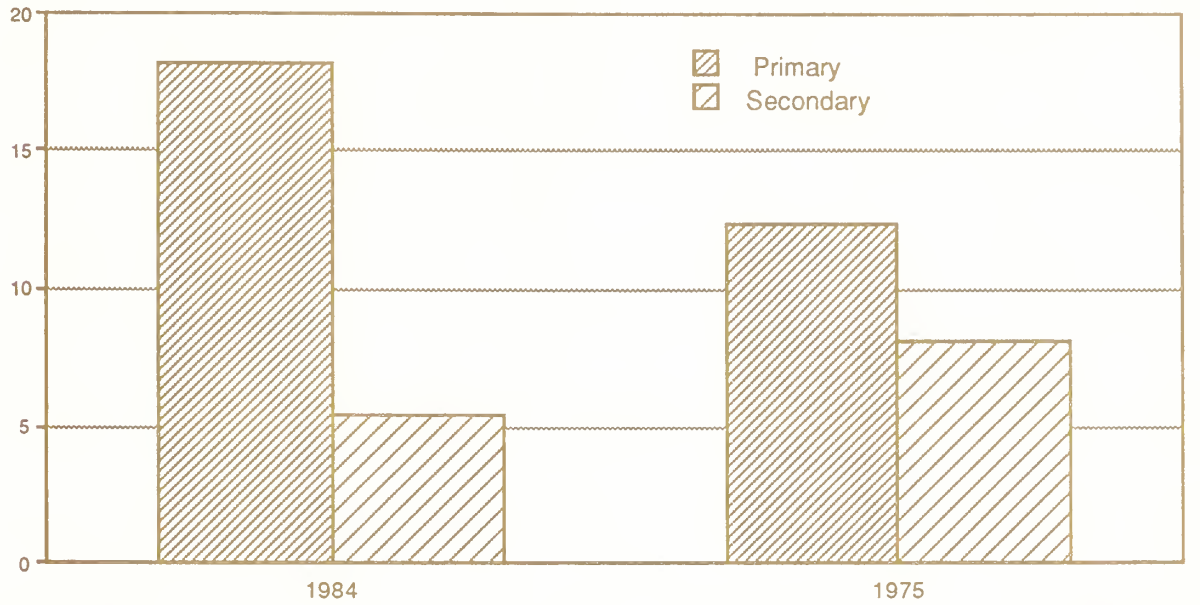


Figure 4—Cooperative Formula Feed Production by Region, 1969, 1975, 1984

Million tons

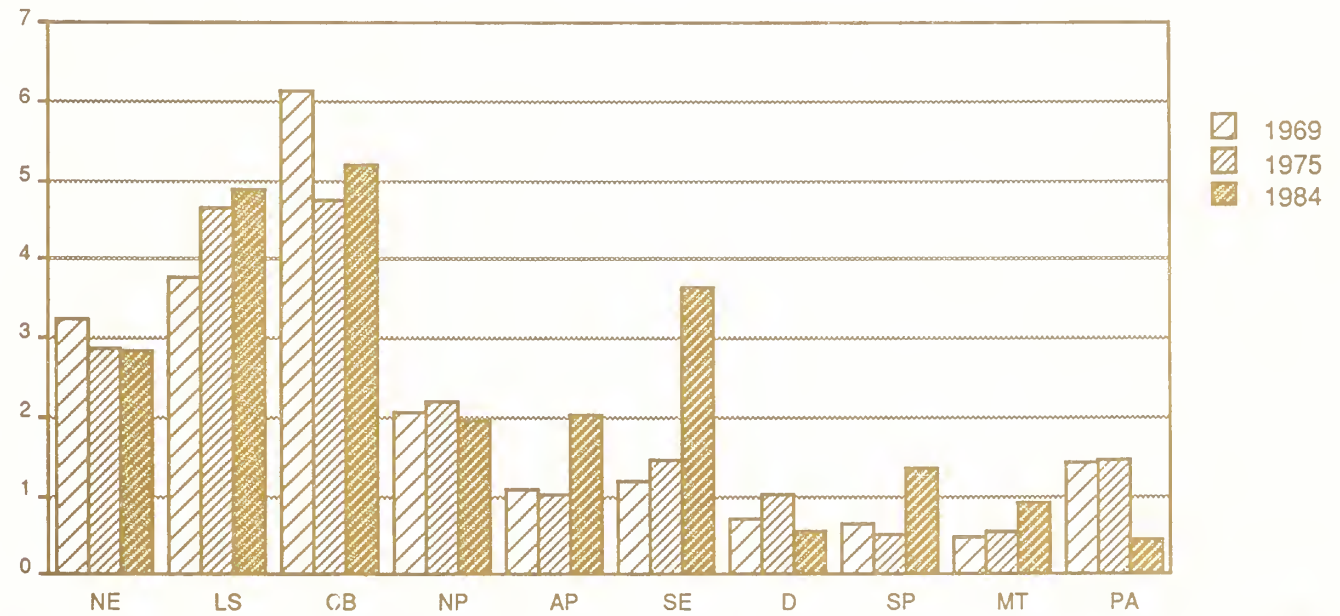


Figure 5—Cooperative Market Share of Formula Feed by Region, 1969, 1975, 1984

Percent

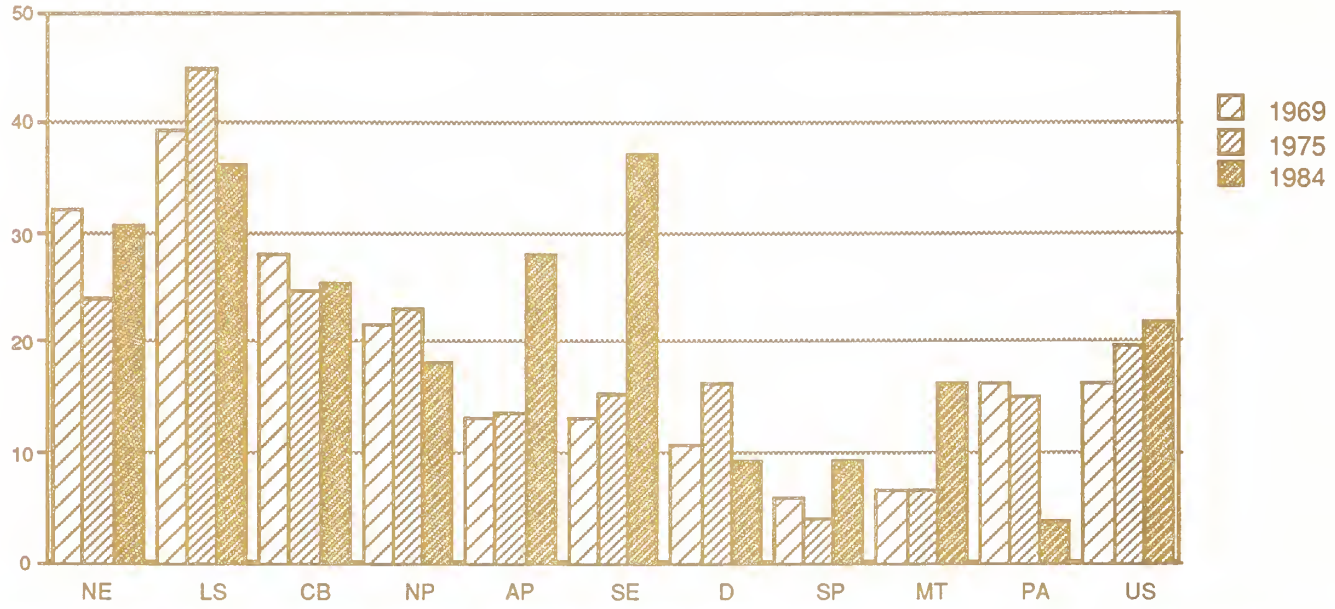


Table 3—Production of formula feeds, by size interval and region, 1984

Region	Up to 999 tons		1,000-9,999 tons		10,000-24,999 tons		25,000-49,999 tons	
	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced
	Number	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*
Farmer cooperative								
Northeast	10	4.7	56	87.7	53	223.9	23	269.3
Lake States	8	0	199	1,243.6	138	1,555.4	45	1,166.6
Corn Belt	17	6.0	262	740.7	176	1,307.5	73	1,403.4
Northern Plains	17	8.8	151	296.6	112	604.9	43	458.1
Appalachian	24	4.5	24	18.1	4	6.0	20	161.0
Southeast	0	0	4	8.7	4	9.9	4	11.3
Delta	0	0	13	147.6	5	4.9	5	101.7
Southern Plains	0	0	17	26.8	13	30.2	17	278.5
Mountain	0	0	5	24.1	36	313.7	0	0
Pacific	0	0	5	26.2	5	75.4	16	229.3
Total Cooperative	77	24.0	737	2,614.0	547	4,132.1	247	4,082.1
Total mills in region								
Northeast	28	7.8	194	384.1	143	699.7	85	1,061.2
Lake States	54	12.8	525	2,155.3	385	3,431.2	99	2,105.0
Corn Belt	89	29.4	789	1,789.6	565	3,361.9	274	4,515.7
Northern Plains	47	18.2	357	903.2	253	1,333.0	116	1,513.3
Appalachian	48	6.3	188	254.9	85	286.8	64	505.9
Southeast	8	1.4	54	79.6	35	111.4	42	385.3
Delta	5	3.2	59	246.0	20	79.3	30	546.3
Southern Plains	17	4.7	167	352.2	85	527.0	76	1,374.4
Mountain	16	3.8	81	379.0	87	837.8	55	1,168.0
Pacific	0	0	24	96.6	32	445.6	43	868.1
Total U.S.	313	77.5	2,439	6,643.9	1,688	11,104.8	884	14,046.5

Figure 6—Percent Distribution of Cooperative Establishments and Production, by Size Class, 1984

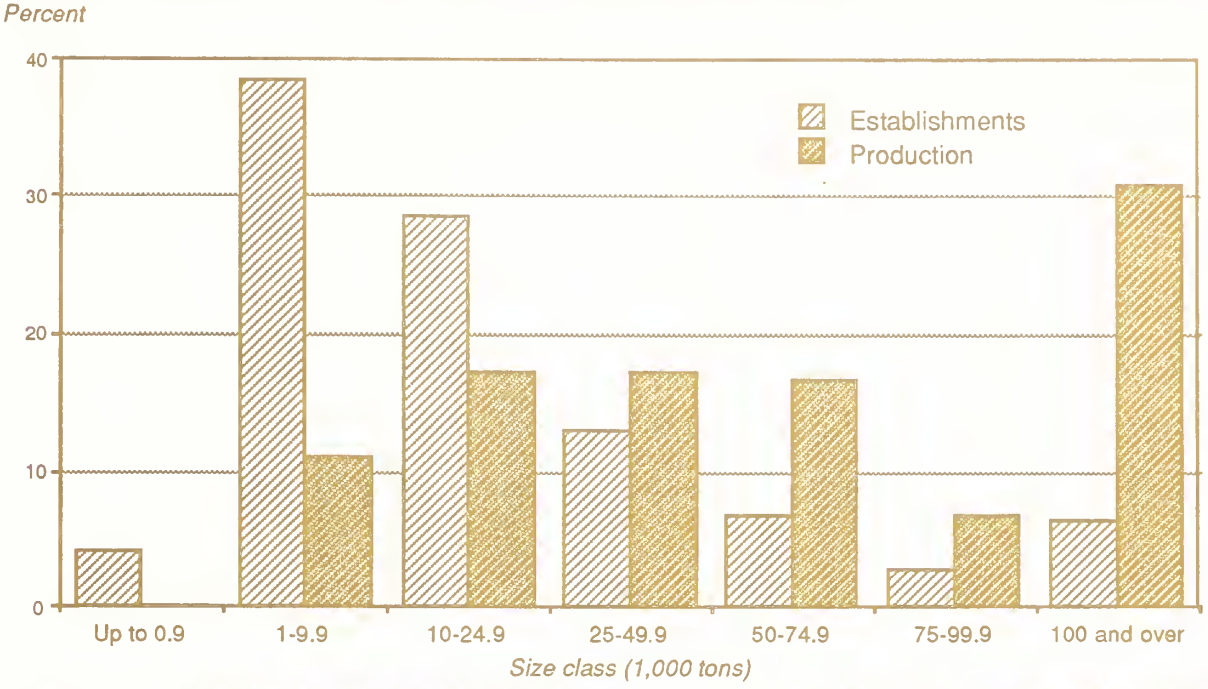


Table 3—Production of formula feeds, by size interval and region, 1984 continued

Region	50,00 to 74,999 tons		75,000-99,999 tons		100,000 tons and over		Total	
	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced	Manufac-turers	Formula feed produced
	Number	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*
Farmer cooperative								
Northeast	27	629.4	17	482.2	27	1,149.2	212	2,846.5
Lake States	12	418.2	8	484.2	0	0	411	4,868.0
Corn Belt	39	950.6	9	230.9	99	230.9	585	5,184.9
Northern Plains	13	320.1	4	96.9	4	187.9	344	1,973.3
Appalachian	4	91.8	8	136.9	28	1,607.0	113	2,025.3
Southeast	17	1,068.7	4	117.2	43	2,426.8	77	3,642.5
Delta	3	77.1	0	0	3	238.8	28	570.2
Southern Plains	4	97.5	4	104.5	4	812.4	60	1,365.0
Mountain	5	209.1	0	0	5	382.1	51	929.0
Pacific	5	121.2	0	0	0	0	32	452.1
Total Cooperative	129	3,986.8	54	1,654.2	122	7,363.7	1913	23,856.8
Total mills in region								
Northeast	45	1,058.1	38	950.2	66	5,084.8	599	9,245.8
Lake States	50	1,652.3	29	1,747.6	21	2,348.2	1163	13,452.4
Corn Belt	118	2,848.6	83	3,259.2	64	4,558.4	1983	20,362.8
Northern Plains	59	1,829.2	30	1,109.9	56	4,200.7	918	10,907.5
Appalachian	44	726.5	24	580.4	88	4,849.1	542	7,209.9
Southeast	40	1,365.8	35	762.7	115	7,098.0	328	9,804.1
Delta	24	703.8	5	255.2	40	4,281.9	184	6,115.6
Southern Plains	38	939.2	43	1,792.2	105	9,336.4	531	14,341.5
Mountain	40	1,603.9	15	628.4	10	1,163.7	303	5,784.5
Pacific	14	496.8	12	640.2	49	9,818.7	173	12,365.9
Total U.S.	472	13,230.0	314	11,728.5	615	52,758.8	6724	109,590.0

25,000 tons. Establishments producing less than 10,000 tons accounted for 11 percent of cooperative output and those producing less than 25,000 tons accounted for 28 percent of output.

In 1984, there were 814 cooperative feed mills producing less than 10,000 tons, down from 1,222 mills in 1975. Of these, 279 were located in the Corn Belt and 207 in the Lake States. Delta and Lake States had 26 percent of their output accounted for by mills with a capacity of less than 10,000 tons.

The tendency for cooperative mill size was to increase. Mills rated at greater than 50,000 tons increased from 94 in 1975 to 305 in 1984. The Northeast had the most mills exceeding 50,000 tons with 71, up from 16 in 1975. Only the Delta and Pacific regions had declines in the number of larger feed mills. Of the 122 mills producing 100,000 tons or more, 43 were in the Southeast region, accounting for 67 percent of that region's output. Only the Southeast and Mountain regions had more large mills than small. However, smaller mills still outnumber larger mills in the United States as a whole.

Table 4—Annual rated capacity of cooperative feed mills and cooperative percentage of capacity, by form and region, 1984[1]

Ownership and region	Meal		Pellets		Blocks				Total	
					Dry		Liquid			
	Manufacturers	Capacity	Manufacturers	Capacity	Manufacturers	Capacity	Manufacturers	Capacity	Manufacturers	Capacity
	Number	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*
Northeast										
Farmer cooperative	203	1,494	94	2,381	3	1	16	40	213	3,916
Cooperative percent of total	36.3	31.1	28.0	35.6	50.2	52.9	64.0	81.0	35.6	34.0
Lake States										
Farmer cooperative	394	4,405	101	757	24	10	37	29	410	5,201
Cooperative percent of total	35.5	34.2	32.6	19.2	65.8	74.1	38.5	7.8	35.3	30.2
Corn Belt										
Farmer cooperative	580	8,253	181	2,817	34	83	25	114	585	11,267
Cooperative percent of total	29.9	40.0	22.8	25.7	31.3	28.2	18.6	11.9	29.5	34.3
Northern Plains										
Farmer cooperative	334	2,405	105	649	17	69	21	259	344	3,382
Cooperative percent of total	38.9	12.8	32.8	4.3	35.7	19.9	30.0	22.1	37.6	9.6
Appalachian										
Farmer cooperative	104	850	56	1,495	12	35	12	8	112	2,389
Cooperative percent of total	21.2	21.6	23.3	30.8	60.0	48.6	37.5	30.2	20.8	26.9
Southeast										
Farmer cooperative	72	1,002	55	2,454	0	0	1	9	76	3,465
Cooperative percent of total	24.1	24.4	31.7	32.4	0	0	8.1	5.7	23.1	32.4
Delta										
Farmer cooperative	26	184	9	417	0	0	2	2	29	602
Cooperative percent of total	17.6	7.2	10.5	9.3	0	0	17.7	0.6	15.8	8.2
Southern Plains										
Farmer cooperative	55	1,370	15	319	5	32	2	2	59	1,723
Cooperative percent of total	11.2	15.2	7.8	5.3	10.4	7.4	5.6	0.7	11.2	10.9
Mountain										
Farmer cooperative	46	1,306	26	202	5	15	10	56	51	1,578
Cooperative percent of total	17.5	22.3	17.9	11.9	15.3	3.1	39.4	25.5	16.7	19.1
Pacific										
Farmer cooperative	26	153	26	222	0	0	0	0	31	375
Cooperative percent of total	17.0	2.1	24.5	2.5	0	0	0	0	18.1	2.2
United States										
Farmer cooperative	1,840	21,423	669	11,712	100	245	126	519	1,910	33,898
Cooperative percent of total	29.1	23.8	24.7	16.9	32.1	14.4	27.2	14.0	28.5	20.6

[1]Annual rated capacity estimated by multiplying the reported capacity of cooperative mills for a 40-hour week by the number of shifts per day and a 50-hour week.

Feed Mill Capacity and Utilization

Total milling capacity for cooperatives was 33.9 million tons in 1984, up from 29.4 million tons in 1975 (table 4). Utilization rates, the ratio of production over capacity, were 70 percent for cooperatives and 66 percent for the industry net of cooperatives (fig. 7). Cooperative utilization rates for the United States as a whole have been stable from 1975 to 1984 while the industry net of cooperatives fell by 14 percentage points.

The most common size class for both cooperatives and noncooperative mills was in the 1,000 to 9,999-ton capacity range. Mills in this size range had utilization rates in excess of 100 percent. Forty-three percent of the mills were rated less than 10,000 tons and accounted for 7 percent of cooperative capacity. The larger cooperative mills, those exceeding 100,000 tons, accounted for 38 percent of total capacity while representing 7 percent of the mills.

Cooperative feed mills in the two size classes greater than 75,000 tons had utilization rates less than 65 percent. The cooperative trend toward greater utilization rates for smaller mills was not true for noncooperatives.

Cooperative feed mills, on the average, had the highest utilization rates in the Pacific and Southeast regions with 120 and 105 percent, respectively. Cooperatives in the Corn Belt had the most underutilized feed mills with an average utilization rate of 46 percent.

FEED MANUFACTURED

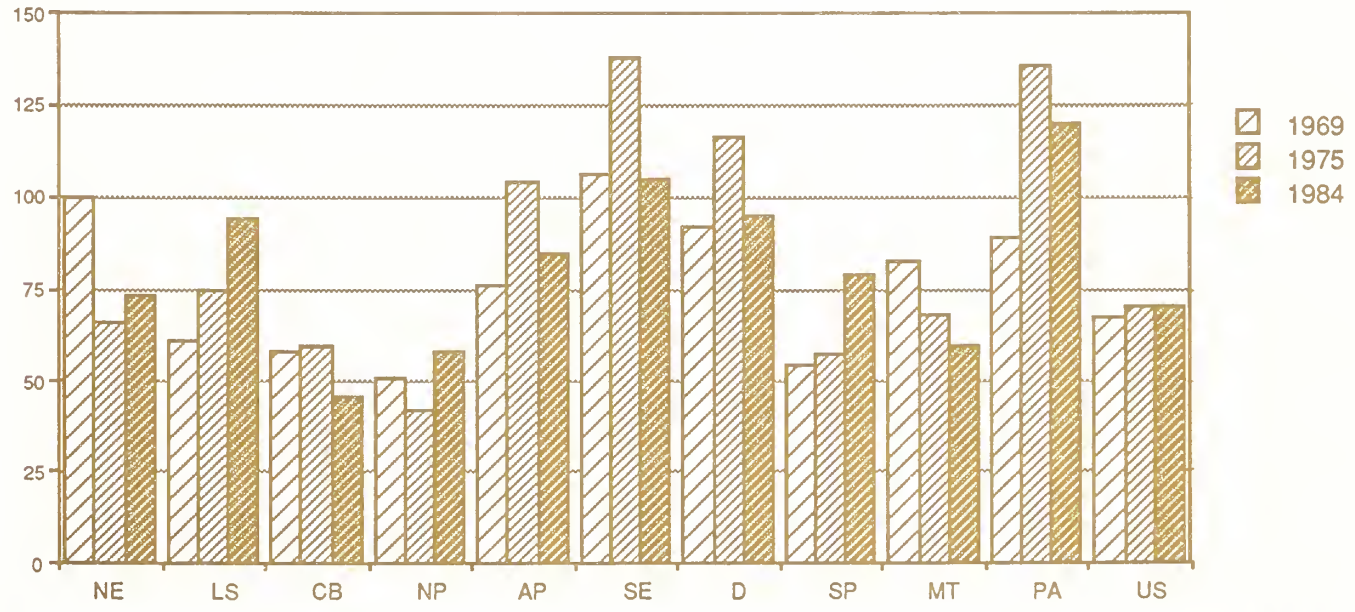
Cooperative mills produce feed with varied formulations for all major types of livestock and poultry. These feeds are produced by both primary and secondary manufacturing processes and in the form of meal, pellets, cubes, and liquid.

Primary and Secondary Feed Types

Primary feed was made by 1,465 cooperative establishments (table 5). They produced 18.4 million tons of primary feed—representing 77 percent of total feed output. Large mills, those with a capacity of 100,000 tons or more, produced 35 percent of the primary output while

Figure 7—Cooperative Feed Mill Capacity Utilization by Region, 1969, 1975, 1984

Percent



accounting for only 8 percent of all primary feed establishments. These large cooperative mills produced 15 percent of secondary feed output and were 1 percent of the mills that produced secondary feed.

Most feed mills, 893 of the total of 1,913, produced only primary feed; the Corn Belt had the largest number with 237 and the Delta region the fewest with 20. Of the 448 feed mills that produced only secondary feed, the Corn Belt had the largest number of mills with a total of 151. Cooperative mills in the Northeast, Southeast, Appalachian, Delta, Mountain, and Pacific regions dedicated more than 94 percent of their output to primary feed. The Southeast and the Pacific did not have any mills producing only secondary feed. The remaining 572 mills produced both primary and secondary feed; the Corn Belt had the most with 198 mills. The Delta, Mountain, and Pacific regions reported no feed mills that produced both primary and secondary feed.

Types of Primary Feeds

Using regionally expanded data, complete feed from primary manufacturing produced by cooperatives was 13.559 million tons, or 74 percent of all primary feed output by cooperatives (fig. 8). Supplement feed was next with 3.7 million tons, or 20 percent of primary feed output; super concentrate and feed premix produced by cooperatives were 780,000 and 360,000 tons, respectively.

Cooperatives accounted for 19 percent of complete feed output and 21 percent of supplement feed, up from the 1975 market share levels of 16 and 18 percent, respectively. Cooperatives had 25 percent and 28 percent of the feed premix and super concentrate markets, respectively.

Most of the complete feed, 5.2 million tons, went to dairy. Its total of 34 percent was also the strongest livestock type for complete feed by cooperatives. The Southeast produced the most complete feed, 3.6 million tons, and with 39 percent had the strongest market share for cooperative complete feed.

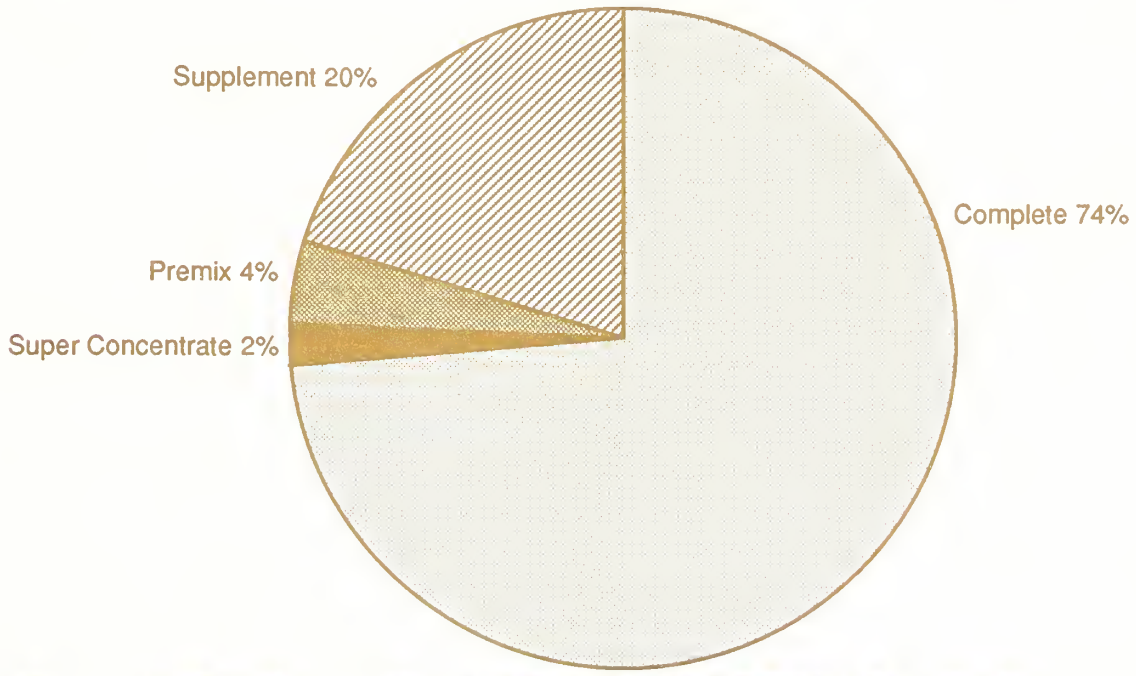
The largest quantities of supplemental feed are produced in the Lake States and the Corn Belt. These two regions have grain surplus that are often combined with supplemental feeds in farm mixing and grinding operations. Of the 3.7 million tons of supplemental feed produced, the Corn Belt led the most with 1.6 million tons, with disappearance mainly going to the hog sector. Overall, 41 percent went to the hog sector

Table 5—Production of primary and secondary formula feeds, by size interval, United States, 1984

Ownership and size interval	Primary production		Secondary production		Total production	
	Manufacturers	Primary feed	Manufacturers	Secondary feed	Manufacturers[1]	All formula feed
	Number	*1,000 tons*	*Number*	*1,000 tons*	*Number*	*1,000 tons*
Farmer cooperative						
Up to 999 tons	44	10.5	52	13.5	77	24.0
1,000-9,999 tons	506	1,184.3	482	1,429.7	737	2,614.0
10,000-24,999 tons	409	2,381.9	361	1,750.1	547	4,132.1
25,000-49,999 tons	221	3 138.4	91	943.7	247	4,082.1
50,000-74,999 tons	120	3,913.2	12	73.5	129	3,986.8
75,000-99,999 tons	50	1,265.3	8	388.9	54	1,654.2
100,000 tons and over	115	6,530.3	14	833.4	122	7,363.7
Total	1,465	18,424.0	1,020	5,432.8	1,913	23,856.8
Total mills in region						
Up to 999 tons	230	46.4	169	31.1	313	77.5
1,000-9,999 tons	1,606	3,325.7	1,463	3,318.2	2,439	6,643.9
10,000-24,999 tons	1,291	7,530.0	846	3,574.8	1,688	11,104.8
25,000-49,999 tons	827	12,341.0	222	1,705.5	884	14,046.5
50,000-74,999 tons	451	12,533.1	37	696.8	472	13,230.0
75,000-99,999 tons	300	10,867.7	33	860.8	314	11,728.5
100,000 tons and over	572	48,569.4	70	4,189.4	615	52,758.8
Total	5,277	95,213.3	2,841	14,376.7	6,724	109,590.0

[1]Total mills may be less than the sum of primary and secondary mills since some mills produce both primary and secondary feed.

Figure 8—Percent Cooperative Formula Feed Production by Primary Feed Types, 1984



and 32 percent to the dairy sector. The poultry sector, with largely vertically integrated operations producing their own complete feed, consumed very little supplemental feed.

Eighty-five percent of feed premix went to the dairy and hog sectors. The Mountain region produced the most feed premix, with 84 percent going to the dairy market.

Super concentrate production was also focused mainly in the dairy and hog sectors. The Lake States produced the most super concentrate where dairy was the largest consumer.

Meal, Pellets, Cubes, and Liquid

U.S. primary feed production has been shifting toward a greater use of pellets (fig. 9). Total U.S. production of meal has increased only slightly, from 41 million tons in 1975 to 42.6 million tons in 1984. In the same time period, production of pellets and crumbles went from 30.8 million tons to 50.9 million tons, surpassing meal in total use.

In 1984, meal was still the most important primary feed form for cooperatives. Cooperatives produced 9.1 million tons of meal and 8.7 million tons of pellets and crumbles (table 6). Cubes, blocks, and liquid primary feed production was 397,000, 164,000, and 77,000 tons, respectively.

Cooperatives in the Lake States, Corn Belt, Northern Plains, and Mountain regions produced mostly meal. The Lake States had the largest proportion dedicated to meal with 73 percent. The Corn Belt produced the largest amount of meal, 2 million tons. U.S. cooperative market share was 21 percent, while the largest regional market share was in the Southeast with 44 percent.

Appalachian had the highest proportion of production dedicated to pellet and crumble production with 76 percent. Southeast production was highest with 2 million tons. U.S. cooperatives had an 18-percent market share of pellets and crumbles, the highest share was in the southeast with 34 percent.

Cooperatives dedicated only 2 percent of their output to cube production, capturing 19 percent of primary cube feed output. Greatest output was in the Northern Plains with 103,000

tons; in the Southern Plains 14 percent of output was cubes.

Both blocks and liquid accounted for less than 1 percent of cooperative output. Blocks had a 16-percent market share and output was greatest in the Appalachian region with 56,000 tons. Cooperative liquid feed was 8 percent of the U.S. market and the greatest output was 23,000 tons in the Mountain region.

Primary Feed Disappearance, by Livestock Type

Cooperative dairy feed production was up significantly from 1975 and constituted the largest market share of cooperative feed for any livestock type. The next largest use of cooperative feed by livestock went to hogs, followed by chickens, beef and sheep, and turkeys.

Dairy—Dairy feed production was the largest livestock category for cooperative primary feed (fig. 10, table 7). Dairy primary feed was 7 million tons, or 38 percent of cooperative primary feed output. Cooperatives had a 34-percent market share of dairy primary feed.

Cooperative dairy feed production was up from 4.1 million tons (29-percent market share) in 1975 and 3 million tons (30-percent market share) in 1969. Cooperative production of dairy primary feed grew 70 percent from 1975 to 1984 while dairy herd numbers fell slightly. A greater increase in tonnage than market share may be explained by increases in cow productivity that required greater feeding needs. The trend toward fewer and larger specialized dairy farms and drylots may also have increased dependence on processed feed.

Seventy-four percent of primary dairy feed by cooperatives, or 5 million tons, was consumed as complete feed. Dairy was the strongest livestock category for complete and supplement feeds where cooperatives captured 34 and 27 percent of the respective markets. Dairy was the largest consumer of complete, premix, and super concentrate feeds by cooperatives.

Dairy herd concentration was the highest in

Table 6—Primary feed production and cooperative market share, by form, by region, 1984

Region	Meal	Pellets and crumbles	Cubes	Blocks	Liquid	Total primary
			Tons			
Northeast	1,256,319	1,430,074	0	5	6,702	2,693,100
Lake States	1,855,924	655,227	10,579	3,128	10,042	2,534,900
Corn Belt	2,006,541	1,606,948	92,915	42,116	11,979	3,760,500
Northern Plains	785,330	442,646	102,688	29,102	11,534	1,371,300
Appalachian	396,381	1,527,753	16,536	55,815	6,215	2,002,700
Southeast	1,677,081	1,952,224	2,540	0	6,454	3,638,300
Delta	127,874	385,114	32,612	0	0	545,600
Southern Plains	177,603	259,302	69,519	8,625	1,451	516,500
Mountain	621,363	163,407	70,038	26,341	23,750	904,900
Pacific	195,321	255,223	1,556	0	0	452,100
48 States	9,108,841	8,675,736	397,432	164,621	77,370	18,424,000
			Percent market share			
Northeast	41.2	25.4	0.0	8.0	89.2	31.0
Lake States	32.9	17.2	21.0	23.0	11.1	26.4
Corn Belt	24.2	18.9	23.9	21.7	9.7	21.5
Northern Plains	16.6	16.0	30.4	20.6	4.8	16.7
Appalachian	18.9	32.2	24.6	85.7	55.7	28.7
Southeast	44.1	34.1	9.1	0	10.7	37.7
Delta	7.5	9.2	54.8	0	0	9.0
Southern Plains	3.1	5.3	9.5	2.3	1.1	4.3
Mountain	25.1	10.0	16.9	31.6	9.8	18.6
Pacific	3.9	3.7	2.8	0	0	3.8
48 States	21.4	17.8	18.6	16.3	8.2	19.3

Figure 9—Cooperative Primary Feed Production by Form, 1984

Million tons

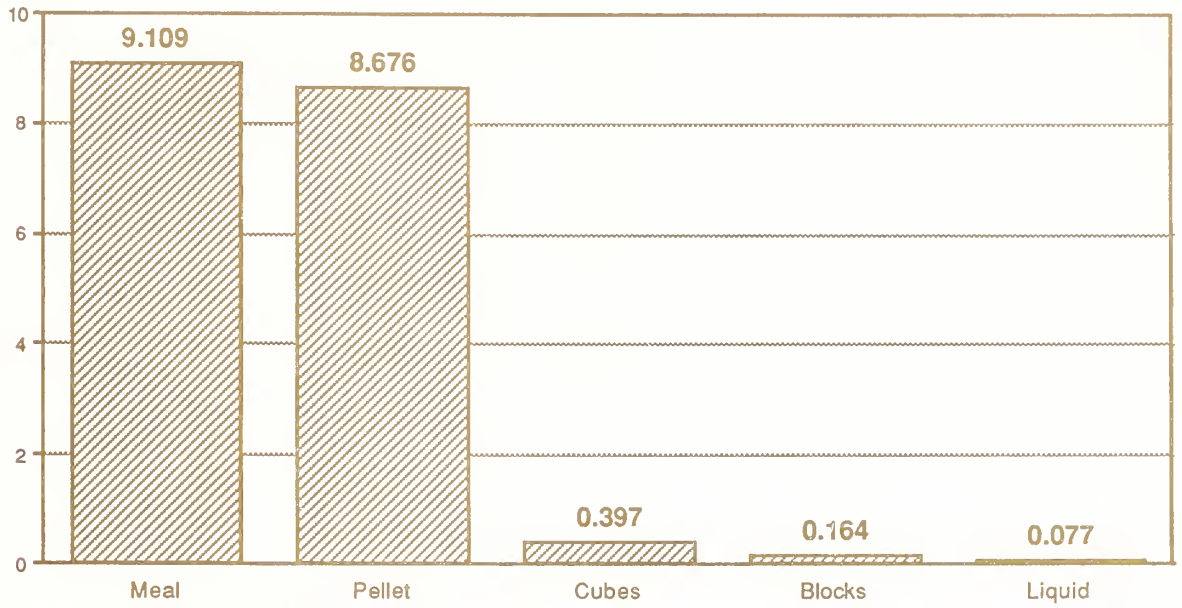


Figure 10—Cooperative Primary Feed Production and Percent Market Share by Livestock Type, 1984

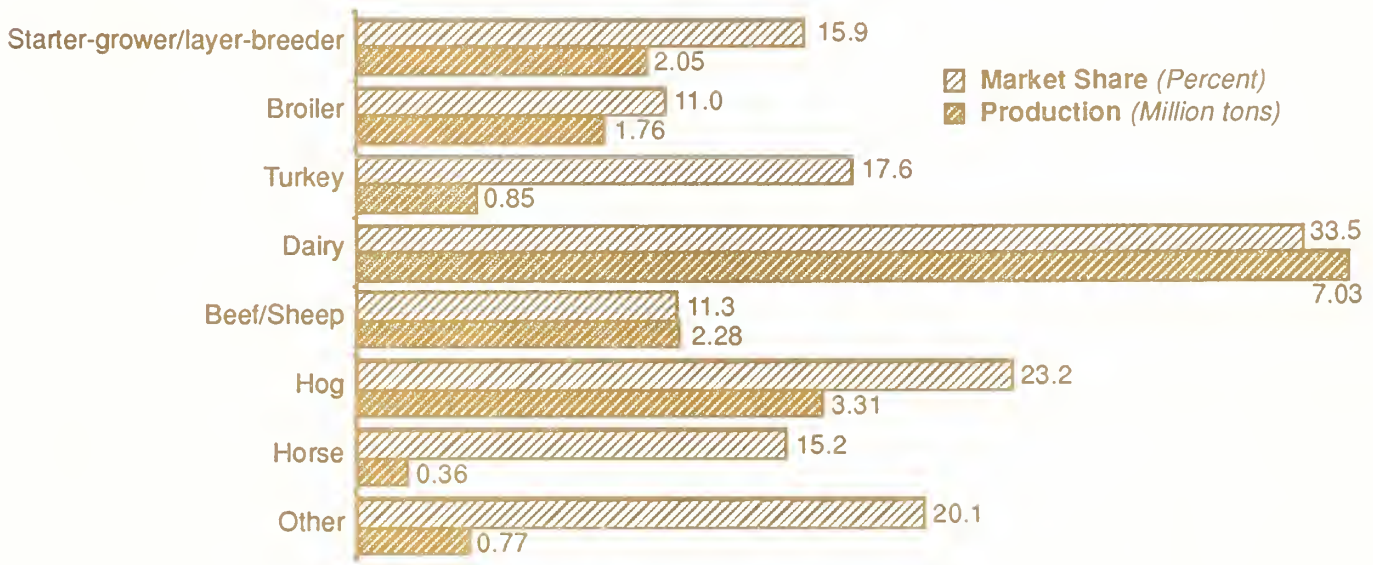


Table 7—Formula feed from primary manufacturing: Cooperative production and market share by livestock type, by region, 1984

Region	Starter-grower layer-breeder	Broiler	Turkey	Dairy	Beef and sheep	Hogs	Horse	All other	Total
Northeast									
Tons	547,794	24,485	65,117	1,660,649	86,439	85,257	149,773	73,586	2,693,100
Market share (percent)	27.3	1.4	25.6	46.6	59.5	25.7	43.4	32.1	31.0
Lake States									
Tons	196,874	5,231	51,359	1,547,001	118,049	547,470	19,111	49,804	2,534,900
Market share (percent)	13.9	1.2	3.2	45.7	28.9	29.5	10.9	16.2	26.4
Corn Belt									
Tons	142,248	15,636	89,535	830,860	456,124	1,790,956	43,118	392,023	3,760,500
Market share (percent)	9.9	2.2	10.2	31.1	21.2	22.7	13.5	27.8	21.5
Northern Plains									
Tons	52,893	10,432	4,252	155,045	694,753	430,741	12,046	11,136	1,371,300
Market share (percent)	19.8	9.3	6.5	23.3	15.0	19.9	18.1	4.4	16.7
Appalachian									
Tons	206,458	140,268	406,932	789,183	101,520	197,051	71,837	89,451	2,002,700
Market share (percent)	18.1	7.1	49.2	52.3	44.8	20.8	38.1	51.9	28.7
Southeast									
Tons	809,292	1,390,896	65,001	1,148,194	38,470	126,698	13,749	45,999	3,638,300
Market share (percent)	39.4	30.5	54.6	63.7	13.3	34.5	10.3	13.6	37.7
Delta									
Tons	46,905	166,894	0	137,363	115,136	13,863	19,410	46,028	545,600
Market share (percent)	3.0	5.6	0	35.6	39.8	8.0	15.6	9.5	9.0
Southern Plains									
Tons	22,486	104	164	130,783	290,434	37,768	16,116	18,645	516,500
Market share (percent)	2.0	0	0	14.3	4.2	13.7	3.1	7.2	4.3
Mountain									
Tons	10,372	8,477	163,759	295,781	301,886	78,423	13,433	32,768	904,900
Market share (percent)	2.5	31.4	96.0	31.2	11.3	44.3	4.8	20.8	18.6
Pacific									
Tons	17,307	436	93	336,744	78,066	3,852	311	15,291	452,100
Market share (percent)	1.2	0	0	6.6	3.2	3.9	0.2	6.3	3.8
48-State total									
Tons	2,052,629	1,762,861	846,214	7,031,605	2,280,876	3,312,080	358,904	774,731	18,424,000
Market share (percent)	15.9	11.0	17.6	33.5	11.3	23.2	15.2	20.1	19.3

the Lake States with 3.1 million cows, or 28 percent of all dairy cows (source for all livestock numbers: USDA Agricultural Statistics, various years). Next highest dairy herd concentrations were in the Northeast, Corn Belt, and Pacific regions. The Pacific region had the highest growth rate of dairy cows between 1975 and 1984 with a 19-percent increase. The Mountain, Appalachian, and Lake States were the only other regions that experienced growth in dairy herd numbers between 1975 and 1984. Cooperative dairy feed production was highest in the Northeast with 1.7 million tons of primary feed produced, and lowest in the Southern Plains with 130,000 tons of feed. Highest market share by cooperatives was 64 percent for the Southeast. The Southeast and Mountain regions had the highest growth in cooperative dairy primary feed since 1969 with 604- and 419-percent increases in tonnage, respectively. Lowest market share was 3 percent for the Pacific region. Both the Pacific and Delta regions had declines in cooperative production since 1969.

Ruminant (dairy, and beef and sheep) primary feed production was split almost equally between meal, and pellets and crumble (table 7). The two forms accounted for 49 percent and 45 percent of output to ruminants, respectively. The Lake States produced the most meal, 1.1 million tons, while the Northeast produced the most pellets and crumbles, 1.1 million tons.

Hogs—Hogs consumed 3.3 million tons of cooperative primary feed, the second highest amount of any livestock category. Cooperative primary feed production was 23 percent of the U.S. primary feed supplied for hogs.

Cooperative hog feed production was up from 2.3 million tons (24-percent market share) in 1975 and 2.5 million tons (24-percent market share) in 1969. Cooperative primary feed production increased 43 percent while hog and pig numbers increased 5 percent from 1975 to 1984. Explanations for greater increases in feed production over hog and pig numbers without increasing cooperative market share may, as with dairy, be explained by increased feed requirements with improved breeding stock. Also, in 1975 about 80 percent of the grain fed to hogs was produced on the same farm, providing substantial leeway to increase use of off-farm-processed feed.

Forty-seven percent of cooperative hog feed was in the form of supplement feed, 45 percent was complete. One and one-half million tons of supplement feed for hogs represented 41 percent of all cooperative supplement feed output. Hogs consumed the fourth largest quantity of cooperative complete feed, 1.5 million tons, and were the second largest consumers of cooperative feed premix and super concentrate.

The largest concentration of hogs and pigs was in the Corn Belt, which had 29.3 million head, or 56 percent of the U.S. total. The total hog and pig count in the Corn Belt had an increase of 9 percent from 1975 levels. The Corn Belt had the largest share of cooperative output for hog feed, producing 1.8 million tons, or 23 percent of the Corn Belt's primary feed for hogs. In 1984, the Corn Belt produced 377,000 tons more, a 27-percent increase, than in 1969. The strongest regions for cooperatives were the Mountain, Southeast, and Lake States with 44, 35, and 30 percent of their respective markets.

Primary feed for swine was mainly meal, 2.2 million tons, or 66 percent of output for swine. Slightly more than a million tons, 31 percent of output, was pellets and crumble. The Corn Belt produced the most meal, 1.146 million tons, and pellets and crumble, 572,000 tons. Cooperatives produced a small amount of swine feed in blocks and none in liquid.

Chickens—The next largest livestock group as a consumer of cooperative primary feed was starter-grower layer-breeder. Primary feed production by cooperatives was 2.1 million tons with primary feed for broilers adding an additional 1.8 million tons to the chicken sector, respectively. Cooperatives captured 16 percent of the starter-grower layer-breeder sector and 11 percent of the broiler market.

Starter-grower layer-breeder feed by cooperatives declined from 2.3 million tons in 1975 and 2.5 million tons in 1969. Market shares were down from 19 and 20 percent from the same respective census years. Cooperative production of primary feed for broilers regained some of the market it lost in the mid-seventies. Vertical integration of the starter-grower layer-breeder and broiler industries, where feed mills are part of a large integrated firm, may partially explain why cooperatives have failed to increase their market share in the chicken sector. Also, lower feed conversion ratios have dampened the demand for chicken feed at the same time that the demand for chicken meat has been rising.

Ninety-four percent and 55 percent of cooperative feed for broilers, and starter-grower layer-breeders, respectively, was produced by mills with a capacity of more than 100,000 tons. Complete feed accounted for 95 percent of primary feed for the two combined categories.

The largest concentration of chickens (all categories) were in the Corn Belt with 69,800 thousand head, or 19 percent of the U.S. total. In the Corn Belt, chicken numbers were up 29 percent from 1975. The second highest chicken concentration was in the Southeast with 65,000 head, down 18 percent from 1975. The Southeast had the largest cooperative primary feed production in both starter-grower layer-breeder and broiler categories with 809,000 and 1.4 million tons, respectively. The Southeast also had the largest market share of starter-grower layer-breeder with 39 percent and the second highest share in the broiler sector, slightly behind the Mountain region, with 31 percent. Cooperative production in the Corn Belt was 142,000 tons for starter-grower layer-breeder and 16,000 tons for broilers, 10 and 2 percent of the respective markets.

Primary feed to poultry was mainly in the form of pellets and crumbles, 3 million tons, or 65 percent of poultry primary feed output. The Appalachian, Southeast, Delta, and Southern Plains regions dedicated roughly 80 percent of their poultry feed production to pellets and crumbles. The remaining regions produced mostly meal, with the Mountain region produc-

ing 94 percent of its output in meal form.

Beef and Sheep—Beef and sheep consumption of cooperative feed was 2.3 million tons in 1984. Cooperative output was 12 percent of the U.S. output for 1984, up substantially from the 1.2 million tons produced in 1975. Cooperatives realized a slight increase in market share of beef and sheep feed over 1975 levels, all in a market that saw cattle and calf numbers decline 17 percent in the same period.

Disappearance of cooperative formula feed by beef and sheep was split in the following types: 63 percent was complete feed; 34 percent was supplement feed; and the remainder going into premix and super concentrate. The Southern Plains had the largest amount of cattle and calves, 19,400 head, followed closely by the Northern Plains region. All regions, except the Northeast, saw cattle and calf numbers decline. Cooperatives produced the most feed in the Northern Plains, 695,000 tons, and had the strongest market share, 60 percent, in the Northeast.

Turkeys—Consumption of cooperative feed by turkeys was 846,000 tons in 1984. Cooperative production was up substantially from 298,000 tons in 1975 and 425,000 tons in 1969. Cooperatives' market share of 18 percent of U.S. turkey feed was up from 10 percent in 1975 and 15 percent in 1969. Cooperatives have been successful in capturing a greater market share of turkey feed in a market that has seen increases in per capita turkey meat consumption.

Ninety-three percent of cooperative primary turkey feed was complete feed. Most turkey feed was produced by larger mills. Three-fourths of the feed was produced by mills having a capacity of 75,000 tons, with 56 percent from mills having a capacity rating of more than 100,000 tons.

Appalachian and the Lake States were the largest producers of turkeys in 1984 with 43,500 and 36,700 head, respectively; both regions saw substantial increases in turkey numbers. Appalachian produced the most turkey feed by cooperatives, capturing 49 percent of that region's market. Cooperatives in the Mountain region produced 96 percent of that region's turkey feed, the largest market share by cooperatives.

Secondary Feed Manufactured

Large cooperative mills with a capacity of 100,000 tons or more produced 15 percent of secondary feed output and were 1 percent of the mills that produced secondary feed. Cooperative mills producing less than 25,000 tons represented 54 percent of secondary feed output and accounted for 88 percent of secondary feed-producing mills. These smaller mills produced roughly equal amounts of primary and secondary feed, while mills producing more than 25,000 tons produced 6.6 times more primary feed than secondary.

FEED INGREDIENTS

Cooperative feed manufacturers utilize the same wide range of feed ingredients as investor-oriented firms. Ingredient usage for exacting formulations is often determined through the use of linear programming models that are constrained by both price and availability.

Usage of Feed Grains, Oilseeds, and Others

Corn was the most widely used feed ingredient. Of all feed grains used, corn accounted for 77 percent (6.2 million tons) of the 8.1 million tons of feed grain used as a feed ingredient. Corn was the most often used feed grain in all 10 regions. Only in the Northern Plains, Pacific, and Mountain regions did corn account for less than 50 percent of the feed grain use. Next most popular feed grains were sorghum, barley, and oats, in order.

Oilseed meals were the next largest ingredient group used by cooperatives for feed; disappearance was 3.8 million tons. More than 90 percent of oilseed meal consumed was from soybean meal. The Corn Belt was the biggest user of soybean meal; 27 percent of soybean meal used by cooperatives, or 917,000 tons, was milled here.

Byproducts closely followed oilseed meal in use; disappearance was 3.1 million tons. Wheat millfeed disappearance was 1.5 million tons, 49 percent of all byproduct use. Wheat millfeed use was greatest in the Northeast, Appalachian, and Corn Belt regions, which

accounted for 70 percent of all wheat millfeeds. Soybean millfeeds, distiller's grains, hominy feed, and brewer's grain accounted for 33 percent of byproduct use.

Inshipments

Trucks were the major mode of transportation used by cooperative feed mills for inshipments of feed ingredients (table 8). Sixty-seven percent of the feed ingredients used by cooperatives in producing formula feed in 1984 were hauled in by truck; 55 percent by contracting trucks and 12 percent by company trucks. Thirty-one percent came by railcar and 2 percent came by barge.

The Northern Plains, Southern Plains, and Corn Belt regions transported more than 90 percent of their feed ingredients by truck. The Northeast, Appalachian, Southeast, and Delta regions used rail as the major source of inshipment transportation. Only the Northeast and Southeast utilized barge as transportation.

Table 8—Cooperative inshipments of feed ingredients received by mode of transportation, by region, 1984

Region	Trucks			Rail	Barge
	Cooperative	Other	Total		
			Percent		
Northeast	7.9	34.5	42.4	56.6	1.1
Lake States	19.9	63.0	82.9	17.1	0
Corn Belt	17.7	74.4	92.1	7.9	0
Northern Plains	27.2	70.3	97.5	2.5	0
Appalachian	0.7	33.2	33.9	66.1	0
Southeast	1.3	22.7	24.0	66.3	9.7
Delta	0.0	33.3	33.3	66.7	0
Southern Plains	11.6	82.9	94.5	5.5	0
Mountain	5.8	72.5	78.3	3.1	0
Pacific	4.9	57.9	62.8	33.3	0
48-State average	12.4	55.1	67.5	30.8	1.7

Storage Capacity

Cooperative feed mills of all size classifications allocated the most ingredient storage capacity to bulk grain (table 9). Bulk was also preferred to bag in storing of nongrain dry ingredients, except for mills under 1,000 tons' capacity. The average tons of bulk grain storage capacity per establishment was 9,970 tons. For other dry ingredients average bulk ingredient storage capacity was 531 tons.

Mills in the 50,000- to 74,999-tons capacity range had the largest bulk grain storage capacity with 28,691 tons per establishment. By comparison, mills with a capacity exceeding 100,000 tons had a bulk storage capacity of only 6,249 tons. Differences in ingredient storage capacity may be due to those establishments whose major activity is grain handling.

FINISHED FEED

Cooperatives as well as investor-oriented firms are continuing to sell more of their feed directly (wholesale) to livestock producers. The trend toward fewer and larger livestock produc-

Table 9—Ingredient and manufactured feed storage capacity of cooperatives: Average per establishment, by size interval, 1984

Size interval	Ingredient storage capacity						Manufactured feed storage capacity		
	Grains		Other dry ingredients		Liquid				
	Bag	Bulk	Bag	Bulk	Molasses	Fat	Bag	Bulk	Liquid
					Tons per establishment				
48-State average									
Less than 1,000 tons	223	691	50	44	17	0	94	56	NA
1,000-9,999 tons	21	8,197	113	117	12	0	114	78	62
10,000-24,999 tons	19	14,198	49	338	23	1	137	96	109
25,000-49,999 tons	11	2,237	109	749	202	214	374	198	30
50,000-74,999 tons	19	28,691	87	1,009	42	3,461	525	281	30
75,000-99,999 tons	0	1,561	93	1,239	98	29	681	343	125
100,000 tons and more	9	6,249	118	2,720	89	55	994	882	165
Average	29	9,970	90	531	51	246	254	203	73

NA=No data available

ers is continuing and cooperatives have often been forced, in order to keep these large and important accounts, to offer these producers feed on a wholesale basis.

Large, compartmentalized delivery trucks are often used to deliver feed, allowing distribution to several farms in one trip. Linear programming transportation models are used to minimize delivery cost and determine equitable charges based on distance and volume.

Distribution

Cooperatives distributed 33 percent of their formula feeds by wholesale methods, 33 percent by retail, 20 percent by custom grind and mix, 13 percent to their own livestock, and 1 percent as custom feeding (fig. 11, table 10). Cooperatives accounted for 25 percent of the total wholesale formula feed distribution, 29 percent of the retail distribution, 49 percent of custom grind and mix, 10 percent of the output going to their own livestock, and 2 percent of custom feeding.

The Corn Belt sold the most by wholesale with 2.3 million tons, while the Northeast had the largest wholesale market share of 56 percent and the greatest relative amount, 64 percent, sold through wholesale. The Lake States sold the most through retail outlets with 2 million tons, and the Southeast had the highest share in retail outlet sales with 58 percent. Cooperatives in the Pacific region sold almost all their feed through retail outlets.

Cooperatives' in the Southeast distributed 62 percent of their output, or 2.4 million tons, to feeding their own livestock, the largest of any region, accounting for 35 percent of the Southeast market for own livestock feeding. The Southern Plains distributed the most through custom feeding with 106,000 tons, 8 percent of their output. The Lake States distributed the most through custom grind and mix with 1.9 million tons. Cooperatives in the Southern Plains had the largest regional market share of custom grind and mix with 85 percent. Sixty-three percent of the Southern Plains cooperative output was custom grind and mix.

Outshipments

Trucks were the major source of outshipments of formula feed, with 99 percent being shipped by some form of truck transportation (table 11). Cooperative-owned trucks accounted for 61 percent of outshipments of cooperative-manufactured feed. Customer-owned trucks handled 30 percent, and 9 percent left the plant via other truck ownerships.

Cooperative-owned truck deliveries ranked the highest in the Southeast, with 94 percent of outshipments, and lowest in the Corn Belt, with 40 percent. The Delta region ranked the highest for customer-owned truck delivery, 45 percent, and the Southeast ranked the lowest, 4 percent.

Outshipments of manufactured feed from cooperatives went by rail for only 1 percent of output. The Northeast, Corn Belt, Southeast, and Delta were the only regions reporting use of rail for outshipments of formula feed. Less than one percent of manufactured feed left cooperative establishments via barge, with only the Northeast reporting use of barges for outshipments.

An important factor in determining the mode of transportation used is miles transported. In three of the four regions that responded to using rail, average rail mileage shipped was greater than average truck mileage of manufactured feed (table 11). The average rail distance shipped was 80 miles and was greatest in the Delta region, where average rail distance shipped was 146 miles. All truck transportation averaged 51, miles with cooperative owned truck transportation averaging 50 miles, customer trucks averaging 47 miles, and other trucks averaging 67 miles.

Storage Capacity

To accommodate finished feed production, both bulk and bagged storage capacity are usually required. Average bag capacity for manufactured feed was 254 tons, or 48 percent of all combined feed storage capacity (table 9). Bulk manufacturing feed (both dry and liquid) accounted for the remaining storage capacity. Dry bulk had an average per establishment storage capacity of 203 tons, and liquid feed storage capacity was 73 tons.

Figure 11—Percent Distribution of Cooperative Formula Feed by Method, 1969, 1975, 1984

Percent

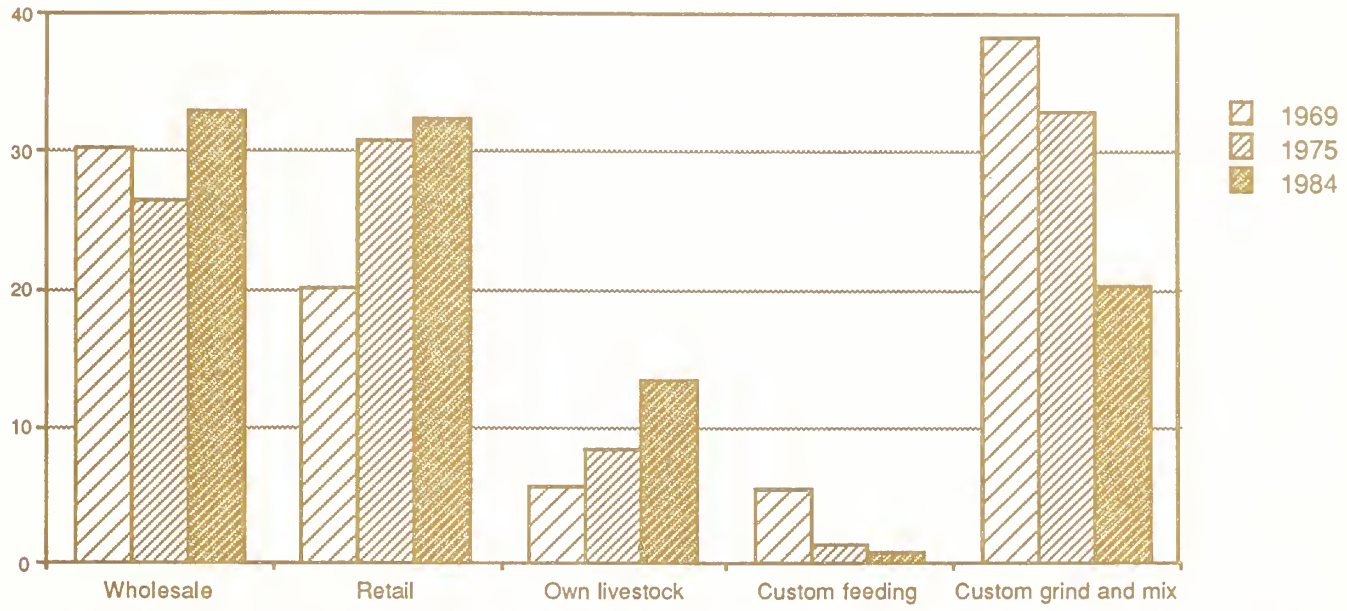


Table 10—Cooperative distribution of formula feed by method and region, United States, 1984

Region	Wholesale		Retail		Own livestock		Custom feeding		Custom grind and mix		Total	
	Manufac-turers	Production	Manufac-turers	Production	Manufac-turers	Production	Manufac-turers	Production	Manufac-turers	Production	Manufac-turers	Production
	Number	*Tons*	*Number*	*Tons*	*Number*	*Tons*	*Number*	*Tons*	*Number*	*Tons*	*Number*	*Tons*
Northeast	94	1,844,572	129	900,556	3	348	0	0	82	142,911	212	2,888,387
Lake States	77	853,584	331	2,040,785	17	9,169	22	18,220	240	1,910,213	411	4,831,972
Corn Belt	113	2,340,993	440	1,465,628	10	24,395	5	2,825	355	1,196,282	585	5,030,122
Northern Plains	50	623,402	232	716,878	14	6,488	4	10,826	210	558,764	344	1,916,358
Appalachian	44	1,139,620	68	314,613	20	590,530	0	0	61	23,227	113	2,067,990
Southeast	32	353,755	24	1,021,864	48	2,351,193	4	2,512	11	77,632	77	3,806,956
Delta	11	273,002	14	38,227	3	246,947	0	0	10	7,249	28	565,425
Southern Plains	21	376,529	30	39,226	0	0	4	106,220	30	902,874	60	1,424,849
Mountain	30	126,423	47	795,425	0	0	5	42,857	28	49,124	51	1,013,829
Pacific	8	2,577	26	484,634	0	0	0	0	8	4,037	32	491,248
48-State total	479	7,934,457	1,341	7,817,835	115	3,229,071	44	183,462	1,035	4,872,312	1,913	24,037,137
Capacity size interval												
Up to 999 tons	4	4	45	9,755	0	0	0	0	59	12,699	78	22,457
1,000-9,999 tons	76	121,187	604	1,129,577	12	2,441	18	28,855	505	1,473,040	748	2,755,101
10,000-24,999 tons	104	327,795	439	2,327,932	13	10,911	19	45,874	314	1,036,105	543	3,748,618
25,000-49,999 tons	107	1,799,706	139	1,266,926	13	24,122	4	106,220	103	922,150	246	4,119,124
50,000-74,999 tons	75	1,612,768	52	1,521,893	12	111,252	0	0	23	295,664	118	3,541,577
75,000-99,999 tons	39	890,386	19	407,065	0	0	0	0	13	239,006	51	1,536,458
100,000 tons and up	75	3,182,611	43	1,154,686	63	3,080,344	4	2,512	17	893,648	130	8,313,802
Total	479	7,934,457	1,341	7,817,835	115	3,229,071	44	183,462	1,035	4,872,312	1,913	24,037,137

Table 11—Cooperative outshipments of formula feed: Percentage shipped by mode of transportation, by region, 1984

Region	Trucks				Rail	Barge
	Cooperative	Customer	Other	Total		
			Percent			
Northeast	60.2	18.0	17.1	95.3	3.8	0.9
Lake States	70.5	28.0	1.5	100.0	0	0
Corn Belt	39.8	41.0	17.5	98.3	1.7	0
Northern Plains	56.5	40.2	3.3	100.0	0	0
Appalachian	40.6	40.7	16.6	97.9	2.1	0
Southeast	94.2	3.9	1.9	100.0	0	0
Delta	48.2	45.2	0	93.4	6.6	0
Southern Plains	52.0	43.0	5.0	100.0	0	0
Mountain	55.6	37.9	6.5	100.0	0	0
Pacific	75.7	23.6	0.7	100.0	0	0
48-State total	60.5	29.6	8.6	98.7	1.2	0.1

HUMAN RESOURCES

The average cooperative feed establishment employed 5 employees in production and a total of 12 employees at the establishment (table 12). This compared with 6 production employees and 14 total employees per establishment for the industry as a whole. The Northern Plains had the fewest production employees per establishment with three; the most production employees per establishment was nine in the Southeast.

Number of production employees generally increased directly with the increase in the size of the establishment. For cooperatives, the ratio of nonproduction employees to production employees generally decreased as the size of the establishment increased. The nonproduction to production employee ratio remained about the same across size classes for the industry as a whole, but varied slightly from region to region.

Type

Employee types were divided into six categories: production workers, maintenance and repair, warehousing, truckers, office and management, and sales and service. Production workers accounted for the largest division of feed mill employees, claiming 9,408 (40 percent) of the 23,776 total feed establishment employees. Production employees as a proportion of total employees ranged from 30 to 46 percent, with the Southern Plains the claiming the highest ratio.

Office and management employees totaled 5,588, or 24 percent of the feed mill labor force. Sixteen percent of feed mill workers were truckers. Nine percent worked in warehousing. Roughly 6 percent of the labor force worked in sales and services and another 6 percent in maintenance and repair. More than 18 percent of the employment in the Pacific region was involved in sales and services.

Productivity

Output for cooperatives was 2,654 tons per production employee, slightly lower than the industry average of 2,963 tons per production employee. The highest cooperative output per production employee was in the Pacific, Southeast, and Southern Plains regions which

averaged more than 5,000 tons. The Corn Belt and Northern Plains regions averaged less than 2,000 tons per production worker. Generally, output per production employee increased directly with the size of the establishment.

Eighty-six percent of cooperative mills operated single shifts in their feed mills; 12 percent operated double shifts; 2 percent operated triple

Table 12—Labor: Production employees and all employees, average per establishment, and output per employee, by size interval and region, 1984

Size interval	Production employees		All employees		Ratio non-production to production employees
	Average per establishment	Output per employee	Average per establishment	Output per employee	
	Number	*Tons*	*Number*	*Tons*	*Ratio*
Farmer cooperative					
Up to 999 tons	1.5	187	7.8	37	4.2
1,000-9,999 tons	2.4	1,512	7.0	523	1.9
10,000-24,999 tons	3.2	2,166	8.8	781	1.8
25,000-49,999 tons	5.5	3,042	15.1	1,107	1.7
50,000-74,999 tons	10.0	2,990	22.2	1,354	1.2
75,000-99,999 tons	10.3	2,922	21.7	1,389	1.1
100,000 tons and up	16.6	3,846	36.2	1,765	1.2
Average	4.7	2,654	12.1	1,038	1.6
All feed manufacturers					
Up to 999 tons	2.2	121	6.1	43	1.8
1,000-9,999 tons	2.6	1,076	6.4	426	1.5
10,000-24,999 tons	3.4	1,997	9.2	736	1.7
25,000-49,999 tons	6.1	2,616	16.9	945	1.8
50,000-74,999 tons	9.9	2,752	25.4	1,074	1.6
75,000-99,999 tons	10.7	3,414	31.0	1,181	1.9
100,000 tons and up	17.4	4,915	42.8	1,996	1.5
Average	5.5	2,963	14.4	1,133	1.6
Region					
Farmer cooperative					
Northeast	5.5	2,486	15.1	902	1.7
Lake States	4.3	2,745	11.0	1,073	1.6
Corn Belt	4.8	1,810	12.2	706	1.5
Northern Plains	3.0	1,876	7.5	743	1.5
Appalachian	6.5	2,825	15.2	1,208	1.3
Southeast	9.4	5,237	21.6	2,285	1.3
Delta	6.2	3,251	17.6	1,146	1.8
Southern Plains	4.6	5,211	9.9	2,404	1.2
Mountain	6.8	2,909	18.6	1,070	1.7
Pacific	2.9	5,360	8.8	1,743	2.0
United States	4.7	2,654	12.1	1,038	1.6
All feed manufacturers					
Northeast	5.7	2,700	17.3	891	2.0
Lake States	4.1	2,842	10.4	1,117	1.5
Corn Belt	5.0	2,063	13.5	763	1.7
Northern Plains	4.1	2,873	10.6	1,125	1.6
Appalachian	5.7	2,342	14.9	893	1.6
Southeast	8.1	3,671	21.3	1,405	1.6
Delta	7.6	4,362	18.6	1,791	1.4
Southern Plains	8.3	3,241	20.2	1,336	1.4
Mountain	7.7	2,488	16.7	1,141	1.2
Pacific	7.3	9,838	21.2	3,380	1.9
United States	5.5	2,963	14.4	1,133	1.6

NA = not available

shifts. The Lake States, Corn Belt, Northern Plains, Delta, and Mountain regions utilized single shifts by more than 93 percent of feed mills.

SERVICES AND AUTOMATION

Cooperatives were organized to serve their owner-members and continue to operate by this principle. Cooperative feed mills, to satisfy the desires of their owner-users, provide services more often than investor-oriented firms. Computerized automation has increased vastly over the past decade as inexpensive personal computers became widely available.

Custom Services

Custom services provided by cooperative feed mills included least cost formulation, feed blending, feed programs, record keeping, and "other" services. In all categories, a larger percentage of cooperative feed mills provided these services than did noncooperative mills (table 13). Four-fifths of the feed mills provided feed blending services with larger mills less likely to provide this service.

Slightly more than half the feed mills provided least cost formulation and feed programs. Record keeping was done by 25 percent of the feed mills. Roughly 9 percent of the cooperative establishments provided some other form of custom service.

Computerized Automation

Computerized automation practices were done in pelleting, mixing, ingredient storage, finished product storage, shipping, formulation, purchasing, energy management, and "other." The availability of feed application software and more common usage of personal and minicomputers has greatly increased computer automation from 1975 to 1984 (table 14). Twenty-four percent of feed establishments used computerized formulation, 16 percent used computerized mixing, 10 percent used computerized purchasing. All other computerized services were utilized by less than 7 percent of feed establishments. The likelihood of cooperatives using computerized automation was roughly the same as for noncooperatives.

Table 13—Custom services associated with feed sales provided by cooperative feed mills, United States, 1984

Size interval	Least cost formulation	Feed blending	Feed program	Record keeping	Other services
Famer cooperative			*Percent*		
Up to 999 tons	36.8	84.2	42.1	5.3	21.1
1,000-9,999 tons	47.8	85.6	59.4	23.3	10.0
10,000-24,999 tons	57.8	89.8	66.4	32.8	7.8
25,000-49,999 tons	57.6	79.7	47.5	18.6	6.8
50,000-74,999 tons	69.0	69.0	34.5	17.2	0.0
75,000-99,999 tons	69.2	69.2	46.2	15.4	7.7
100,000 tons and up	55.9	44.1	32.4	20.6	11.8
Total	53.4	81.5	55.5	24.0	8.7
Total all mills			*Percent*		
Up to 999 tons	21.3	76.0	30.7	8.0	6.7
1,000-9,999 tons	39.2	81.4	46.9	16.9	8.0
10,000-24,999 tons	49.1	79.2	54.9	24.3	8.8
25,000-49,999 tons	54.2	63.2	50.0	17.0	5.2
50,000-74,999 tons	64.3	58.0	48.2	23.2	2.7
75,000-99,999 tons	65.8	52.6	47.4	22.4	3.9
100,000 tons and up	47.5	40.0	32.5	15.6	7.5
Total	46.5	71.2	47.3	19.0	7.1

Table 14—Cooperative feed mills utilizing computerized automation, 1984 and 1975

Computerized automation practices	Farmer cooperative		Total	
	1984	1975	1984	1975
	Percent			
Pelleting	4.2	1.3	4.7	2.1
Mixing	15.9	7.0	15.8	7.4
Ingredient storage	7.0	5.3	6.4	3.2
Feed storage	5.1	3.0	4.7	1.8
Shipping	5.3	2.8	6.0	2.3
Formulation	23.8	10.0	28.4	13.3
Purchasing	10.2	3.2	11.1	3.8
Energy management	4.5	0.8	3.8	0.8
Other	3.6	0.8	4.5	1.2

CHALLENGES FOR COOPERATIVES IN THE FEED INDUSTRY

Numerous challenges face cooperatives in the feed industry as the number of firms decline and remaining firms grow larger. Cooperatives have the largest farm distribution system in the United States and, because they are owned by their users, should be well prepared to address future challenges. Some of the following challenges will be unique to cooperatives while others will affect the industry as a whole.

1. Vertical integration will continue in the animal and animal products industry. Hog production is most often mentioned as the next frontier for integration, as is now exemplified in the broiler industry.

2. With falling volumes of complete feed sold and increases in supplemental, super concentrate, and premix feeds, the temptation will be to ensure feed demand by feeding owned livestock. Investor-oriented firms distributed more than one-third of their feed to their own livestock. These operations require large amounts of capital, management expertise, and risk acceptance. Feeding owned livestock can also put a cooperative in direct competition with its owner members.

3. Treatment and service of both large and small accounts will be on an equitable basis. In operations where economies of size are evident, the loss of a large volume feed account can increase the cost of service to other farms due to decreases in mill capacity utilization. Variable costs must be known for all volume levels and supply distances. Service to smaller accounts needs to accurately reflect all costs.

4. More producers are becoming large enough to command carload ingredient shipments. These producers can still benefit from cooperatives' ability to produce premixes and super concentrates to exacting formulas for inclusion in producers' mixing operations. The cooperative can ensure quality of its products and provide testing services for members' on-farm mixed feeds.

5. A large number of small cooperative feed mills exist, especially in the Corn Belt. These small mills are probably older than the industry average and may no longer be operating efficiently due to the lack of economies of size. Instead of competing among themselves, it might be beneficial for several cooperatives to operate jointly or merge to finance new feed mills.

6. Cooperatives pioneered in offering open formula feed nearly a century ago. Feed ingredients were stated on the bag label to ensure quality. This level of quality continues with most larger regional cooperatives operating feed performance facilities. Some research is shared through testing at cooperative research farms. Branded pet food products and milk replacer are sold by agreement through several cooperative distribution systems.

7. Cooperatives need to continually educate both employees and members on basic cooperative principles and objectives. Cooperatives have long supported the rural infrastructure and because of this can play a key position in the revitalization of rural America. In many rural areas, local cooperatives are the largest employer.

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