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Minnesota AGRICULTURE ECONOMIST



Competition In Prepared Animal Feed Manufacturing in Minnesota

R. Clyde Greer and Dale C. Dahl

This article extends an earlier discussion of the prepared animal feed industry serving Minnesota.¹ It reviews the geographic and size organization of feed manufacturers, investigates market practices, and speculates about the future of this industry.

Expenditures for prepared animal feeds by Minnesota farmers are second only to expenditures for livestock and poultry. This expenditure is more than twice as large as that for any other input. The group of firms, the industry, that sells prepared feeds and feed ingredients to Minnesota farmers includes three types: (1) custom mixers, firms that manufacture less than 1,000 tons of feed per year, (2) large manufacturers, firms that manufacture more than 1,000 tons of feed per year, and (3) ingredient suppliers. About three-tenths of the firms, which supply about one-third of the total tonnage, are located outside the state. During the study period, 1954-64, ingredient supplying firms were most prevalent and increased their position among out-of-state firms.

Data presented in this report show that firms in the industry, particularly custom mixers, are in a vulnerable position unless they can provide an array of buyer services.² The changing nature of agricultural production and the advent of many micro-ingredients have altered buyer demands. Custom grinding and mixing of farmer-owned feed grains is decreasing, while the number of sophisticated formulations and services is increasing. The data also indicate that buyers must be prudent in selecting a supplying firm, because the nature of competition in the industry and the multitude

of possible feed formulations make inter-firm price comparison difficult.

INDUSTRIAL AND SPATIAL ORGANIZATION

During the study period both the industrial and spatial organization of the prepared feed industry in Minnesota underwent substantial change. The total number of firms located in Minnesota decreased by nearly one-fifth, average firm size increased, and there was a substantial change in the location of manufacturing activity.

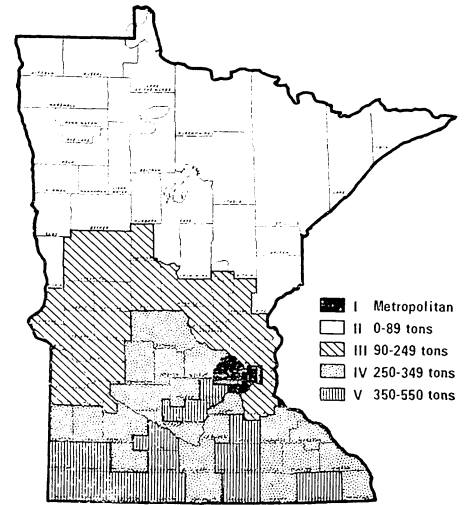
Large manufacturing firms were the only type to show an increase in number during the study period (table 1). The vulnerability of the small firm is evidenced by the decrease in custom mixers and consideration of ingredient suppliers by size categories. In fact, the decrease in the number of custom mixers, 26 per-

cent, was substantially greater than the net industry decrease.

Average firm size increased as a result of the decrease in firm numbers and a 64 percent increase in industry output. However, the rate of firm growth achieved by the largest firms was only equal to the rate of industry output expansion.

Change in the spatial organization of feed manufacturing is due to a changing spatial distribution of firms and intrafirm reorganization through initiation of satellite plant operations by large manufacturers (table 1). Manufacturing activity is moving from the metropolitan area to the heavily agricultural southern half of the state (table 2). During the study period, the largest relative increase in manufacturing activity occurred in the second highest consumption area, area IV, rather than in the area of greatest feed concentrate consumption per acre, area V (see the figure).³ Two factors probably are

³ The authors will consider the county feed concentrate consumption estimates in detail in a forthcoming University of Minnesota publication, *Estimation of Livestock Feed Concentrate Consumption by County*.



Minnesota feed concentrate consumption areas (tons consumed per thousand acres)

Table 1. Number of prepared animal feed manufacturing firms and plants in Minnesota, by classification and consumption area, 1954, 1959, and 1964

Consumption area	Year	Custom mixers	Large manufacturers		Ingredient suppliers	Total (firms and plants)
			Firms	Plants*		
I	1954	43	19		13	75
	1959	25	11		14	50
	1964	28	12		21	61
II	1954	89	5	1	16	111
	1959	75	7	1	12	95
	1964	73	6	2	4	85
III	1954	147	10		10	167
	1959	128	10		9	147
	1964	121	15	2	13	151
IV	1954	201	16	1	34	252
	1959	145	29	1	28	203
	1964	136	34	2	26	198
V	1954	117	11		15	143
	1959	83	13	1	10	107
	1964	82	19	2	11	114

* Enumerations represent facilities operated in the respective consumption area by firms that reported aggregate tonnage data and operated their "home" plant in another consumption area.

¹ R. Clyde Greer and Dale C. Dahl, "Industrial and Geographic Changes in Minnesota Feed Manufacturing," *Minnesota Farm Business Notes*, Agricultural Extension Service, University of Minnesota, No. 485, June 1966.

² Most of the structural data for this study were supplied by the Minnesota Department of Agriculture. Firm conduct data were obtained by a survey of firms (75 custom mixers and 33 large manufacturers responded).

Table 2. Relative spatial distribution of prepared animal feed firms, plants, and total manufacture, Minnesota, by consumption area, 1954, 1959, and 1964

Consumption area	Year	Percentage of total (firms only)	Percentage of total manufacture accounted for (firms only)	Percentage of total manufacture accounted for (firms and plants)
Area I	1954	10.0	50.7	49.9
	1959	8.4	48.2	46.6
	1964	10.2	43.9	39.3
Area II	1954	14.7	4.4	5.1
	1959	15.7	4.3	5.0
	1964	13.8	4.0	5.0
Area III	1954	22.4	10.2	10.2
	1959	24.5	7.0	7.0
	1964	24.8	10.6	12.4
Area IV	1954	33.6	21.5	22.4
	1959	33.7	24.7	26.5
	1964	32.6	27.4	29.5
Area V	1954	19.2	13.3	12.4
	1959	17.7	15.8	15.1
	1964	18.6	14.0	13.8

Table 3. Exit and entry of prepared animal feed manufacturing firms, Minnesota, by consumption area and classification

Consumption area	Exit				Entry			
	Custom mixers	Large man- u- facturers	Ingre- dient sup- pliers	Total	Custom mixers	Large man- u- facturers	Ingre- dient sup- pliers	Total
1954-59								
I	20	7	7	34	4		5	9
II	29	1	4	34	15	1	2	18
III	42		5	47	23	1	3	27
IV	75	1	12	88	26	5	8	39
V	50		8	58	18		3	21
Minnesota	216	9	36	261	86	7	21	114
1959-64								
I	6		5	11	8	1	13	22
II	18		5	23	11	1		13
III	24		5	29	24	1	8	32
IV	31	2	6	39	26	1	6	33
V	20	2	4	26	20	7	5	32
Minnesota	99	4	25	129	89	11	32	132

important in explaining this organization: (1) The livestock enterprise mix within area IV contains a relatively greater proportion of those enterprises (turkeys and dairy) that currently tend to use a higher proportion of prepared animal feeds and (2) There is a relatively greater supply of feed grains in area V.

The decrease in manufacturing activity in area I is the result of a decrease in the number of large manufacturers located within the area and the initiation of satellite plant operations in areas III, IV, and V by large manufacturers located in area I (table 1). The net effect of exit and entry activity has been softened by an increase in ingredient manufacturing and supplying activity within the area. The introduction of many micro-ingredients has greatly increased the importance of this activity in the industry. The industrial complex, central location, and transportation facilities available have

placed area I in a leading role in ingredient supplying for the state.

The net changes in the number of firms manufacturing feeds in Minnesota between 1954 and 1964 are only indicative of total exit and entry activity (table 3). The largest amount of activity, both absolutely and relatively, occurred among custom mixers. The vulnerability of the small firm is further evidenced by two facts. First, 15 of the 21 ingredient suppliers entering the industry supplied less than 1,000 tons in 1959, and 31 of the 36 ingredient suppliers leaving the industry supplied less than 1,000 tons in 1954. Second, custom mixers have shown an inability to increase in size. The net decrease in the number of custom mixers due to exit and entry activity accounted for 94 percent of the total decrease in the number of custom mixers during the study period. Only 6 percent of the custom mixers in the industry were able to

increase their yearly output above 1,000 tons.

Predominant among the spatial patterns of exit and entry were the entry of large manufacturers into area V when satellite plants were being erected in areas III, IV, and V and the entry of ingredient suppliers in area I.

INTERFIRM COMPETITION

Interfirm rivalry is strong in the industry, though activities primarily are limited to nonprice considerations. Overt price competition can be avoided because some degree of selling firm interdependence exists due to the small number of firms in any one market area and because there are opportunities for product differentiation. The latter is attempted in hopes that price differentials can be initiated and maintained. Possibilities for product differentiation in the prepared feed industry are provided by the large number of specific formulations. Each formulation can be given a name that may then be associated with a particular firm. Of course, such differentiation exploits the buyer's lack of technical knowledge. Additional differentiation possibilities are available through the provision of services attendant to the sale of prepared feeds. Such services often are functions (other outputs) necessary to a buyer's successful employment of the input. Three general types of services, feed delivery, deferred payment programs, and management counseling, are evident in the industry.

Competition is complicated by a unique situation in the industry. In effect, two-thirds of the custom mixers sell two sets of outputs: the prepared feeds they manufacture and sell under their own brand names and the prepared feed manufactured by and carrying the brand name of a large manufacturer. A buyer may be offered some incentive to buy the custom mixer's feed rather than that of the large manufacturer. But such an incentive is not likely to be a direct price reduction, mainly because of the fear of retaliatory action, such as dealership agreement rescission, by the large manufacturer. Also, because of buyers' motivations and beliefs, the likelihood that a feasible reduction will be successful is quite small.

Providing feed delivery service is the most heavily employed practice in the industry. During the study period, only one custom mixer and one large manufacturer did not provide it. This service is, of course, spatially limited, but improved technology has increased its feasibility by reducing per unit costs. However, resource expenditure by the firm still depends upon the distance and, to a lesser extent, the quantity delivered to each buyer. Although it still is an important aspect of firm conduct, feed delivery is now more readily recognizable as a complementary firm output for which a price must be paid. Only two custom

Table 4. Conditions under which custom mixers and large manufacturers granted price concessions, Minnesota, 1954-64

Conditions under which price concessions were granted	Number of firms granting concessions	
	Custom mixers	Large manufacturers
Quantity orders	65	27
Cash purchases	41	17
Feeds purchased in regular intervals and in constant quantities	31	9
Feeds bought in bulk	58	29
Feeds picked up by the purchaser	35	20
No concessions granted	4	1

mixers and no large manufacturers reported that they did not make a specific charge for feed delivery. Half of the custom mixers and two-thirds of the large manufacturers reported that they charged on a per ton basis (table 4).

Because delivering small quantities from the central plants is not feasible, large manufacturers have offered deferred payment programs. Such programs are available even for those feeds purchased through a custom mixer. The programs vary from informal ones to risk and management sharing contracts. The latter require considerable involvement and proficiency in enterprise management, so this service has naturally followed once a firm has developed such skills. Deferred payment programs are now generally available throughout the industry. Custom mixers, however, largely limit their involvement to informal arrangements.

The incidence of management counseling is increasing. About half of the custom mixers entering the industry between 1959 and 1964 provided management counseling services, whereas only about one-fifth of the older custom mixers provided it.

Granting price concessions constitutes a fourth general area of interfirm competition. The granting of price concessions under specific purchase conditions approaches the area of price competition. But these concessions generally are not published and are made known at the seller's discretion at the time of sale.

The concessions favor the large, well financed buyer who employs the latest technology, and they may be justified on the basis of cost and risk bearing criteria (table 4). But the manner with which concessions are granted provides the possibility to discriminate between buying firms that are internally similar.

The nearly universal practice of making specific charges for feed delivery and the fact that nearly half of the custom

mixers and two-thirds of the large manufacturers grant price reductions to buyers who do not use the feed delivery service may be indicative of coming changes in the industry. If the industry is going to continue providing this service, it will do so only at a high price. The predominant form of charging for performance also introduces another aspect of discrimination. Since the cost of delivery is highly dependent on distance while the price is quoted on quantity, those buyers located closest to the manufacturing facility are paying a relatively greater price than those located farther from it.

CONCLUSIONS

The organization of the industry changed substantially during the study period. Firms grew in size not only through total industry output expansion, but also because of a large decrease in the number of firms. However, there was no substantial change in the degree of industry concentration. The exit of small firms was particularly heavy between 1954 and 1959, while the entry of large manufacturers was heaviest between 1959 and 1964. Spatially, the industry became more consumption-oriented. Prepared animal feed manufacturing moved toward the areas of heaviest feed concentrate consumption both through firm reorganization and through the entry of large manufacturers in areas of heaviest feed concentrate consumption. Countering this decentralization was a trend toward centralization as the ingredient supplying function became more heavily concentrated in the metropolitan area.

Competition is intensive in the industry but is primarily limited to nonprice activities. Besides heavy involvement in promotional activities, firms provide for delivery of purchased feeds, deferred payment agreements, and some management counseling. Further investigation of firm conduct revealed that price concessions are granted discriminately to those buyers who do not accept available services. So buyers of prepared animal feeds may or may not purchase from the same firm outputs that are complementary to the prepared animal feed. However, the somewhat discretionary procedures used in granting the concessions place the practice in the area of nonprice competition rather than make the firm recognizable as the supplier of several complementary outputs. In addition, the practice complicates the buyer's activities in product price comparison and attainment of knowledge about the industry price levels.

IMPLICATIONS

Organizational changes are to be expected. Nutritional knowledge, which is the industry's foundation, expands continually. This knowledge will increase

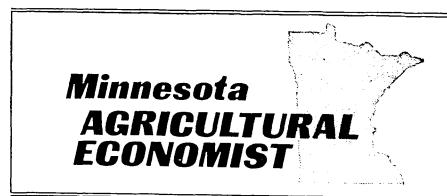
the use of highly sophisticated micro-ingredients, and ingredient manufacturing activity will be concentrated in an industrial community, area I. The use of such ingredients in prepared feeds will require refined mixing facilities that custom mixers do not have and cannot feasibly acquire with small-scale production. The increasing specialization of agricultural production will decrease the demand for the custom mixer's services, so the number most likely will decrease. Those remaining probably will be located in areas of low feed consumption.

Increasing size and specialization in agriculture may have additional ramifications: (1) Increasing specialization will increase the demand for prepared feeds and (2) If the rate of change in agriculture is greater than the rate of change in the feed industry, feed manufacturing facilities will become a feasible capital investment for the farm firm.

A substantial increase in manufacturing firm size is expected. The important question is which firms will grow. Although the conduct described earlier suggests that there may be some degree of "published" price leadership, no firm has been able to capture a large proportion of total industry output. During the study period, intermediate size firms were able to increase output at a slightly greater rate than industry output increased, so intermediate size firms entered the industry. No available evidence indicates a change in these growth patterns.

Most likely, then, the industry will not consist of just a few large firms but will continue to be comprised of many. Also, the range of firm size will narrow.

What this conclusion means for competition is difficult to judge. The current granting of price concessions is perhaps indicative. Firms in the industry recognize that the services they provide actually are outputs that complement the prepared feed. Increased buyer knowledge will decrease the effectiveness of these services as competitive devices. And greater dissemination of nutritional knowledge will decrease the effectiveness of attempted product differentiation. Promotional activities most likely will remain as methods of nonprice competition. ■



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IN PERSPECTIVE



Minnesota's Expanding Fertilizer Industry

Dale C. Dahl

Few industries have recorded as much change in the past 5 years as those that manufacture and distribute fertilizer materials. This article presents some evidence of the magnitude and character of that change. It deals with fertilizer manufacturing activities in plants serving Minnesota farmers. The numbers of firms and plants engaged in each of these activities in 1964 and 1969 are identified in the accompanying table.

Prior to 1958, almost all of the fertilizer manufactured in Minnesota fell into three categories: (1) chemical formulation to grade, (2) ingredient manufacture, and (3) specialty grade. These traditional channels for bringing fertilizer to the farmer started with the manufacture of ingredients (N, P, and K). Most ingredients ultimately used by Minnesota farmers came from outside the state. Ingredient manufacturers in Minnesota have increased their plant numbers within the past 5 years. Most of the new plants produce nitrogen compounds.

In the past, the ingredient manufacturer shipped his nutrient product to the chemical formulator, who usually was located at central points near farming areas. The chemical formulators then produced mixes (or grades) of fertilizer that were in turn distributed to local retail outlets. Chemical formulation has become an even more important link in the marketing system for fertilizer. The number of plants has increased twofold between 1964 and 1969.

The specialty grade category consists of manufacturers who specialize in the

production of lawn and garden fertilizers or in the production of nonnutrient additives for fertilizer mixtures. Specialty grade manufacturers for Minnesota have tripled during the past 5 years, adding more than three times the number of plants that existed in 1964.

Beginning in 1958, technical advances in developing dry nutrient materials that could be mixed and blended made feasible the location of blending facilities at points of heavy fertilizer consumption. In 1964, there were 66 firms with 99 plants engaged in dry blending to customer formula. Within the past 5 years, the number of firms has increased to 214 and the number of plants has increased to 337.

Firms engaged in dry mixing to grade have increased from 54 to 176 over the 5-year period and have 264 plants in the current year, compared to 83 plants in 1964. With blending and mixing operations, the localized manufacturing activity bypasses chemical formulators and wholesalers and purchases its nutrient re-

quirements directly from ingredient manufacturers.

This process of decentralization also is found in liquid grade manufacturing and liquid blending to customer formula. In 1964, there were 15 firms manufacturing liquid grades of nutrients. This number has increased to 37 firms having 117 plants throughout the state within the past 5 years. The number of firms blending liquid to customer requests has increased from 7 firms operating 10 plants in 1964 to 37 firms operating 134 plants today.

CONCLUSIONS

The total number of firms manufacturing fertilizer materials for resale in Minnesota increased from 104 to 249 between 1964 and 1969. These 249 firms now operate 501 plants at various locations throughout the state.

This substantial increase in the number of manufacturing activities in Minnesota has had a substantial impact in rural areas. Assuming a modest figure of \$50,000 for investment per manufacturing plant, the increased number of plants would involve an investment of \$17.6 million by the fertilizer industry in rural Minnesota. ■

Fertilizer manufacturing activities in Minnesota, 1964 and 1969, by number of plants and firms engaging in each activity

Activity	Number of firms		Number of plants	
	1964	1969	1964	1969
Dry blending to customer formula	66	214	99	337
Chemical formulation to grade	14	20	20	41
Liquid grade manufacture	15	37	19	117
Liquid blending to customer request	7	37	9	134
Dry mixing to grade	54	176	83	264
Ingredients manufacture	5	6	6	12
Specialty grade	5	16	5	18
Totals*	104	249	148	501

* The totals are less than the sums of the columns because some plants and firms perform more than one manufacturing activity.
Source: Division of Agronomy Services, Minnesota Department of Agriculture.

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