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Minnesota Farm Business Notes

REGIONAL CHANGES IN MINNESOTA'S FARM OUTPUT, 1939-64

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The last 25 years witnessed significant changes in the structure and output of Minnesota's agriculture. The recent release of the Preliminary Reports of the 1964 U.S. Census of Agriculture for Minnesota and for each of its 87 counties provided an opportunity to examine this period of growth and change. Although large quantities of detailed information are available, this article discusses only one set of data: the dollar value of output of farm products.

To provide perspective, the total value of output of **All Farm Products** also is examined in terms of its two major components: (1) **All Crops** and (2) **Livestock and Livestock Products.** These two major components are also treated in terms of their subcomponents: (1) **Field Crops** and (2) **Vegetables** and (1) **Livestock** and (2) **Livestock Products,** respectively. These data are examined for the state level but a regional analysis approach also is used.

Data used in this article are for the terminal years 1939 and 1964 (or 1959 when 1964 data were not available). Since we are concerned with shares and relative change, the use of current instead of constant dollar values is feasible. In addition, weather causes some variation but we believe that price response probably minimizes these weather effects on volume of output at the regional level.

MINNESOTA ECONOMIC REGIONS

For purposes of research and analysis, we have divided the state into 11 economic regions (see the figure). The regions are aggregations of counties into economic areas that are as internally homogeneous as possible in their socio-economic characteristics. At the same time, the regions are discretely different from adjacent—as well as more distant—neighboring regions.

Such data as demographic, agricultural, industrial, trade and commercial, transportation, and resource from 1939 to 1965 were considered when determining these areas. Clearly, no single set of regions can serve as a framework for analysis and action for **every** purpose. Nevertheless, a common framework for the study of problems is a vital first step towards their efficient solution.

This analysis is based upon data shown in the table (page 2). Each output category is discussed below. If you wish to analyze the data on the basis of a single region, examine table data on a column rather than a row basis.

REGIONAL CHANGES— ALL FARM PRODUCTS SOLD

The most significant fact derived from analysis of this overall measure of farm output is that no large change occurred since 1939 in terms of the *share* sold in each region.

Of the four regions whose shares of total farm output sold went down during the 25 years, only the rapidly urbanizing Region 11 lost over a full percentage point (—1.7 percent). In contrast, only the agriculturally intensive South-Central Region (Region 9) gained more than a full percentage point in total share (from 15.4 to 16.6 percent).

This overall regional growth stability is additionally emphasized when the annual average rates of output growth are observed. The nonagricultural Regions 2, 3, and 11 had relatively low rates of growth. But the other eight regions had annual average rates of growth within 0.3 percent of the state's average growth rate of 6.3 percent per year.

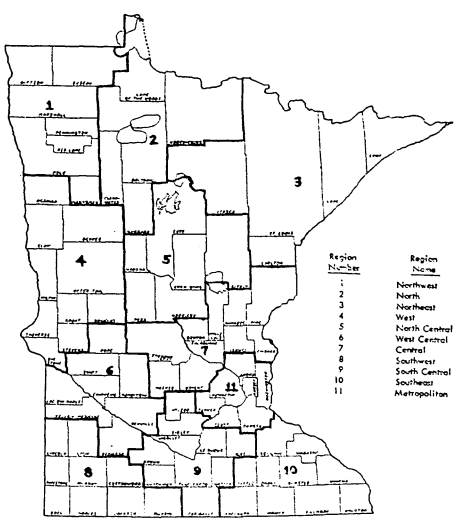
The table also lists the comparative rank of each region in terms of output in the 2 terminal years and in terms of annual average growth rate. Concerning All Farm Products Sold, the top six ranked regions did not change rank over the period; the remaining five changed no more than a single rank each. Note, however, that although Region 1 ranked seventh in total output in 1964, it had the third highest rate of growth during the period.[1]

All Crops Sold

Some impacts of regional comparative advantage become apparent when you consider the level of All Crops Sold. No longer do we find the relative stability in either output rank or rate of growth.

For example, Region 1 in the northwest ranked first in total output of all crops sold in 1939. But it dropped to fifth by 1964 and ranked eighth of 11 in growth rate over the period. Region 9 ranked fourth in 1939 in volume of output but rose to first by 1964 due to a growth rate of 7.6 percent per year. The state's average growth rate was 5.7 percent per year.

Despite some relative shifts in share, the six western and southern regions accounted in 1964—as in 1939—for 85-90 percent of the total value of all crops sold in Minnesota. Within these six regions, only the agricultural belt (Regions 4, 6, 9, and 10) showed an annual average growth rate that was above the state's average rate.



Minnesota Economic Regions

[1] Rates of growth were rounded in the table to the nearest tenth of a percent. For ranking purposes, we calculated rates as far as necessary to determine relative position. Region 1 ranked ahead of Regions 4, 7, and 8 in growth rate, even though the rounded rates shown are the same.

Value of output of all farm products and component parts of all farm products, shares of state totals, and annual average rates of growth, Minnesota and Minnesota Economic Regions, 1939, 1959, and 1964

	Year	Minnesota Economic Region											Minnesota
		1	2	3	4	5	6	7	8	9	10	11	
All farm products:													
Value sold ($000,000):	1939	19.8	4.3	5.3	33.7	11.4	39.9	27.4	50.1	46.5	41.8	20.7	301.0
	1964	93.6	13.1	11.6	158.3	49.6	184.7	129.2	234.7	228.1	200.6	72.3	1375.7
Share of state total (percent):	1939	6.6	1.4	1.8	11.2	3.8	13.3	9.1	16.6	15.4	13.9	6.9	100.0
	1964	6.8	1.0	0.8	11.5	3.6	13.4	9.4	17.1	16.6	14.6	5.2	100.0
Annual average growth rate (percent):	1939-64	6.4	(4.6)*	(3.1)	6.4	(6.1)	6.3	6.4	6.4	6.6	6.5	(5.1)	6.3
Regional output rank:	1939	8	11	10	5	9	4	6	1	2	3	7	NA†
	1964	7	10	11	5	9	4	6	1	2	3	8	NA
Rate of growth rank:	1939-64	3	10	11	6	8	7	4	5	1	2	9	NA
All crops:													
Value sold ($000,000):	1939	23.3	1.4	0.9	14.0	1.5	19.2	5.4	23.0	15.5	8.7	5.4	118.4
	1964	64.1	3.0	2.5	65.9	4.4	75.1	18.3	76.4	96.1	44.1	20.4	470.2
Share of state total (percent):	1939	19.7	1.2	0.7	11.8	1.3	16.2	4.6	19.5	13.1	7.4	4.6	100.0
	1964	13.6	0.6	0.5	14.0	0.9	16.0	3.9	16.3	20.4	9.4	4.3	100.0
Annual average growth rate (percent):	1939-64	(4.1)	(3.1)	(4.2)	6.4	(3.4)	5.7	(5.0)	(4.9)	7.6	6.7	(5.4)	5.7
Regional output rank:	1939	1	10	11	5	9	3	8	2	4	6	7	NA
	1964	5	10	11	4	9	3	8	2	1	6	7	NA
Rate of growth rank:	1939-64	8	11	9	3	10	4	6	7	1	2	5	NA
Field crops:													
Value sold ($000,000):	1939	10.7	1.4	0.6	14.1	1.4	15.4	5.1	22.8	14.5	7.3	2.5	95.9
	1964	57.6	3.2	1.6	65.1	3.9	74.0	17.2	75.4	91.9	38.9	12.5	441.3
Share of state total (percent):	1939	11.1	1.4	0.7	14.8	1.5	16.1	5.3	23.8	15.1	7.6	2.6	100.0
	1964	13.0	0.7	0.4	14.8	0.9	16.8	3.9	17.1	20.1	8.8	2.8	100.0
Annual average growth rate (percent):	1939-64	7.0	(3.5)	(3.7)	6.3	(4.1)	6.5	(5.0)	(4.9)	7.7	6.9	6.6	6.3
Regional output rank:	1939	5	10	11	4	9	2	7	1	3	6	8	NA
	1964	5	10	11	4	9	3	7	2	1	6	8	NA
Rate of growth rank:	1939-64	2	11	10	6	9	5	7	8	1	3	4	NA
Vegetables:													
Value sold ($000,000):	1939	11	10	115	70	12	40	168	119	653	739	933	2870
	1964	32	14	94	341	74	936	456	577	3288	2494	1924	10230
Share of state total (percent):	1939	0.4	0.4	4.0	2.4	0.4	1.4	5.9	4.1	22.8	25.8	32.5	100.0
	1964	0.3	0.1	0.9	3.3	0.7	9.2	4.5	5.6	32.1	24.4	18.0	100.0
Annual average growth rate (percent):	1939-64	(4.4)	(1.4)	(−0.8)	6.6	7.6	13.4	(4.1)	6.5	6.7	(5.0)	(2.9)	5.2
Regional output rank:	1939	10	11	6	7	9	8	4	5	3	2	1	NA
	1964	10	11	8	7	9	4	6	5	1	2	3	NA
Rate of growth rank:	1939-64	7	10	11	4	2	1	8	5	3	6	9	NA
Livestock and livestock products:													
Value sold ($000,000):	1939	9.0	2.8	4.3	19.6	9.7	20.7	21.6	27.1	30.9	33.0	15.2	194.0
	1964	29.5	9.2	9.1	92.1	45.1	109.6	107.6	158.3	131.9	156.5	51.8	900.6
Share of state total (percent):	1939	4.6	1.4	2.2	10.1	5.0	10.7	11.1	13.9	16.0	17.0	7.9	100.0
	1964	3.3	1.0	1.0	10.2	5.0	12.2	11.9	17.6	14.6	17.4	5.8	100.0
Annual average growth rate (percent):	1939-64	(4.9)	(4.9)	(3.0)	6.4	6.4	6.9	6.6	7.3	(6.0)	6.4	(5.0)	6.3
Regional output rank:	1939	9	11	10	6	8	5	4	3	2	1	7	NA
	1964	9	10	11	6	8	4	5	1	3	2	7	NA
Rate of growth rank:	1939-64	10	9	11	5	6	2	3	1	7	4	8	NA
Livestock:													
Value sold ($000,000):	1939	3.5	0.9	0.9	8.5	3.1	12.4	7.9	36.0	15.8	16.3	4.3	109.6
	1959	12.3	4.4	1.8	41.4	18.2	63.1	37.1	243.9	73.8	81.5	20.0	597.4
Share of state total (percent):	1939	3.2	0.8	0.8	7.7	2.9	11.3	8.0	32.8	14.4	14.9	3.9	100.0
	1959	2.1	0.7	0.3	6.9	3.0	10.6	6.2	40.1	12.4	13.6	3.4	100.0
Annual average growth rate (percent):	1939-59	(6.5)	(8.3)	(3.5)	(8.3)	9.2	(8.5)	(8.1)	10.1	(8.0)	(8.4)	(8.0)	8.6
Regional output rank:	1939	8	10	11	5	9	4	6	1	3	2	7	NA
	1959	9	10	11	5	8	4	6	1	3	2	7	NA
Rate of growth rank:	1939-59	10	5	11	6	2	3	7	1	9	4	8	NA
Livestock products:													
Value sold ($000,000):	1939	5.4	1.9	3.6	11.1	6.6	7.5	14.0	9.1	15.2	16.7	11.0	101.9
	1959	14.0	5.0	6.1	38.3	26.4	29.1	59.6	27.8	49.0	69.2	34.0	358.6
Share of state total (percent):	1939	5.3	1.9	3.5	10.9	6.5	7.3	13.8	8.9	14.9	16.4	10.8	100.0
	1959	3.9	1.4	1.7	10.7	7.4	8.1	16.6	7.7	13.7	19.3	9.5	100.0
Annual average growth rate (percent):	1939-59	(4.9)	(5.0)	(2.7)	(6.4)	7.2	7.1	7.5	(5.8)	(6.1)	7.4	(5.8)	6.5
Regional output rank:	1939	9	11	10	4	8	7	3	6	2	1	5	NA
	1959	9	11	10	4	8	6	2	7	3	1	5	NA
Rate of growth rank:	1939-59	10	9	11	5	3	4	1	8	6	2	7	NA

* Numbers in parentheses are less than the rate for Minnesota as a whole.
† NA = not available.
Source: U.S. Census of Agriculture, 1939, 1949, 1959, and 1964 (preliminary).

Field crops sold—Only two regions experienced over a 2-percent change in their net share of the state's total output of field crops sold. The changes in these adjacent regions, Regions 8 and 9, were numerically almost offsetting. Region 8, in the southwest corner, dropped from 23.8 percent of the state total in 1939 to 17.1 percent in 1964. Conversely, Region 9 rose from 15.1 percent in 1939 to 20.1 percent in 1964.

In terms of value of output sold, only the regions ranked first, second, and third had a change in relative rank

over the period. And only Region 9, which rose from third to first, moved as much as two positions in rank.

As was found for All Crops Sold, the six western and southern regions accounted for about 90 percent of the total state value in both 1939 and 1964. In this category, however, the agricultural belt of Regions 4, 6, 9, and 10 was joined by Regions 1 and 11 in exhibiting annual average growth rates above the state's average rate.

Technological developments in soybean, corn, and oat production, plus the shift in livestock production concentrations, partly accounted for these growth rates in the agricultural belt. In Region 1, the explanation lies in the relatively rapid increases in sugar beet and potato production. In Region 11, demands increased substantially for high valued horticultural products due to rapid urban growth and housing construction.

Vegetables sold—Within this second component of All Crops Sold, patterns of growth and change were quite different. The most substantial growth in terms of annual average rates occurred in Regions 4, 5, 6, 8, and 9. These five regions accounted for just under one-third of the total state value sold in 1939; by 1964, they accounted for just over one-half. One of these five regions, Region 9, plus Regions 10 and 11 accounted for over 80 percent of the state total in 1939; these same three accounted for about 75 percent in 1964.

Despite their dominant positions in terms of volume of output, Regions 10 and 11 experienced growth rates below the state average. This relative decline resulted from the interrelationships of rising land values in urbanizing areas and technological improvements in vegetable processing and transportation. These factors make it economical to move processing plants close to production sources and to ship fresh vegetables long distances without quality loss.

This ability to transport fresh vegetables over long distances also helps explain the rather sharp declines in relative (not absolute) values of output in Regions 2, 3, and 11. As technological breakthroughs make vegetable processing and distribution industries relatively footloose, agronomic developments for particular vegetable crops may play an ever increasing role in industry locations.

Livestock and Livestock Products Sold

In both 1939 and 1964, this second major component accounted for about 65 percent of the total value of All Farm Products Sold in Minnesota. Moreover, this component was somewhat more evenly distributed in volume throughout the state than was the volume of All Crops Sold. Although the agricultural belt of the western and southern regions accounted for about 90 percent of All Crops Sold in 1939 and 1964, it accounted for only about 75 percent of the total value of Livestock and Livestock Products Sold. However, two-thirds of this total—or 50 percent of the state total—was concentrated in Regions 8, 9, and 10.

This concentration increased slightly over the 25 years, but only Region 8 increased its rate substantially above the state's average rate. The central area of Minnesota, represented by Regions 4, 5, 6, and 7, also grew in share somewhat more rapidly than the state as a whole. As can be seen in the table, only the northern tier of regions and the metropolitan region grew significantly slower than the state as a whole.

Livestock sold alive—In terms of annual average growth rate, this component was the most rapidly growing sector of Minnesota's farm economy. It showed an annual average growth rate in the state of 8.6 percent per year as compared with 6.3 percent per year for All Farm Products Sold and 5.7 percent per year for All Crops Sold.

In addition, marked regional concentrations were apparent. Region 8, in the southwest, accounted for almost one-third of the total state value in 1939 and two-fifths in 1959 (1964 data for this and the following component of Livestock Products are not yet available from census sources).

In terms of relative rank in volume of sales, the 11 regions did not significantly change over the period. In fact, only Regions 1 and 5 changed in rank position and they only reversed their eighth and ninth positions.

Livestock products sold—A more even dispersion of activity throughout the state existed for this subcategory than for the Livestock Sold Alive category, partly because this component includes both poultry and dairy products. Poultry is not as closely tied technologically to land area as is most agricultural activity; dairy products are related to population concentrations. Products such as wool, fur pelts, honey, and processed meats also are included and make regional analysis difficult because of their wide variety.

Regions 7 and 10, north and south of the metropolitan region, contained the largest share of the total volume of livestock products sold in 1959 and also grew most rapidly during the period. Together with Region 9, which was the third largest in share but which did not grow as fast over the 20 years, they accounted for about 50 percent of the state total, up slightly from their 1939 share.

IN REVIEW

In this article, we attempted to place in context some recently available data from the 1964 Preliminary Reports of the Census of Agriculture with earlier data from the 1939 Census. Although not included, similar series for each of the census years 1944, 1949, 1954, and 1959 were collated and analyzed. In your own analysis of the table, keep in mind that:

- Value data are in current dollars. Price deflation to constant dollars is not possible without extensive further research.

- Terminal year values are used. Weather effects are "washed out" only to the extent that aggregations of county data to regional levels takes care of some of this problem and price response (demand) takes care of another part.

- Regional aggregations are in terms of general functional economic areas. Examination of a wide selection of agricultural output data indicates that these regions also usefully delineate agricultural areas of the state. Obviously, these areas are not discrete along county boundaries; the overlap of areas of agricultural specialization must be expected.

- For the Livestock Sold and Livestock Products Sold categories, 1964 data are not yet available so 1959 data are presented.

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In perspective

Changes In Farm Size

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In recent technical and popular literature, much discussion has been presented about the dramatic changes occurring in the numbers and average size of farms. This brief article treats only one of these two related events: average farm size in acres. Furthermore, it is descriptive rather than analytical; its purpose is to place into perspective the fact that *within* Minnesota there have been significant variations in this pattern of change.

The regions illustrated in the figure on page 1 will again form a spatial frame of reference. Because annual average rates of change as well as changes in absolute size varied during 1939-64, data are presented for the two 10-year periods of 1939-49 and 1949-59 and for the 5-year period of 1959-64 (see the table).

The nature and direction of change can be examined in many ways including: (1) annual average rates of change in size over the quarter-century, (2) direction of changes in the rate of change in each time interval, and (3) relative regional rank in average farm size in 1939 and 1964.

Annual average rates of change over the 25 years exhibited a strong regional pattern. Without exception, as the annual average rates of change are examined by moving from west to east through the regions, the rates increased. Again without exception, moving through the regions from south to north, the rates increased. In addition, the rates of change were the greatest in the nonfarm Regions 2 and 3 and least in the agricultural area of Regions 6, 8, 9, and 10.

Directions of changes in the rate of change also exhibited regional patterns. Annual average rates of increase in farm size rose steadily in all 11 regions except the two nonfarm regions, 2 and 3, where the rates declined steadily, and the Metropolitan Region, 11. In Region 11, the rate declined in 1949-59 as compared with 1939-49 and then rose marginally in 1959-64.

Conditions of tenure and the type of farming undoubtedly played major roles in these differing rates of change, just as they did in considerations of average size of farm. Moreover, technological change, particularly as it relates to cost efficiencies of large-scale commercial farming, is probably far from having run its full course in Minnesota's agricultural areas. Major changes are yet to come.

Regional rankings of average farm size evidenced distinct patterns of regional distribution. In 1939 the six western and southern regions accounted for the six highest rankings in terms of average farm size. In 1964 the western regions still retained four of the first five rankings but Regions 2 and 5 had moved into fourth and sixth ranks, respectively. Region 2 incurred most of this change in rank during 1939-49. The rise in rank of Region 5 took place somewhat more slowly.

Detailed examination of factors affecting these relative ranks is not possible in this article. But many forces including tenure, type of farming, and technology come into play. In addition, the distribution within each region of (1) the numbers of farms in various size classes and (2) the total number of farms affects both the real and "statistical" ability of each region to adjust or conform to an "average" pattern.

Besides the regional data in the table, available data for Minnesota and the United States are also shown. The average size of farm in Minnesota was only slightly smaller than the average in the United States in 1939. But Minnesota's average farm size grew at an annual average rate that was less than half of that of the nation's farms as a whole. Therefore, in 1959, Minnesota's average farm size was only about two-thirds of the national average size.

Of course, variations in regional average size were substantial in Minnesota. Nevertheless, only one region, the Northwest, had an average farm size greater than the national average in 1959.

Changes in average size of farm by Minnesota Economic Regions and the United States, 1939-64

Region	Average farm size				Average annual growth rate in farm size			
	1939	1949	1959	1964	1939-49	1949-59	1959-64	1939-64
	acres				percent per year			
1	266	306	369	421	1.4	1.9	2.7	1.8
2	132	180	230	254	3.2	2.5	2.0	2.7
3	78	112	147	161	3.6	2.7	1.8	2.9
4	214	234	270	302	0.9	1.4	2.4	1.4
5	135	159	186	205	1.7	1.6	2.0	1.7
6	209	210	232	261	0.1	1.0	2.4	0.9
7	134	150	169	181	1.1	1.1	1.4	1.2
8	203	202	222	251	—0.1	1.0	2.6	0.8
9	154	159	175	192	0.3	1.0	1.8	0.9
10	161	168	185	203	0.4	1.1	2.0	0.9
11	102	116	139	149	1.2	1.8	1.4	1.5
Minnesota	165	184	211	234	1.1	1.4	2.2	1.4
United States	174	215	303	NA*	2.2	3.5	NA	NA

* NA = not available; 1964 census data for the United States have not been released yet.
Source: U.S. Census of Agriculture, 1939, 1949, 1959, and 1964 (preliminary)

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