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MINNESOTA
farm business NOTES

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COSTS OF INTER-PLANT MILK TRANSPORTATION

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The production of dry milk in Minnesota increased from 49 million pounds in 1940 to 506 million pounds in 1958. Most drying plants have increased their average plant volumes significantly during this period.

Eighty Minnesota drying plants processed 4½ billion pounds of milk in 1956. This was an average annual volume of 56 million pounds per plant. Sixty-eight percent of this milk was received from other plants. Most milk-drying plants in the state assemble milk from a few to as many as 25 to 30 local creameries and receiving stations.

As plants have grown in volume, it has usually been necessary for them to assemble milk from larger supply areas. Assembly costs per unit of volume generally increase when supply areas are expanded.

Plant managers are interested in total costs per unit of volume. Planning decisions are made in terms of processing costs plus transportation costs.

Studies made by the Department of Agricultural Economics show that processing costs per unit usually decrease as volume increases. Relatively little is known about milk transportation costs in this area. Therefore, the purpose of this study was to measure inter-plant milk transportation costs. These costs are those associated with the transporting of milk from local creameries and receiving stations to central milk-drying and butter-powder plants.

The data for this study were obtained from 10 large milk-drying plants in Minnesota. These 10 plants were selected from different areas in the state so that costs could be determined under various conditions of roads, terrain, and milk density. Each plant had a truck fleet with 5 to 16 units. These trucks varied in capacities, models, and kind of fuel used.

Truck Costs

Truck costs were estimated from the records of 5 plants. These 5 plants had 49 truck units (truck plus insulated tank). The capacities of these units varied from 13,000 to 43,000 pounds.

The records of these five plants were of sufficient detail so that costs could be compared between plants. It was possible to obtain physical data for variable cost factors such as fuel, oil, grease, and repair labor. Also, purchase specifications were obtained for each truck unit. Each unit was then replaced at fleet prices. Depreciation and interest were then calculated using these replacement costs.

For efficient truck transportation, the size and number of trucks in the fleet should be planned so that each truck can be utilized as many miles as possible per month. The importance of utilization is shown in table 1.

When a 28,500-pound truck is driven 3,000 miles per month, average costs per mile are 17.83 cents. As more miles are driven per month, costs per mile decline. Thus, when 9,000 miles are driven per month, costs decrease to 12.91 cents per mile. This represents a cost savings of 27.6 percent.

Table 1. Milk truck operating costs for a 28,500-pound unit* (truck and tank costs only)

Miles driven per month	Total costs per month	Total costs per mile
	dollars	cents
3,000	535	17.83
5,000	744	14.88
7,000	953	13.62
9,000	1,162	12.91

* Assumptions: (a) All truck capacity is utilized. (b) Fuel, oil, grease, and repair labor were priced at average market prices paid in 1958 by firms studied. (c) Trucks were depreciated on straight line 5-year basis with allowance for salvage value. Tanks were depreciated on straight line 10-year basis with no allowance for salvage value.

In inter-plant milk transportation, some truck sizes are used more frequently than others. Straight trucks with a single driving axle generally transport between 13,000 and 13,500 pounds. Those with a tandem driving axle usually haul between 18,800 and 21,000 pounds.

For tank sizes larger than 25,000 pounds, managers usually find it desirable to use a tractor-trailer combination (semi-truck). These tractor-trailer units are generally either a single axle tractor and a tandem axle trailer or a tandem axle tractor and trailer. The payload of the smaller semi-unit is generally between 35,400 and 38,700 pounds. Larger tractor-trailer combinations usually have a capacity between 41,300 and 43,000 pounds.

Cost estimates for these four truck sizes are presented in table 2 (see page 2). These costs can be analyzed in two different ways. They can be evaluated in terms of costs per mile or per hundredweight-mile (cwt.-mile). The cwt.-mile basis provides the most comparable and best unit of measurement. Both the size of the load and the number of miles driven are taken into account.

Truck costs (excluding labor) per cwt.-mile continually decrease as the capacity of the truck is increased from 13,000 to 38,700 pounds. It costs .0610 cents per cwt.-mile to haul milk in a 13,000 to 13,500-pound truck and .0493 cents per cwt.-mile in a 35,400 to 38,700-pound truck.

For trucks larger than 38,700 pounds, truck costs per cwt.-mile increase. Tractors with a tandem driving axle cost more to operate.

(Continued on page 2)

Labor Costs

Labor costs were estimated using time and motion procedures. Eighty-eight drivers, covering 214 inter-plant routes, were timed in each of their tasks. These data made it possible to estimate the average amount of labor time required per task.

In inter-plant milk transportation, the driver's principal duty is that of operating the truck. In addition, he generally performs all of the local and central plant tasks which are associated with loading and unloading.

The amount of time required to assemble a load of milk depends mainly upon the distance driven, the number of local plant stops, and the sizes of the loading and unloading pumps.

If a driver has a truck with a capacity of 29,000 pounds, makes one stop per load, and can utilize the most common sizes of loading and unloading lines, he can cover a 50-mile route in an average time of 169 minutes.

Driving time averages 72 minutes for a 50-mile route. It takes about the same amount of time for a small truck as for a large truck.

Loading time requires 35 minutes (.120 minutes per cwt.) Unloading time requires 20 minutes (.068 minutes per cwt.). The amount of time required for loading and unloading varies with the amount of milk that has to be handled.

The fixed tasks require 42 minutes. These tasks include connecting and disconnecting the loading lines and other duties. They must be done for each load regardless of the miles driven or milk hauled. Therefore, the fixed time required doesn't vary with the size of the load.

Total Transportation Costs

Total transportation costs were determined by combining truck and labor costs. These data are presented in table 3. Milk transportation costs per cwt. and per cwt.-mile continually decrease as the capacity of the truck is increased from 13,000 to 43,000 pounds. It costs .1237 cents per cwt.-mile to haul milk with a 13,000- to 13,500-pound truck unit. A 41,300- to 43,000-pound truck can transport milk for only .0775 cents per cwt.-mile. This is a cost saving of 37 percent. These cost differences increase when more than 5,000 miles are driven per month.

In addition, total transportation costs per cwt.-mile are less for a 41,300- to 43,000-pound unit than they are for the smaller semi-combinations of 35,400 to 38,700 pounds. The saving in labor is more than sufficient to overcome the increase in truck operating costs.

On the basis of the above, an important inference can be made. Inter-plant transportation costs can be minimized by using the largest tank trucks and trailers that can be operated on the highways. Of course, these units must be used at near or full capacity.

Most milk plants in this state can make large savings in the inter-plant transportation of milk. These savings may be accomplished through (1) full utilization of inter-plant assembly equipment, (2) investment in more efficient loading and unloading equipment, and (3) better planning of the truck fleet.

Table 2. Milk truck operating costs for selected truck capacities* (truck and tank costs only)

Pounds of capacity	Monthly fixed costs per truck	Monthly variable costs per truck	Monthly total costs per truck	Average costs per mile	Average costs per cwt.-mile
	dollars	dollars	dollars	cents	cents
13,000-13,500	137	267	404	8.1	.0610
18,800-21,000	215	313	528	10.6	.0531
35,400-38,700	380	533	913	18.3	.0494
41,300-43,000†	441	614	1,055	21.1	.0501

* Assumptions: (a) Each truck is driven 5,000 miles per month. (b) All costs were calculated using prices and procedures as stated in table 1. (c) All truck capacity is utilized.
† These truck units used only propane and diesel fuels.

Table 3. Milk transportation costs for selected truck capacities*

Pounds of capacity	Total labor costs per month	Total truck costs per month	Transportation costs			
			Per month	Per cwt.	Per mile	Per cwt.-mile
pounds	dollars	dollars	dollars	cents	cents	cents
13,000-13,500	416	404	820	6.19	16.4	.1237
18,800-21,000	453	528	981	4.93	19.6	.0986
35,400-38,700	550	913	1,463	3.95	29.3	.0790
41,300-43,000†	579	1,055	1,634	3.88	32.7	.0775

* Assumptions: (a) Each truck is driven 5,000 miles per month. (b) Route distance is 50 miles (25 miles each way). (c) Only one loading stop per load of milk. (d) Labor rate is $1.80 per hour. (e) All truck capacity is utilized.
† These trucks used only propane and diesel fuels.

Minnesota's Expanding Turkey Industry

Turner Oyloe and Darrell Fienup

Minnesota's turkey production has increased rapidly in the last decade—from 4 million birds in 1950 to about 15½ million in 1960. Along with this growth has come a rapid change in the characteristics of the industry.

The Department of Agricultural Economics of the University of Minnesota has cooperated with the Minnesota Turkey Growers Association to study these changes. The purpose of this study has been to determine the nature of these changes, the forces behind them, and problems that have arisen.

Producers

The number of farmers raising turkeys fell from 16,847 in 1939 to 3,176 in 1949, and to 2,629 in 1954, according to the U. S. Census of Agriculture. The average number of birds per farm rose from 149 in 1939 to 1,082 in 1949, and to 2,684 in 1954.

Further information about production per farm was obtained from the replies to a questionnaire mailed to all members of the Minnesota Turkey Growers Association. Out of 2,200 questionnaires mailed, replies were received from 800. These 800 farmers accounted for approximately 10 percent of the turkeys raised in Minnesota.

One half of the farmers who replied have discontinued their turkey operations in the last few years. Of the farmers who continued to raise turkeys, 20 percent sold 10,000 or more birds in 1955. (See table 1.) This rose to 34 percent in 1959, and probably will rise to 42 percent in 1960.

The number of very large producers rose even more rapidly. Only 1 percent sold 50,000 birds or more in 1955; this will rise to 10 percent in 1960.

These producers have also become highly specialized in turkey production. One half of all producers marketing 10,000 birds or more in 1959 had no

Table 1. Distribution of turkey growers by number of birds marketed 1955-1960

Firms selling	1955	1959	1960*
Under 2,000	31	15	12
2,000-4,999	26	34	29
5,000-9,999	23	16	17
10,000-19,999	13	14	16
20,000-49,999	6	14	16
Over 50,000	1	6	10
Total	100	100	100

* Growers' estimates.

other source of income. With a few isolated exceptions, the remaining one half of these producers (10,000 birds and over) reported that their turkey enterprises accounted for more than one half of their total farm income. Among producers marketing under 10,000 birds, three quarters reported turkeys accounted for 50 percent or less of their total farm income. It appears then that the larger producers are more specialized in turkey production than are the smaller producers.

Hatcheries and Processors

Hatcheries and processors were surveyed by mail questionnaire. Additional evidence on their operations was secured by personal interviews. A recent survey conducted by the University of Wisconsin on processors' operations in Minnesota was also utilized.

Hatcheries have declined in number from 101 in 1949 to 76 in 1957. Available evidence indicates that 11 hatcheries accounted for more than 75 percent of all poults hatched in Minnesota in 1958. Three of these turned out more than 50 percent of the total hatch.

These hatcheries have also moved toward specialization in either turkeys or chicks; in the past many plants hatched both.

Turkey processing, along with hatching, has been concentrated in fewer plants. More than 75 percent of all birds processed in 1958 were handled by 10 processors.

These plants have shifted toward greater specialization in the processing of turkeys. In the past, many processors broke shell eggs and processed chickens along with the turkeys.

Seasonal Distribution

Hatching, processing, and production have also been spread more evenly over the year. In 1951, 94 percent of all birds in Minnesota were hatched in the first 6 months of the year. By 1957, this had fallen to 76 percent of the total. In 1951, 86 percent of the Minnesota turkeys were processed in the last 4 months of the year. By 1957 this had increased to 61 percent of the total birds processed.

Three forces are probably responsible for most of this shift. First, consumers' habits have changed; turkey is no longer primarily a holiday meat.

Second, farmers, hatcheries, and processors have tried to spread production over a longer period in order to use more fully the large fixed investments they have in their plants.

A third factor has been vertical integration. Vertical integration is the linking of two or more stages of the marketing process under one firm or management. Integration of the industry has made it easier to adjust production to the needs and opportunities of the market.

Vertical integration in Minnesota's turkey industry includes both contractual and ownership arrangements. One of the major types of contractual agreements is between the processor and the turkey grower.

There are many types of integration with full ownership. Several hatcheries and processors own and manage turkey flocks. In a few cases, hatcheries, turkey flocks, and processing plants are owned by the same company. Turkey growers also have established hatcheries; and, in some cases, they have built processing plants.

What Contributed to the Changes?

A number of incentives have played an important role in the growth of the industry in Minnesota. On the production side there has been increased efficiency in turkey production and falling death rales among the birds.

Availability of credit has been another factor. Total expenses, especially feed, for a large flock are very big. Only 18 percent of the farmers who replied to the questionnaire provided all of their own financing; 82 percent depended upon other sources for a part or most of their production funds. Feed companies provided the credit for 49 percent of these farmers. Production Credit Associations provided the credit for 14 percent, city banks for 11 percent, and local banks for 9 percent.

Changes in Retailing

Another factor contributing to the concentration of the industry into the hands of a relatively small number of producers, hatcheries, and processors has been the shift of retail marketing to chain stores or other large retailers. More than one half of the birds sold by the processors who were surveyed were sold to large food retailers, either directly or through cooperative associations.

These retailers want a large supply of turkeys of uniform quality and size. They also want to have a dependable source of supply. Large producers are best able to provide these supplies, and consequently have an advantage in sales.

These large retailers also are interested in maintaining a constant flow of goods through their store, rather than having large seasonal variations in types of products handled. They tend to favor the turkey operations which are able to supply birds over a relatively long marketing season.

Problems Facing the Industry

Production of turkeys in the U. S. increased from 1,060 million pounds in 1952 to 1,329 million pounds in 1958. Consumption increased from 6.8 pounds per capita in 1952 to 8.8 pounds in 1958.

Although farmers sold 269 million pounds more of turkeys in 1958 than they did in 1952, the income from birds sold fell by 39 million dollars, from 356 million to 317 million. In part this decline can be explained by the general falling of all agricultural prices—a drop of 13 percent. However, during this same period, the price of turkeys fell 29 percent. Turkey production seems to have outrun effective demand.

Important problems facing the turkey industry are: Will the demand for turkeys expand enough to permit prices to rise with the present level of production? Will production continue to increase, holding prices down or forcing them still lower? This problem of overproduction is recognized as serious by farmers, hatcherymen, processors, and feed dealers.

One of the consequences of falling prices might be to tighten both the amount of credit available and the degree of control the creditor will want in the turkey grower's operation. Although control of the operator's enterprise by agencies extending credit has been limited to advice in the past, the movement to extend this control if prices fall might be stronger in the future.

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THE OUTLOOK CORNER

The Turkey Situation

Minnesota became the leading state in the nation in the number of turkeys produced in 1959. Turkey production in Minnesota and the other principal turkey-producing states is shown in table 1.

Table 1. Production of turkeys in four leading states and U. S.—1959

State	Millions		Percent U. S.		
	Heavy	Light	Heavy	Light	Total
Minn.	11.9	1.6	18	10	16
Calif.	12.2	.6	18	4	15
Iowa	6.7	1.4	10	9	10
Va.	1.6	5.1	2	33	8
U. S.	66.4	15.4	100	100	100

Expansion in per capita consumption of turkey meat has not been as great as commercial chicken broiler meat. (See table 2.)

Table 2. Per capita consumption of poultry meats—U. S.

Year	Turkeys	Broilers	chickens*	Total
	pounds			
1935-39	2.2	1.0	12.4	15.6
1945-49	3.4	5.2	14.2	22.8
1950-54	4.7	11.3	10.5	26.5
1955	5.0	13.9	7.5	26.4
1957	5.9	19.4	6.2	31.5
1959	6.0	23.5	6.3	35.8

* Includes (1) laying hens which have been replaced by pullets and (2) cockerels, usually of egg-laying breeds, which were purchased as "mixed chicks" with pullets.

Heavy breed turkeys and a "holiday" market characterized the earlier years. A shift to smaller turkeys, sold as broilers and fryers, has resulted in more of a "year-around" market. There has been the further development of the so-called large white turkeys which may be sold as mature birds, or as broilers or fryers.

The trend in Minnesota has been toward a higher percentage of small turkeys for the year-around market. Differences in the type of turkeys produced in Minnesota as compared with the entire West North Central Region and the western region are emphasized in table 3.

Table 3. Average liveweight of turkeys sold by region

Year	Minn.	W.N.C.	West
	pounds		
1945-49	18.2	18.2	19.8
1950-54	17.3	18.0	19.3
1955	16.0	17.5	18.5
1956	15.0	16.4	18.6
1957	14.9	16.4	18.7
1958	15.4	16.9	19.0

Table 4. Millions of poults hatched January through April

Type	1959	1960	Percent change
	United States		
Heavy breed	34.4	40.7	18
Light breed	6.6	3.4	48
Total	41.0	44.1	8
	Minnesota		
Heavy breed	7.2	9.1	26
Light breed	.7	.6	—16
Total	7.9	9.7	23

Turkey production has considerable flexibility. With modest prices in the summer of 1959, and the modest prospects for 1960, the number of laying hens was reduced. On January 1, 1960, the inventory of heavy breed hens was 3 percent fewer than a year earlier; light type hens, 30 percent fewer; and, in total, 8 percent fewer.

The extent of flexibility in the number of hatching eggs which can be obtained from turkey breeder flocks during the hatching season, depending on the prices offered, appears to be large.

The sharp rise in prices in late fall of 1959 brought increased interest in turkeys. Orders for poults increased, and the number of poults hatched in January through April, 1960, was actually higher than in the same months in 1959. (See table 4.)

For the first 4 months of 1960 the substantial increase in the number of heavy breed poults hatched was partially offset by fewer light breed poults, but the total was considerably higher than for the same period in 1959.

Since fewer small turkeys will be placed on the market as broilers and fryers, turkey prices should be better through the third quarter of 1960 than they were for that period in 1959. However, the tonnage of turkey meat likely to be marketed in late 1960 will be considerably larger than in 1959.

A significant turkey meat supply factor must be associated with the "heavy white" turkeys and their twofold marketing opportunity. These turkeys can be sold as good quality broilers and fryers at an immature stage or can be matured to heavier weights for the later markets. If substantially large numbers of them are sold during the late summer months, much of the expected "overload" of heavy weight turkeys on the market late in 1960 could disappear. Turkey producers must keep this possibility in mind.

In summary, the present estimate is that turkey prices will remain comparatively favorable until the last quarter of 1960. The demand for turkey meat will no doubt remain pretty much the same as in 1959. With a potential increase in the supply of heavy breed turkeys on the market during the last quarter of 1960, it is expected that prices to producers during this period may average several cents per pound below the prices in 1959.

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