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COMMENTS ON STRUCTURAL AND PRODUCTIVITY TRENDS IN THE
SWINE INDUSTRY AND MINNESOTA'S COMPETITIVE POSITION

William F. Lazarus



Department of Agricultural and Applied Economics

University of Minnesota
Institute of Agriculture, Forestry and Home Economics
St. Paul, Minnesota 55108

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William F. Lazarus*

*William F. Lazarus is an Assistant Professor and Extension Economist -
Farm Management in the Department of Agricultural and Applied Economics,
University of Minnesota.

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Introduction

Industry leaders and state government officials continue to be concerned about the future competitive position of the Minnesota swine industry and state policy directions in areas such as corporate forms of ownership, production contracting, and environmental regulations (Gay). October is also Pork Month, traditionally a time to reflect on the industry's economic importance, where it has been and where it is going in the future.

The body of this paper contains four short sections. Each section addresses a question relating to the competitiveness issue. They contain little in the way of new research, but summarize statistics from other sources and relate them to the current situation in Minnesota, primarily for an audience of top producers, industry leaders and government officials. The sections are:

1. Minnesota's Hog Numbers and Farm Numbers
2. Are Economies of Size Changing the Survivability of Small Swine Operations?
3. Growth Areas for Swine Production in Minnesota, Iowa and North Carolina
4. Are Minnesota Swine Producers Keeping Up With Industry Productivity Gains?

Minnesota's Hog Numbers and Farm Numbers

There are good reasons why the Minnesota swine industry became established and has prospered through most of this century. Minnesota has some important advantages for producing pork. There is a plentiful supply of competitively priced feed. Minnesota farmers have a wealth of expertise in raising hogs. Also, seasonal labor demands for hogs fit well between peak periods of crop work, although this is becoming less important with modern year-round confinement swine facilities.

There were 16,300 farms with hogs in Minnesota in 1989, representing about one of every six farms. They sold over 1.8 billion pounds of pork in 1989. Minnesota ranks third in the United States in the value of hogs marketed. In 1989, Minnesota producers sold hogs valued at \$810 million at the farm level.

But swine operations are changing. Farms producing hogs are becoming fewer, larger and more specialized. While the number of swine operations has decreased about 16 percent in the past five years, the

number of hogs on Minnesota farms has stayed roughly constant. In fact, that number--between four and five million head--has remained relatively constant for over 30 years. Hogs accounted for 12 percent of farm cash receipts in Minnesota in 1988.

Is the concern about the competitive position of the Minnesota swine industry, justified? A check of the statistical data shows that hog numbers in the state are fairly stable. The number of farms with hogs has also remained relatively constant over the past two years, after declining at a rapid rate in the early 1980's.

The three tables below show the trends in hog numbers and numbers of swine operations in Minnesota, the U.S. overall, and a regional breakdown. The nation's hog numbers peaked around 1959 with around 68 million. It was down to 51 million in 1986, and has come back up to around 53 to 56 million since that time, based on December 1 inventories.

The Minnesota swine industry has been growing steadily since the turn of the century. Our share of the nation's hogs was recorded as 2.3 percent in 1900. It was 7.1 percent by 1978. We were up to 8.2 percent by the December 1 1985 inventory count, dropped to 7.9 percent in 1987, and then went up to 8.5 percent in 1988. Breeding herd numbers are not shown in Table 1, but the trend is similar. Minnesota has a slightly higher share of the breeding herd than its share overall in most years, reflecting our status as something of a feeder pig producer and exporter to other states. Recently our share of the breeding herd has been running about 1 to 3 tenths of a percent higher than the share of the total inventory.

Is the drop in share to 8.2 percent in 1989 just a yearly fluctuation, or is our upward trend in share ending? Time will tell. Looking at the past few years, the 0.2 percent drop in 1987 followed by the 0.6 percent jump the next year would tend to make us think that the 0.3 percent drop in 1989 may just be statistical sampling error or random variation.

Minnesota and the rest of the nation have been losing swine operations at a rapid rate over the past decade. The remaining operations are taking up the slack by expanding. Table 2 shows that there were 309,700 swine operations in the U.S. on December 1, 1989. That number is only 49 percent of the 632,360 we had eleven years earlier, in 1978. Minnesota has 16,300 operations as of last count, 52 percent of the 31,000 we had in 1978. One encouraging sign for those concerned with the loss of operations is while we lost 3,000 operations from 1985 to 1987, we have lost only 200 in the two years since then. Of course, another downturn in industry profit levels would likely cause hog producers to exit the business at a faster rate.

A regional breakdown in hog production is shown in Table 3. The western Corn Belt states of Minnesota, Iowa and Missouri together produced 41 percent of the total in 1985. We have since dropped slightly to 38.6 percent in 1989, down 2.4 percent. However, this decline has apparently come in Iowa and especially in Missouri, with a

gain in Minnesota. The eastern Corn Belt has also declined by a smaller amount, down 0.6 percent since 1985. The Northern Plains states have also been growing in share fairly steadily, with a 1.4 percent increase from 1985 to 1989. This is about the same increase as in the Southeastern states. North Carolina accounts for about two-thirds of the growth in the Southeast overall.

The Minnesota swine industry faces a continual challenge to improve in productivity and efficiency to keep up with innovators elsewhere. At the same time, we must guard against a defeatist attitude. These figures would indicate that while there is concern about what will happen as many of our facilities wear out and operators reach retirement age, we are competing pretty well in the national arena.

Table 1. Minnesota and U.S. Hog Inventory, December 1

Year	U.S. (000)	Minnesota (000)	% of U.S.
1870	25,100	148	0.5
1880	49,800	381	0.8
1900	62,900	1,459	2.3
1920	59,400	2,387	4.0
1940	34,100	1,667	4.9
1959	67,900	4,706	6.9
1978	57,700	4,090	7.1
1985	52,250	4,300	8.2
1986	50,900	4,100	8.1
1987	53,800	4,260	7.9
1988	55,299	4,690	8.5
1989	53,852	4,450	8.2

Sources: NASS, USDA, Hogs and Pigs; Census of Agriculture

Table 2. Minnesota and U.S. Farm Operations With Hogs, December 1.

Year	% of		
	U.S.	Minnesota	U.S.
1978	632,360	31,000	4.9
1985	395,510	19,500	4.9
1986	346,890	18,000	5.2
1987	331,620	16,500	5.0
1988	326,600	16,500	5.1
1989	309,700	16,300	5.3

Source: NASS, USDA, Hogs and Pigs

Table 3. Regional Distribution of U.S. Hog Production^a

	1955	1965	1975	1985	1986	1987	1988	1989
Region	Percent of U.S. Production							
Corn Belt-Lake States								
Eastern ^b	31.1	31.7	29.2	27.3	26.9	27.1	27.8	26.7
Western ^c	37.8	37.8	39.6	41.0	39.8	39.9	39.0	38.6
Northern Plains ^d	11.1	12.1	12.8	13.0	14.0	13.9	14.0	14.4
Southeast ^e	13.0	12.8	14.8	13.4	13.7	13.3	13.8	14.9
North Carolina	(1.8)	(2.0)	(3.4)	(4.4)	(4.5)	(4.5)	(4.9)	(5.4)
Southwest ^f	2.6	2.0	2.4	1.3	1.4	1.5	1.5	1.5
Other ^g	4.4	3.6	4.2	4.0	4.2	4.3	3.9	3.9

Source: NASS, USDA, Meat Animals: Production, Disposition and Income

^aBased on liveweight production.

^bOhio, Indiana, Illinois, Michigan, Wisconsin.

^cMinnesota, Iowa, Missouri.

^dNorth Dakota, South Dakota, Nebraska, Kansas.

^eArkansas, Louisiana, Kentucky, Tennessee, Mississippi, Georgia, Florida, South Carolina, North Carolina, Virginia, Alabama.

^fTexas, Oklahoma, New Mexico.

^gRemaining states.

Are Economies of Size Changing the Survivability of Small Swine Operations?

Minnesota's future competitive position in the swine industry may well be greatly affected by our attitudes and policies related to growth in size of individual swine operations. Perhaps a review of numbers on U.S. swine operation sizes over time and what they imply about economies of size in the industry may help to stimulate our thinking about the future.

The 1987 Census of Agriculture showed that most Minnesota swine operations were small. About 750 farms had 1,000 or more hogs and pigs on hand. Farms with 2,000 or more hogs totalled 174. About three-quarters of Minnesota's swine operations have breeding herds. They either grow hogs to market size or sell feeder pigs for finishing on other farms. The rest of the operations grow and finish feeder pigs purchased elsewhere.

Changes in the swine industry over time are described in a recent report, "Structural Trends in U.S. Hog Production" by V. James Rhodes at the University of Missouri. He calls the period from the Great Depression until 1970 the commercialization era. Nearly every farm had some hogs in the early years of the twentieth century. By 1970, hogs on most farms were no longer being kept for home use but rather were raised for sale. The era since 1969 can be called the industrialization of the swine industry. The rapid acceptance of production in buildings was followed by other attributes of industrialization such as more standardized procedures, higher capital/labor ratios, more hired employees, a higher proportion of purchased inputs, and larger units.

Dr. Rhodes points out that a characteristic of industrialization is the growth in the sales of economically efficient units. In hog production, larger operating units can achieve profit-enhancing efficiency gains ("economies of size") through a better mix of buildings, equipment, and technology. Other efficiencies may be gained through more efficient use of information (on markets, technology, environment and labor), and better prices through volume marketing and purchases. Business units or firms can sometimes achieve greater efficiencies in information and prices by linking together a number of operating units (each operating unit being what we usually think of as a farm).

A finding of important economies of size does not deny the great importance of superior management. A small unit superbly managed will have lower costs than a large unit with mediocre management. However, large size and good management are mutually attracted.

The approach used by Dr. Rhodes to evaluate economies of size in the swine industry is "survivor analysis", comparing changes over time in the numbers of various sizes of operations. The thesis is that the numbers of weak (inefficient) units will decline relative to the numbers of the more viable units. If larger units are more viable than smaller units, then there are presumed to be economies of size.

The number of operating units marketing less than 200 hogs and pigs per year have declined continuously since 1959, based on U.S. Census of Agriculture figures shown in Table 4. The number of farms marketing between 200 and 499 hogs grew in numbers after 1959. After 1969, these operations no longer seemed to compete as well but units between 500 and 999 hogs marketed continued to grow.

Units with 1,000 or more are still growing in number as of the date of the 1987 census. Table 5 shows a further breakdown within this group in 1978, 1982 and 1987. While all three size groups (1,000-1,999, 2,000-4,999, and 5,000 up) have shown growth in number of farms, growth is clearly relatively faster for the larger farms. The number in the 1,000-1,999 group has probably already peaked while the numbers in the two larger groups may be expected to keep growing. Percentage growth is positively related to size of unit. The dividing line between groups of growing and declining farm numbers has grown rapidly from 200 to 1,000 head marketed and will likely soon be around 2,000.

While only a small minority of farms have been above 1,000 head in annual marketings -- 3 percent in 1978 up to 10 percent in 1987 -- the larger farms' share of total marketings has been much more impressive. Their share rose from nearly 34 percent in 1970 to 57.5 percent in 1987 (Table 6). Most impressive has been the growth, 1978 to 1987, from 6.5 million to 16.5 million marketed by the farms of 5,000 head or more.

Table 4. Numbers of U.S. Farms Selling Hogs and Pigs by Size Groups, 1959-1987

Census Year	Total Farms	Number of Head Sold Per Farm					1,000 & More
		1-99	100- 199	200- 499	500- 999		
Thousands of Farms							
1959	1,273	1,018	161	81	10	1.5	
1969	604	361	109	101	25	6.6	
1978	470	281	69	74	30	15.8	
1982	315	162	44	56	30	21.6	
1987	239	110	33	45	27.5	23.9	
Percent of Total Hog Farms							
1959	100.0	80.0	12.6	6.4	0.8	0.1	
1969	100.0	59.8	18.0	16.7	4.1	1.1	
1978	100.0	59.8	14.7	15.7	6.4	3.4	
1982	100.0	51.4	14.0	17.8	9.5	6.9	
1987	100.0	46.0	13.8	18.8	11.5	10.0	

SOURCE: V. James Rhodes. "Structural Trends in U.S. Hog Production." Agricultural Economics Report 1990-5, University of Missouri.

Table 5. Number of Large U.S. Hog Farms by Size Groups, 1978-87

Census Year	Number of Head Sold Per Farm		
	1,000-1,999	2,000-4,999	5,000 and More
	Number of Farms		
1978	11,591	3,434	727
1982	15,216	5,233	1,199
1987	15,941	6,354	1,630
	Percent of Total Hog Farms		
1978	2.4	0.7	0.1
1982	4.8	1.7	0.4
1987	6.7	2.7	0.7

SOURCE: Rhodes

Table 6. Number and Percent of U.S. Marketings of Hogs and Pigs by Size of Farm, 1978, 1982 and 1987

Census Year	Farm Size by Annual Marketings			
	Less Than 1,000	1,000- 1,999	2,000- 4,999	5,000 and More
	Thousands of Head Marketed			
1978	61,089	15,057	9,441	6,472
1982	49,186	20,010	14,436	11,187
1987	41,051	21,156	17,779	16,522
	Percent of Total Marketings			
1978	66.4	16.3	10.3	7.0
1982	51.9	21.1	15.2	11.8
1987	42.5	21.9	18.5	17.1

SOURCE: Rhodes

Growth Areas for Swine Production in Minnesota, Iowa and North Carolina

Much has been written over the past few years about whether swine production may be gradually shifting toward the fringes of the Corn Belt, and what Minnesota should be doing to maintain our competitive position. As we study the situation, we might keep in mind that there are areas within Minnesota where the swine industry is growing rapidly, and other areas where numbers are declining. If we are interested in helping the swine industry grow in Minnesota, we might look at those areas that are growing, and try to identify actions that would facilitate their growth as well as helping other areas to grow.

We compared Minnesota to Iowa, the largest swine producing state, and North Carolina, the fastest growing of the major swine producing states. The top 10 counties in each state in 1988 were identified, based on December 1988 hog inventories on farms. Then we looked back 10 years to the top 10 counties in the December 1978 inventory, and calculated the percent change in hog numbers in each county over the 10 years.

Table 7 shows the results. In Minnesota, Nobles County in the southwestern part of the state was number 1 in 1978 (see the map in Figure 1). Nobles has remained fairly stable in numbers since then but has fallen to fifth place. Martin County, two counties to the east, is now in the number 1 position with a 77 percent increase in numbers in 10 years. Jackson County has moved from third to second place. Freeborn County has also moved up, from fifth to third.

The fastest growing counties next to Martin are Blue Earth with a 68 percent increase and Renville, up 58 percent. Blue Earth is now in fourth place, while Renville has joined the top 10 by moving into seventh. Mower County increased hog numbers slightly but fell from fourth to sixth place. Faribault and Stearns Counties also moved up in the rankings. Fillmore, Lyon, Murray and Sibley are the counties that declined in hog numbers over the period.

Iowa hog numbers have been more stable (Figure 2). Sioux County in the northwestern part of the state grew 26 percent to move from second to first place, while Plymouth County to the south has dropped 7 percent over the 10 years. Three counties in northeastern Iowa, Delaware, Dubuque and Clayton, are growing steadily with increases of 11, 15 and 15 percent, respectively. The center of the state has seen more declines than increases among the major hog producing counties, with Sac and Jasper up but six other counties down.

North Carolina has seen spectacular growth in several counties (Figure 3). Duplin and Sampson Counties are where the major growth in contract production seems to be taking place. Duplin is up 128 percent while Sampson County to the west grew 95 percent. Six counties to the northeast of Duplin and Sampson are also growing rapidly, while Johnston and Wayne Counties in the center of the state and Robeson to the south are declining.

Table 7. Hogs on Farms, Top 10 Counties in Minnesota, Iowa and North Carolina, December, 1978 and December, 1988.

	<u>December, 1978</u>		<u>December, 1988</u>		Percent Change 1978-88
	Hogs on Farms	Rank	Hogs on Farms	Rank	
<u>Minnesota</u>					
Martin	145,800	2	258,600	1	77.4
Jackson	144,000	3	180,600	2	25.4
Freeborn	143,300	5	176,200	3	23.0
Blue Earth	98,100	12	164,300	4	67.5
Nobles	154,400	1	157,800	5	2.2
Mower	143,800	4	146,500	6	1.9
Renville	89,800	13	141,800	7	57.9
Faribault	120,900	9	140,400	8	16.1
Fillmore	140,200	6	135,300	9	-3.5
Stearns	99,800	11	126,600	10	26.9
Lyon	127,900	7	124,300	11	-2.8
Murray	125,100	8	107,900	12	-13.7
Sibley	113,600	10	107,400	13	-5.5
<u>Iowa</u>					
Sioux	390,000	2	493,000	1	26.4
Delaware	415,000	1	462,000	2	11.3
Plymouth	375,000	3	348,000	3	-7.2
Dubuque	290,000	7	333,000	4	14.8
Clayton	270,000	8	310,000	5	14.8
Washington	345,000	4	304,000	6	-11.9
Carroll	295,000	6	277,000	7	-6.1
Mahaska	300,000	5	248,000	8	-17.3
Sac	210,000	11	237,000	9	12.9
Jasper	225,000	10	236,000	10	4.9
Cedar	270,000	9	225,000	11	-16.7
<u>North Carolina</u>					
Sampson	204,100	1	398,000	1	95.0
Duplin	152,500	2	347,000	2	127.5
Greene	105,000	5	205,000	3	95.2
Pitt	83,200	6	125,600	4	51.0
Wayne	120,000	4	109,500	5	-8.8
Washington	70,000	8	105,000	6	50.0
Beaufort	61,000	9	83,000	7	36.1
Halifax	45,000	15	75,900	8	68.7
Johnston	120,500	3	72,000	9	-40.2
Lenoir	56,000	10	70,000	10	25.0
Robeson	82,000	7	70,000	11	-14.6

SOURCES: Iowa Agricultural Statistics, Minnesota Agricultural Statistics, and North Carolina Agricultural Statistics, 1978 and 1988.

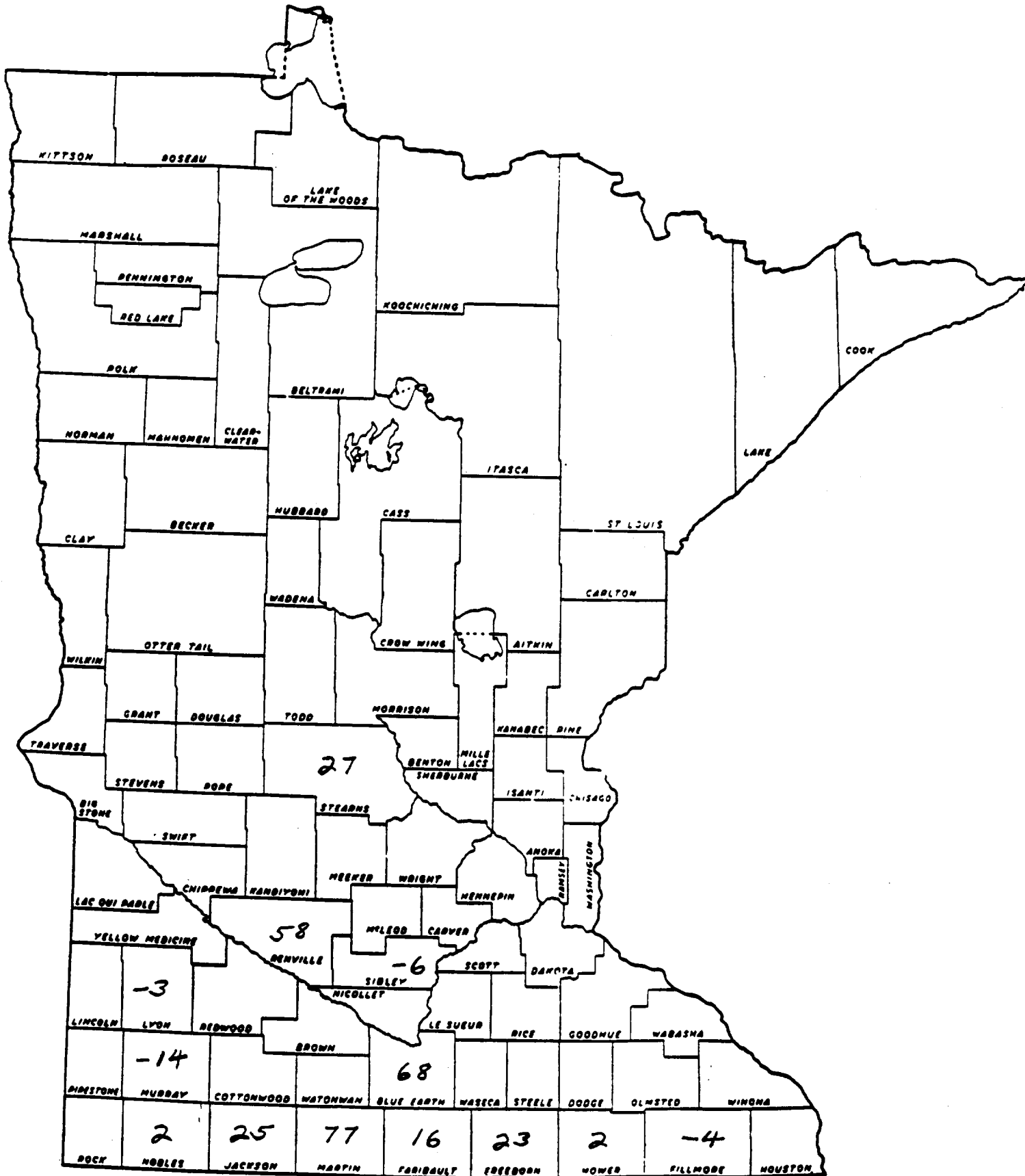
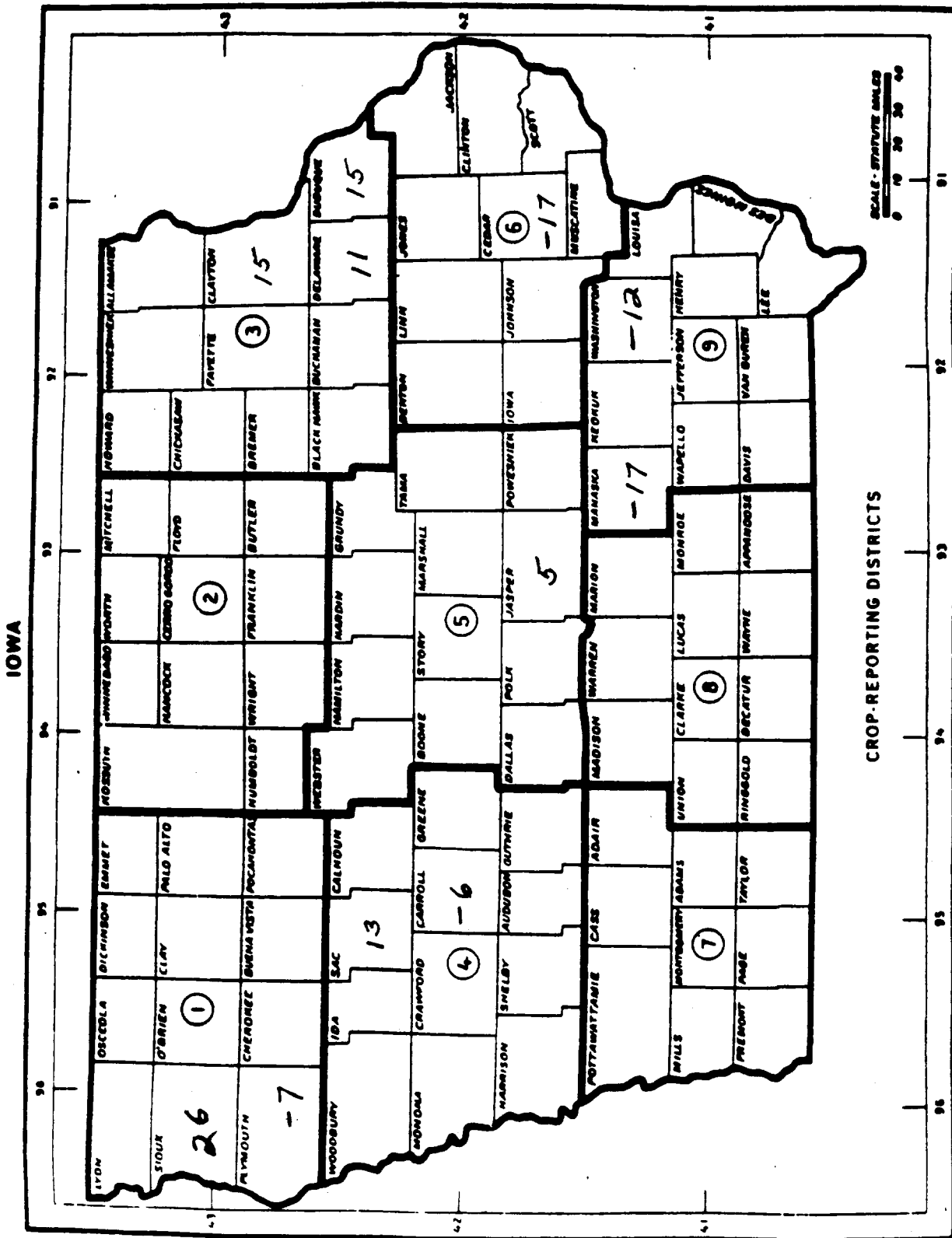


Figure 1. Percent Change in Hog Numbers on Farms, December 1978 to December 1988, counties in top 10 in 1978 or 1988.



Statistical Reporting Service

Figure 2. Percent % Change in Hog Numbers on Farms, December 1978 to December 1988, counties in top 10 in 1978 or 1988.

NORTH CAROLINA AGRICULTURAL STATISTICS DISTRICTS

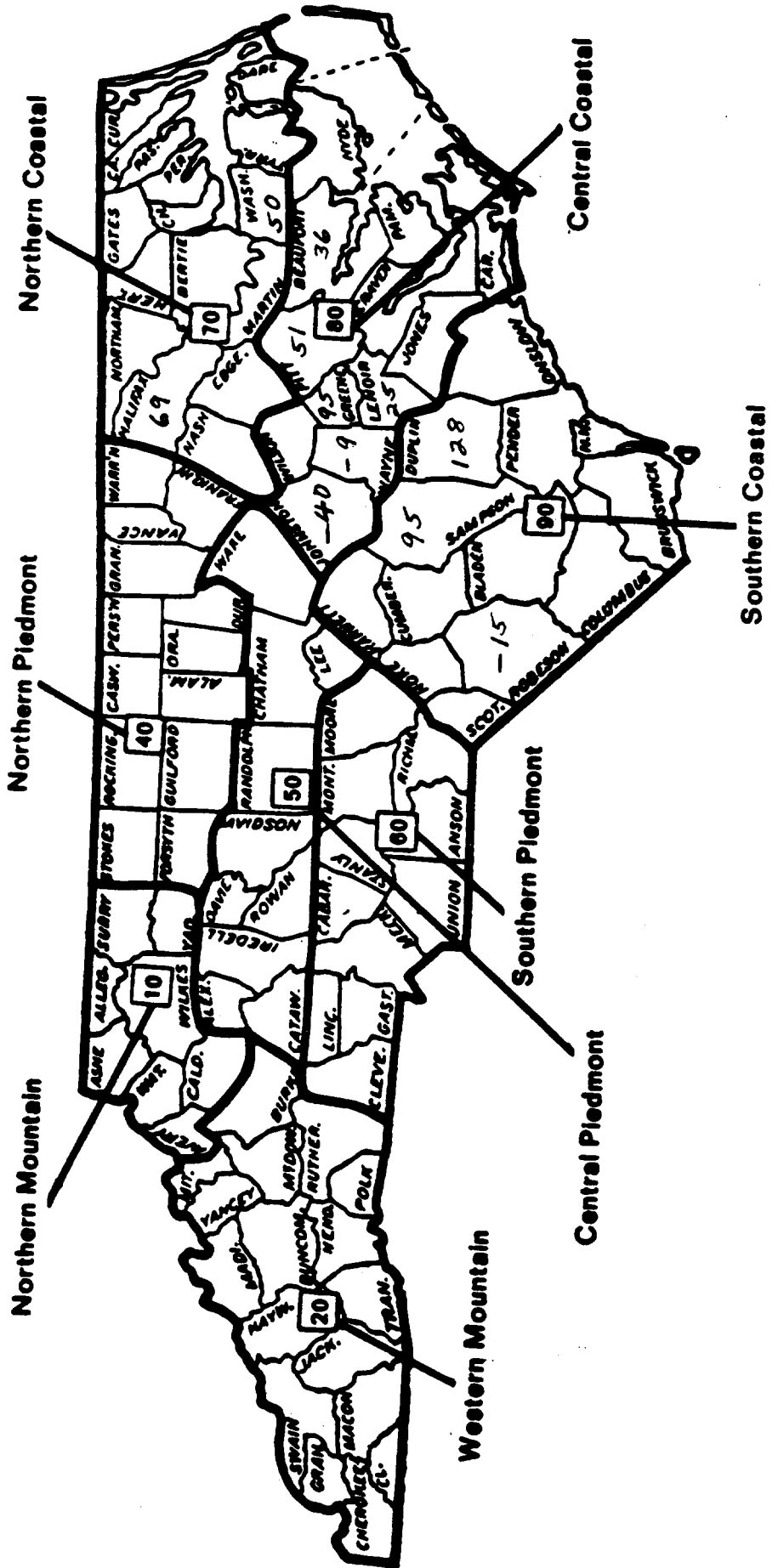


Figure 3. Percent Change in Hog Numbers on Farms, December 1978 to December 1988, Counties in Top 10 in 1978 or 1988.

Are Minnesota Swine Producers Keeping Up With Industry Productivity Gains?

The productive efficiency of U.S. swine enterprises has shown steady improvement during the past decade. On average, 7.79 pigs were weaned per litter in 1989 (see Table 8). That was a record high. There were 1.67 farrowings in 1989 for each animal in the breeding herd on December 1, 1988. Although not as high as 1988's 1.70, it is impressive considering that the breeding herd was declining during 1989.

Minnesota producers have been consistently above the national average over the decade. At 7.97 pigs per litter in 1989, we were 0.18 above the national figure, and 0.06 more litters per breeding animal.

More impressive for the U.S. are the slaughter and production averages (Table 9). In 1989, 12.57 pigs were slaughtered and 2,234 pounds of pork produced per animal in the breeding herd. Both are record high figures and continue the steep upward trend of the 1980's. Compared to 1965, each animal in the 1989 breeding herd produced 3.53 more slaughter hogs and 919 pounds more pork.

One interesting question that relates to the future structure of the swine industry is how these productivity gains are coming about. We know that a lot of producers are leaving the industry over time. If these producers were below average, and were included in the older figures but not the more recent ones, then the averages will improve whether or not other continuing producers have improved over time. To answer the question of how much of the improvement is from good producers getting better versus less productive ones getting out, we compared the overall industry rates of productivity gain in pigs weaned per sow per year against records of a group of 22 Minnesota producers who operated farrow-to-finish enterprises continuously over a six-year period, 1984-89. The producers participate in the Southwestern and Southwestern Minnesota Farm Business Management Associations (FBMA).

Olson and Tvedt examined the representativeness of the Southwest FBMA farms based on 1983 data. They found that the FBMA farms were larger in acreage, with less investment and higher debt per acre, but also higher rates of return on total assets, than Census of Agriculture averages. Farm product sales per acre were higher and livestock made up a higher proportion of sales on the FBMA farms.

For the U.S. and Minnesota overall, quarterly farrowings per sow were estimated by dividing total quarterly farrowings by breeding herd size at the start of the quarter, from the USDA Hogs and Pigs report (Table 10). Quarterly farrowings were then multiplied by quarterly average pigs per litter to arrive at pigs per sow, and summed over the four quarters for an annual total. U.S. breeding herd size on March 1 and September 1 has been reported starting only in 1988. For 1987 and earlier years, the U.S. March and September sizes were interpolated based on the nearby December and June sizes and the quarterly figures for the 10 major hog producing states. The procedure to interpolate the March U.S. breeding herd size was to first calculate the difference between the 10 state March and previous December sizes, and divide by

the difference between the following June and previous December sizes to get a ratio. This ratio was then multiplied by the difference between the U.S. December and June sizes, and the result added to the December figure. A similar procedure was used for the September interpolation.

The small number of FBMA farms causes their averages to vary more from year to year than do the USDA figures. The FBMA average rose from 12.88 in 1984 to 14.04 in 1986. There was a slight decline in 1987 to 13.87, and then a drop to 12.79 in 1988, probably due mainly to the extreme heat experienced during that summer's drought. More normal weather in 1989 was accompanied by a record 14.33 pigs per sow (Table 11). It is interesting that the estimated pigs weaned per sow for Minnesota overall did not decline in 1988, but rather hit an all-time high 13.99 (Table 10). The quarterly ratios of sows farrowing to sows in inventory are not included in the tables, but were examined to see if the hot summer affected conception rates. The ratio for the March-May period was 0.50 in 1988, and was the highest of any year. The next highest March-May ratio was 0.49 in 1990. This quarterly number corresponds with winter breedings which would not have been affected by the summer heat. The September-November, 1988 ratio was 0.41, which is about in the middle of the range for that quarter seen in recent years. Perhaps innovations such as drip coolers and improved ventilation systems helped to maintain productivity. Facilities on many of the FBMA farms are fairly old, and perhaps were more difficult to keep cool.

While it is useful to compare trends on the FBMA farms to those in the USDA data, differences in the way breeding animals are counted may also account for some of the differences in any given year. In the FBMA records, replacement breeding animals are included as "sows" in the calculation of per sow data only after they have farrowed (Hawkins et al., page FINAN-19 and page FINANX-75). The recommended FBMA procedure for calculating average breeding herd size is to total the monthly numbers over the year and divide by 12.

Breeding herd productivity may decline during expansion of the breeding herd because of the influx of gilts, and may increase when the herd is shrinking. A statistical analysis provides some factors to use to adjust predictions of the pigs per sow productivity measure for changes in breeding herd size (Table 12). For each million animals added to the national breeding herd, pigs per sow falls by 0.180. For Minnesota, pigs per sow drops 0.00279 for each thousand animals added to the state's breeding herd. In the FBMA farms, it drops 0.0391 for each additional breeding animal added to the enterprise.

The U.S. data shows pigs per sow increasing at 0.221 per year, apart from the impact of herd size. The Minnesota industry overall is increasing productivity at a higher rate than the nation, 0.244 per year. The group of 22 continuing FBMA producers increased at 0.183 per year. Because of the year-to-year variability in the numbers, the FBMA rates of increase are not statistically reliable.

The two FBMA regressions use a shorter six-year time series, 1984 through 1989, than the U.S. and Minnesota analyses which use the 11 years 1979 through 1989. To test whether the U.S. and Minnesota

productivity gains might have tapered off later in the 11-year period, accounting for the difference between them and the FBMA trend, other runs were made with a (0,1) variable set to one for the 1984-89 period. It was not significant, indicating that the U.S. and Minnesota productivity trends have not changed over the period.

It appears from these numbers that the 22 FBMA continuing farms are keeping up pretty well with the increase in productivity, although they are losing some ground. While the data is too variable to be reliable in a statistical sense, one might say that about 75 percent of Minnesota's productivity gain might be coming from improvements on our continuing operations ($0.183 \text{ FBMA} \times 100 / 0.244 \text{ MN overall} = 75\%$), with the other 25 percent of the improvement coming from less productive operations dropping out and more productive ones expanding or starting new operations.

The FBMA producers are also improving feed efficiency over time. The farrow-to-finish average was 4.1 pounds per pound of pork produced 1984, and dropped to 3.9 pounds in 1989 with some slight year-to-year variability in between. The trend is down 0.0529 pounds per year. Unfortunately, there are no national or state overall averages to compare to the FBMA feed efficiency figures.

Table 8. Pigs Per Litter and Farrowings Per Animal in U.S. and Minnesota Breeding Herds

Year	U.S.		Minnesota	
	Pigs Per Litter	Farrowings Per Animal In Breeding Herd ^a	Pigs Per Litter	Farrowings Per Animal In Breeding Herd ^a
1989	7.79	1.67	7.97	1.71
1988	7.70	1.67	7.96	1.75
1987	7.76	1.64	7.88	1.71
1986	7.72	1.61	8.00	1.68
1985	7.65	1.62	7.92	1.67
1984	7.49	1.58	7.87	1.62
1983	7.41	1.62	7.71	1.70
1982	7.37	1.52	7.49	1.59
1981	7.38	1.48	7.45	1.52
1980	7.22	1.49	7.54	1.56
1979	7.10	1.45	7.28	1.48

SOURCE: USDA Hogs and Pigs Report

^a Quarterly sows farrowing divided by breeding herd at start of quarter, totalled over year.

Table 9. Commercial Hog Slaughter and Pork Production Per Animal in U.S. Breeding Herd

Year	Hog Slaughter (head)	Pork Production (pounds)
1989	12.57	2,234
1988	12.40	2,207
1987	12.12	2,139
1986	11.74	2,065
1985	12.19	2,120
1984	11.52	1,992
1983	11.72	2,023
1982	10.48	1,800
1981	10.04	1,724
1980	9.96	1,704
1979	9.28	1,590
1978	8.99	1,535
1977	9.65	1,629
1976	9.74	1,613
1975	9.30	1,531
1974	9.50	1,579
1973	8.88	1,454
1972	9.99	1,588
1971	9.79	1,514
1970	9.34	1,442
1969	8.85	1,349
1968	9.27	1,401
1967	9.27	1,397
1966	9.00	1,353
1965	9.04	1,315

SOURCE: USDA Hogs and Pigs Report

Table 10. Breeding Herd and Estimated Pigs Weaned Per Sow Per Year, U.S. and Minnesota Swine Industry

Year	Breeding Herd ^a	Estimated Pigs Weaned Per Sow Per Year ^b
<u>U.S.</u>	(thousands)	(head)
1989	7,082	12.97
1988	7,222	12.86
1987	6,898	12.72
1986	6,641	12.42
1985	6,916	12.44
1984	7,331	11.81
1983	7,706	12.00
1982	7,511	11.23
1981	8,615	10.91
1980	9,448	10.78
1979	9,939	10.32
<u>Minnesota</u>	(thousands)	(head)
1989	590	13.63
1988	572	13.99
1987	536	13.47
1986	504	13.45
1985	533	13.22
1984	550	12.71
1983	570	13.14
1982	577	11.88
1981	680	11.31
1980	760	11.76
1979	741	10.80

SOURCE: USDA Hogs and Pigs Report

^a Average of March 1, June 1, September 1 and previous December 1 inventories. U.S. March 1 and September 1 inventories for 1987 and earlier interpolated from 10 state totals.

^b Quarterly pig crop divided by breeding herd at start of quarter, totalled over the year.

Table 11. Breeding Animals Per Operation, Pigs Weaned Per Sow Per Year and Feed Per Pound of Pork Produced, 22 FBMA Producers

Year	Breeding Herd	Pigs Weaned Per Sow Per Year	Feed Per Pound of Pork
	(head per operation)	(head)	(pounds)
1989	107	14.33	3.90
1988	108	12.79	3.96
1987	112	13.87	4.02
1986	103	14.04	4.00
1985	100	13.42	4.25
1984	107	12.88	4.10

SOURCE: Southeastern and Southwestern Minnesota Farm Business Management Association records

Table 12. Ordinary Least Squares Regression Analysis of Productivity Trends in the U.S., Minnesota and FBMA Farms

Model	<u>Independent Variables</u>		R Squared
	Year	Breeding Herd Size ^a	
<u>Pigs/Sow/Year</u>			
U.S. Industry, 1979-89	0.221 (0.0343) ^b	-0.180 (0.104)	0.97
Minnesota Industry, 1979-89	0.244 (0.0551)	-0.00279 (0.00211)	0.89
FBMA Individual Farm, 1984-89	0.183 (0.187)	-0.0391 (0.0888)	0.24
<u>Feed/Pound of Pork</u>			
FBMA Individual Farm, 1984-89	-0.0529 (0.0196)		0.65

^a Units are million head for U.S. industry, thousand head for Minnesota industry, and head for FBMA individual farm analysis.

^b Standard errors in parentheses.

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