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TRENDS IN FARM MACHINERY PURCHASES IN NORTH DAKOTA



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FOREWORD

This report compiles information on the number of specified farm machines on farms and sales of farm equipment during the 1967 to 1977 period. Data are gathered from a number of sources and presented in one convenient publication.

The authors wish to acknowledge the contributions of the clerical and professional staff of the Department of Agricultural Economics who have participated in the preparation of this report.

Appreciation is expressed to Implement and Tractor for the generous use of sales data.

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Highlights

Farmers purchased nearly five billion dollars worth of farm machinery in the United States in 1976. Farm machinery was the largest input group and accounted for 31 percent of total farm inputs. The average farm worker has 55 horsepower at his disposal.

Tractor size has been increasing. The average-sized tractor sold in the United States exceeded 100 horsepower for the first time in 1977 when it reached 103.4 horsepower. The average-sized tractor sold in North Dakota in 1977 was 144.3 horsepower. Almost 90 percent of the tractors sold in North Dakota in 1977 were 100 horsepower or more.

Larger-sized tractors tend to have regional sales patterns, with nearly two-thirds of the sales made in 10 western and midwestern states. North Dakota has led the nation in sales of four-wheel drive tractors every year since 1973 except 1977. It has purchased more wind-rows than any other state since 1967.

The average number of tractors per North Dakota farm has slowly increased, from 2.45 per farm in 1964 to 2.88 tractors per farm in 1974. The total horsepower sold has increased from 351,000 in 1967 to over 541,000 sold in 1976. Motor trucks and grain combines on North Dakota farms have increased both in absolute numbers and in numbers per farm since 1964.

Sales of farm machinery in North Dakota have definite seasonal patterns. Two peaks in tractor purchases occur during the year; one in April or May, and a second in October. The peak in sales of both wind-rows and combines occurs in August each year.

The cost of repairing and operating machinery has doubled since 1972, both nationally and in North Dakota.

TRENDS IN FARM MACHINERY PURCHASES IN NORTH DAKOTA

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Gordon W. Erlandson and Keith Crawford*

Farmers purchased nearly five billion dollars worth of farm machinery in 1976, to bring the total value of farm implements and machinery to about \$66 billion (Table 1). Mechanical power and machinery accounted for 31 percent of total farm inputs in 1976 and was the largest input group. Technology in the form of new equipment permits the substitution of capital for labor and results in the enhancement of every citizen's welfare.

TABLE 1. FARMERS' EXPENDITURES FOR MACHINERY AND EQUIPMENT AND MACHINERY VALUE ON FARMS, SELECTED YEARS, UNITED STATES

Years	Expenditures for Farm Machinery (billion dollars)	Value of Farm Machinery, Implements (billion dollars)
1950	1.4	12.2
1955	1.3	18.7
1960	1.5	22.7
1965	2.2	24.8
1970	2.9	32.3
1971	2.7	34.4
1972	3.2	36.6
1973	4.6	39.3
1974	5.0	44.2
1975	4.8	56.5
1976	4.9	65.9

SOURCE: United States Bureau of the Census, Statistical Abstract of the United States, 1977, 98th Edition, Washington, D.C., p. 693.

This report has two objectives with respect to farm machinery nationally and in North Dakota. First, it presents a collection of data on farm

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machinery ownership. Census data were utilized to show the geographic distribution of machinery ownership on farms. Historical series presents numbers of major implements on farms over various time periods. Secondly, data are presented on machinery purchases during the 1968-1977 period. Data on purchases of farm wheel tractors, grain combines, and windrowers were tabulated by month of purchase to determine seasonality patterns and trends.

Seasonality of implement sales are important to farm machinery dealers as an aid in inventory control and to coordinate selling effort. Some machine items are sold every month throughout the year, but some implements (windrowers, for example) have a relatively short sales season. The remaining weeks of the year exhibit strong sales resistance on the part of buyers. Sales personnel, advertising, and promotion must all be coordinated and in phase with the particular sales period.

The farm machinery retailing industry benefits the community. These business enterprises not only supply new and used implements to farmers, but also furnish parts and repairs for existing implements. Much of the mechanical service is highly technical. Most of these benefits accrue directly to the farming community. There are wider benefits, however. The sales of machinery have a multiplier effect, and the location of these firms throughout the state contributes to the economic welfare of the local governmental units. This is in addition to the employment possibilities they provide.

Machinery on Farms

The growth in mechanization on United States' farms from 1910 to 1977 is indicated in Table 2. The important increases have occurred since World War II in all of the machines listed. The number of tractors reached a plateau at 4.7 million and then began to decline. The number of horsepower has steadily increased, with 232 million horsepower on farms in 1977. Farm workers, on the average, have about 55 horsepower at their disposal.

Implements on North Dakota Farms

Census data were utilized to show the location of farm machinery on North Dakota farms. Information on three categories of major implements are available: tractors, combines, and motor trucks and pickups. County maps of North Dakota were used to list the number of implements in each county, and a second set of maps to show the number of implements per farm. Three time periods were compared--1964, 1969, and 1974.

TABLE 2. FARM MACHINERY: NUMBER OF SPECIFIED KINDS ON FARMS, AND TRACTOR HORSEPOWER, UNITED STATES, 1910-1977^a

Year	Tractors (Exclusive of Steam and Garden)				Motor Trucks	Grain Combines ^c	Corn Pickers and Picker Shellers ^d	Pickup Balers ^e	Field Forage Harvesters ^f
	Total ^b	Wheel	Crawler	Horsepower					
	-----thousands-----			-----millions-----			-----thousands-----		
1910	1	--	--	--	0	1	--	--	--
1911	4	--	--	--	2	--	--	--	--
1912	8	--	--	--	5	--	--	--	--
1913	14	--	--	--	10	--	--	--	--
1914	17	--	--	--	15	--	--	--	--
1915	25	--	--	--	25	--	--	--	--
1916	37	--	--	--	40	--	--	--	--
1917	51	--	--	--	60	--	--	--	--
1918	85	--	--	--	89	--	--	--	--
1919	158	--	--	--	111	--	--	--	--
1920	246 ^g	--	--	10 ^h	139 ^g	4	10	--	--
1921	343	--	--	--	207	--	--	--	--
1922	372	--	--	--	263	--	--	--	--
1923	428	--	--	--	316	--	--	--	--
1924	496	--	--	--	363	--	--	--	--
1925	549	--	--	--	459	--	--	--	--
1926	621	--	--	--	559	--	--	--	--
1927	693	--	--	--	662	--	--	--	--
1928	782	--	--	--	753	--	--	--	--
1929	827	--	--	--	840	--	--	--	--
1930	920 ^g	--	--	25 ^h	900 ^g	61	50	--	--
1931	997	--	--	--	920	--	--	--	--
1932	1,022	--	--	--	910	--	--	--	--
1933	1,019	--	--	--	865	--	--	--	--
1934	1,016	--	--	--	875	--	--	--	--
1935	1,048	--	--	--	890	--	--	--	--
1936	1,125	--	--	--	923	--	--	--	--
1937	1,230	--	--	--	990	--	--	--	--
1938	1,370	--	--	--	1,042	--	--	--	--
1939	1,445	--	--	39	1,020	--	--	--	--
1940	1,567 ^g	--	--	42	1,047 ^g	190	110	--	--
1941	1,665	--	--	45	1,095	225	120	--	--
1942	1,860	--	--	50	1,160	275	130	25	--
1943	2,055	--	--	55	1,280	320	138	31	--
1944	2,160	--	--	58	1,385	345	146	34	--
1945	2,354 ^g	2,255	99	61	1,490 ^g	375 ^g	168	42	20
1946	2,480	2,374	106	64	1,550	420	203	54	25
1947	2,613	2,500	113	69	1,700	465	236	65	30
1948	2,821	2,700	121	77	1,900	535	299	90	45
1949	3,123	2,990	133	85	2,065	620	372	135	60
1950	3,394 ^g	3,250	144	93	2,207 ^g	714 ^g	456 ^g	195 ^g	81
1951	3,678	3,531	147	101	2,325	810	522	240	102
1952	3,907	3,756	151	108	2,430	887	588	298	124
1953	4,100	3,946	154	115	2,535	930	630	345	148
1954	4,243	4,086	157	121	2,610	965	660	395	175
1955	4,345 ^g	4,185	160	126	2,675 ^g	980 ^g	688 ^g	448 ^g	202 ^g
1956	4,480	4,310	170	134	2,707	1,005	715	505	220
1957	4,570	4,392	178	139	2,745	1,015	740	560	240
1958	4,620	4,434	186	144	2,775	1,030	755	600	258
1959	4,673	4,481	192	150	2,800	1,045	775	645	270
1960	4,688 ^g	4,489	199	153	2,834 ^g	1,042 ^g	792 ^g	680 ^g	291 ^g
1961	4,743	4,547	196	158	2,850	980	740	685	291
1962	4,763	4,570	193	162	2,885	960	730	703	300
1963	4,778	4,588	190	167	2,925	940	720	718	307
1964	4,786	4,598	188	172	2,970	920	705	734	312
1965	4,787 ^g	4,601	186	176	3,030 ^g	910 ^g	690 ^g	751 ^g	316 ^g
1966	4,783	4,594	189	182	3,017	888	686	748	316
1967	4,786	4,593	193	189	3,009	867	680	748	319
1968	4,766	4,570	196	195	3,016	847	673	739	321
1969	4,712	4,513	199	199	3,004	820	657	725	314
1970	4,619 ^g	4,416	203	203	2,984 ^g	790 ^g	635 ^g	708 ^g	304 ^g
1971 ⁱ	4,584	4,391	193	206	2,994	760	630	700	300
1972 ⁱ	4,549	4,366	183	209	3,003	725	625	692	298
1973 ⁱ	4,518	4,345	173	212	3,013	701	621	684	292
1974 ⁱ	4,493	4,329	164	219	3,023	698	618	674	295
1975 ⁱ	4,469 ^g	4,311	158	222	3,032 ^g	524 ^g	615 ^g	667 ^g	255 ^g
1976 ⁱ	4,434	4,281	153	228	3,043	527	610	641	263
1977 ^j	4,402	4,260	142	232	3,052	535	605	615	270

^aData as of January 1. Base data are derived primarily from Agricultural Census reports. For years not covered and items not reported in the Agricultural Census, the following information sources were used to derive estimates: Current Industrial Reports of the Census Bureau (formerly Facts for Industry), annual registrations of motor vehicles, results of surveys, changes in farm income, and estimated discard rates.

^bIncludes wheel and crawler type tractors.

^cData for 1975 and after are for self-propelled combines only.

^dIncludes cornheads for combines.

^eDoes not include large balers, over 200 pounds.

^fData for 1976 and after do not include flail-type forage harvesters.

^gCensus of Agriculture year.

^hAverage of 1920-1924 and 1930-1934.

ⁱRevised.

^jPreliminary.

SOURCE: United States Department of Agriculture, Economic Research Service, Changes in Farm Production and Efficiency, 1977, Statistical Bulletin 581, Washington, D.C., November, 1977, p. 31.

Farm Wheel Tractors

A total of 120,360 farm wheel tractors were on North Dakota farms in 1974 (Figure 1). Since counties vary in size, the number of tractors per county may be expected to vary proportionately. Figure 2 shows the number of tractors per farm in each county. This figure shows the trend which prevails in each county. Every county showed an increase in the number of tractors per farm during the 10-year comparison. (Foster, Stutsman, Burleigh, Emmons, Ramsey, and Renville did not show increases between 1964 and 1969.) The number per farm is remarkably stable throughout the state, and fluctuates within a very narrow range from county to county. The largest number in 1974 was Foster County with 3.41 per farm, and the smallest number was 2.45 tractors per farm in Williams County.

The Agricultural Census collects data on the number of farm tractors in each county that were manufactured in the past five years (Figure 3). The range in the percentage of late model tractors in 1974 was from 11.9 percent in Grant County to 24.9 percent in Traill County.

Motor Trucks and Pickups

There were 81,570 motor trucks and pickups on North Dakota farms in 1964, according to the Agricultural Census. This number increased to 91,216 by 1969 and to 101,291 in 1974. Cass County had 4,066 trucks in 1974, which is the largest number of any county that year. Sioux County had the fewest, with 537 in that year (Figure 4). Every county recorded an increase in numbers every census period, with the two exceptions of Emmons and McKenzie counties. The counties showing the heaviest concentration of trucks were in the Red River Valley, which reflects the type of farming carried out. Producers of root crops depend on trucks to a larger extent than do grain farmers. More trucks are needed to haul the greater tonnages produced per acre.

The average number of trucks per farm also showed an increase over the period in question. There were 1.67 units per farm in 1964; 2.00 in 1969; and 2.43 per farm in 1974. The numbers per farm ranged from 1.84 in Morton County to 3.20 in Grand Forks County in 1974 (Figure 5). Again, this fact reflects the need for larger numbers of trucks per farm for harvesting heavy tonnage crops, such as potatoes and sugarbeets.

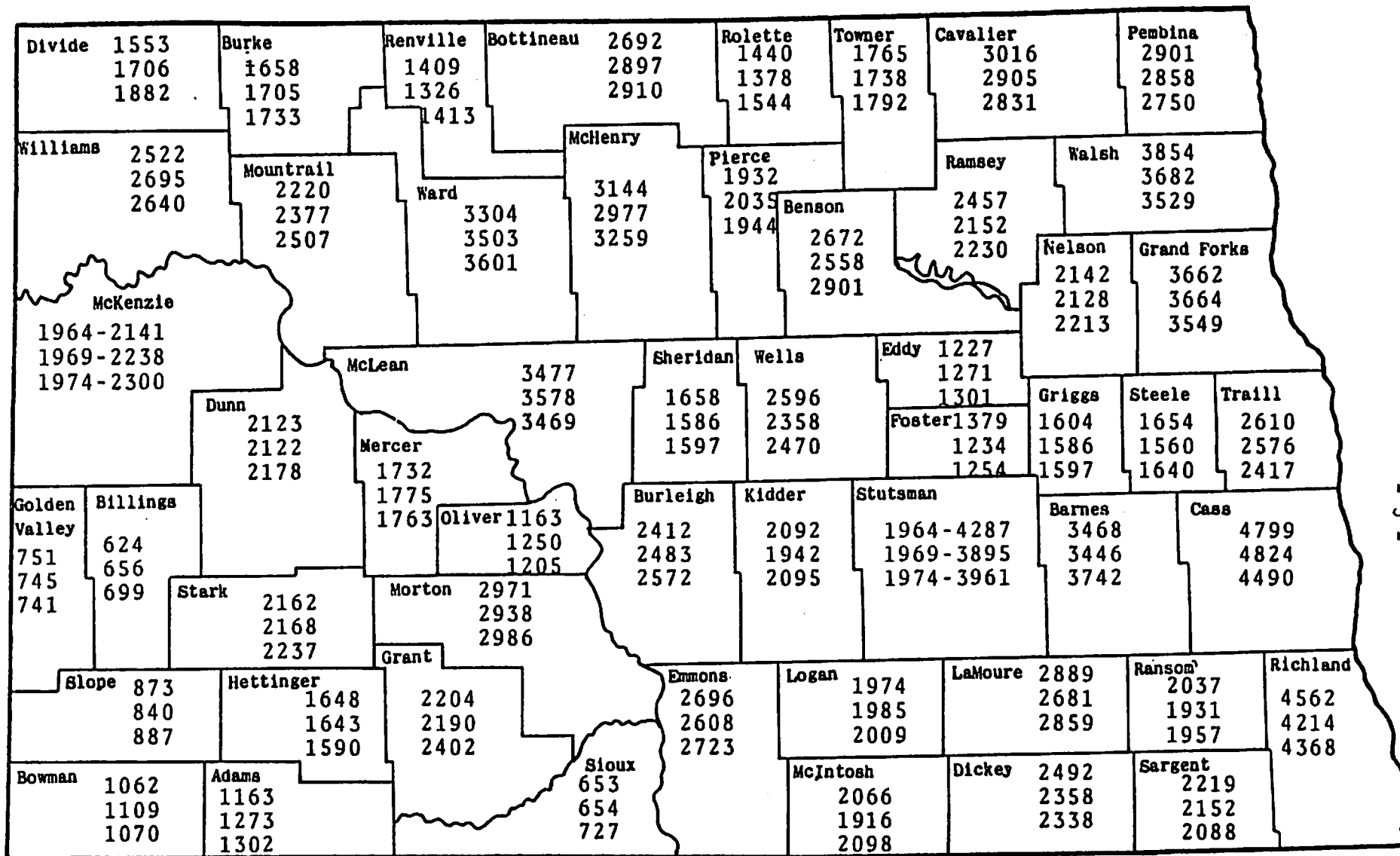


Figure 1. Total Number of Farm Wheel Tractors on All Farms by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

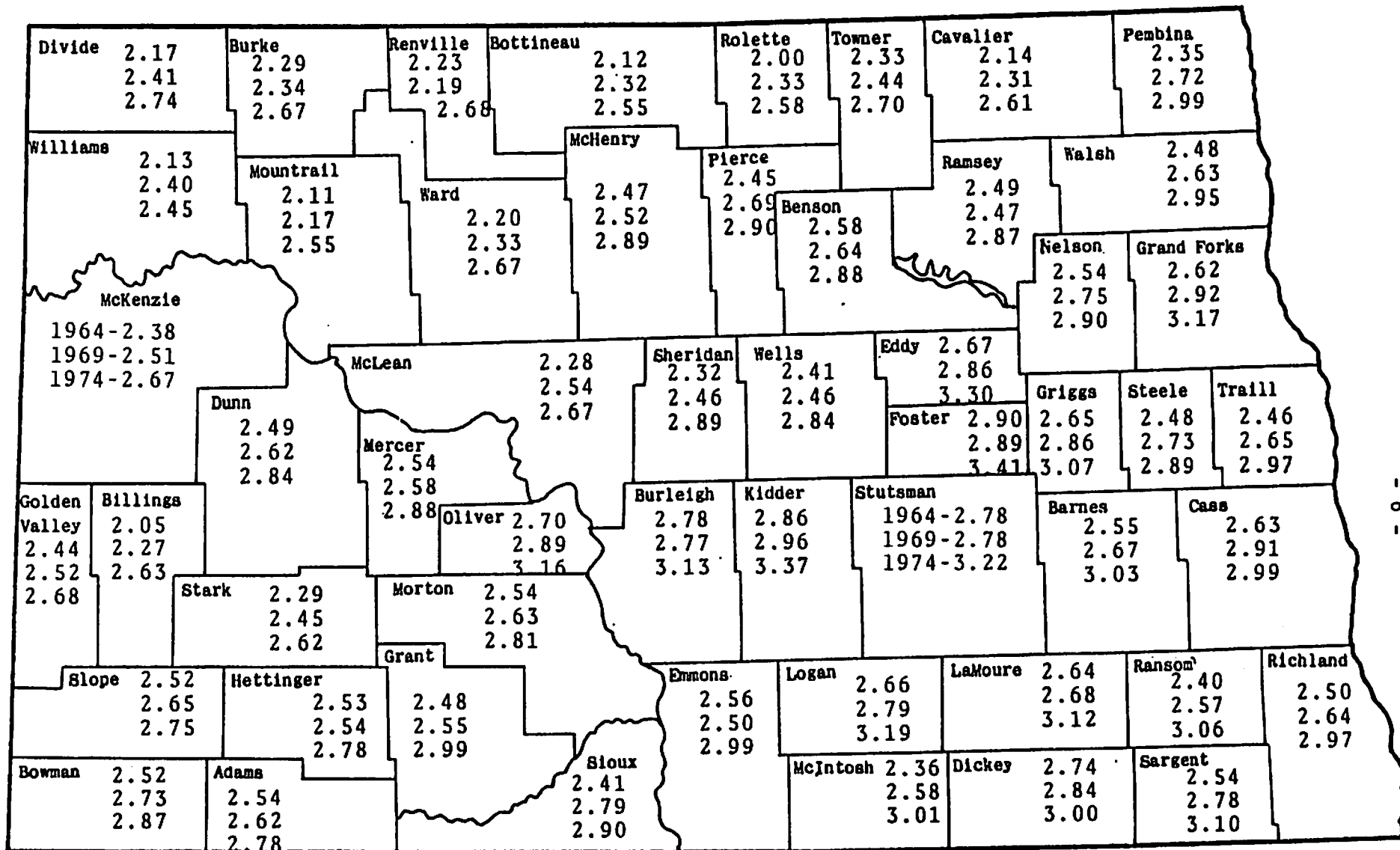


Figure 2. Average Number of Farm Wheel Tractors Per Farm by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

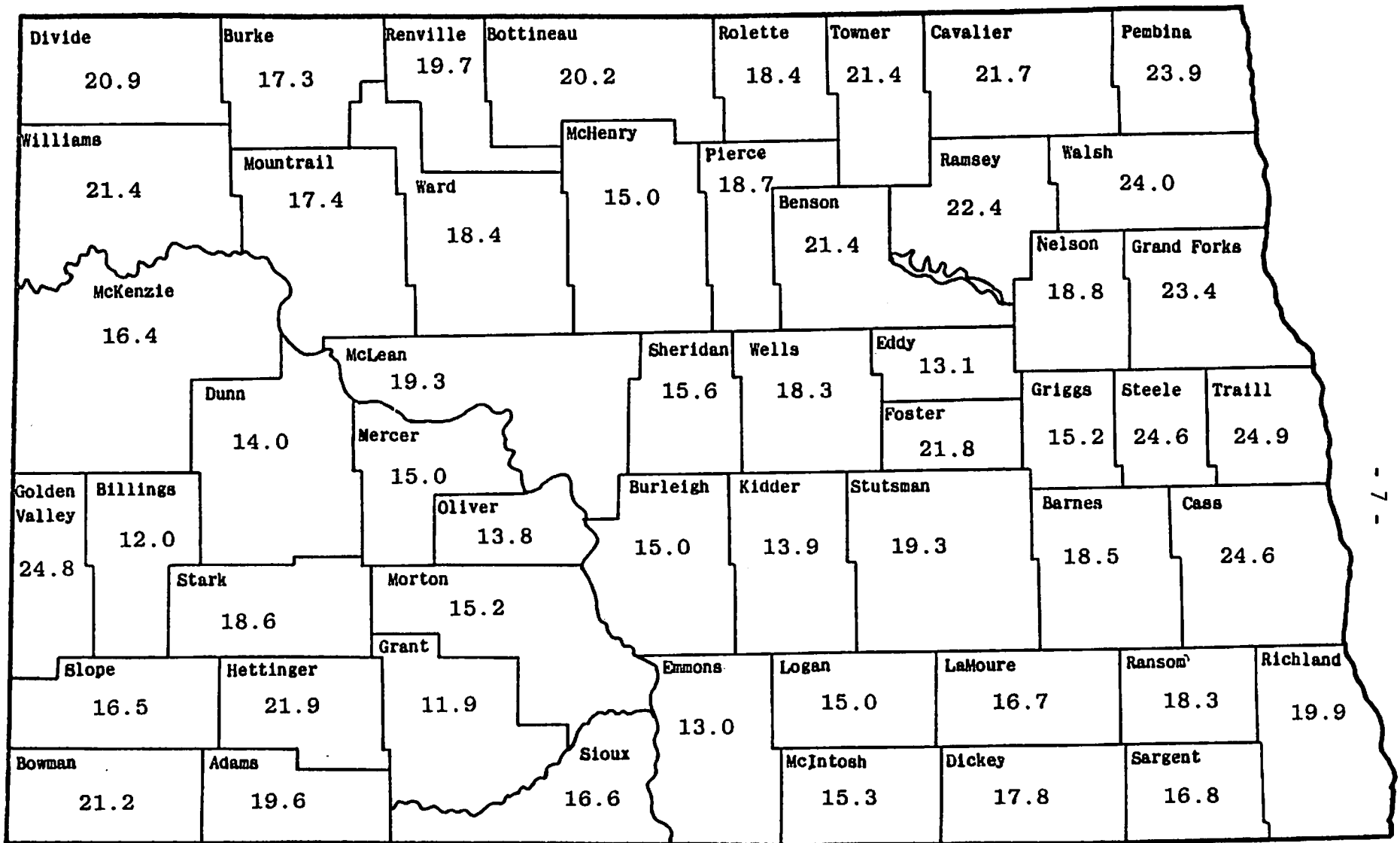


Figure 3. Percent of Farm Wheel Tractors by County on North Dakota Farms Manufactured in the Last Five Years, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1974.

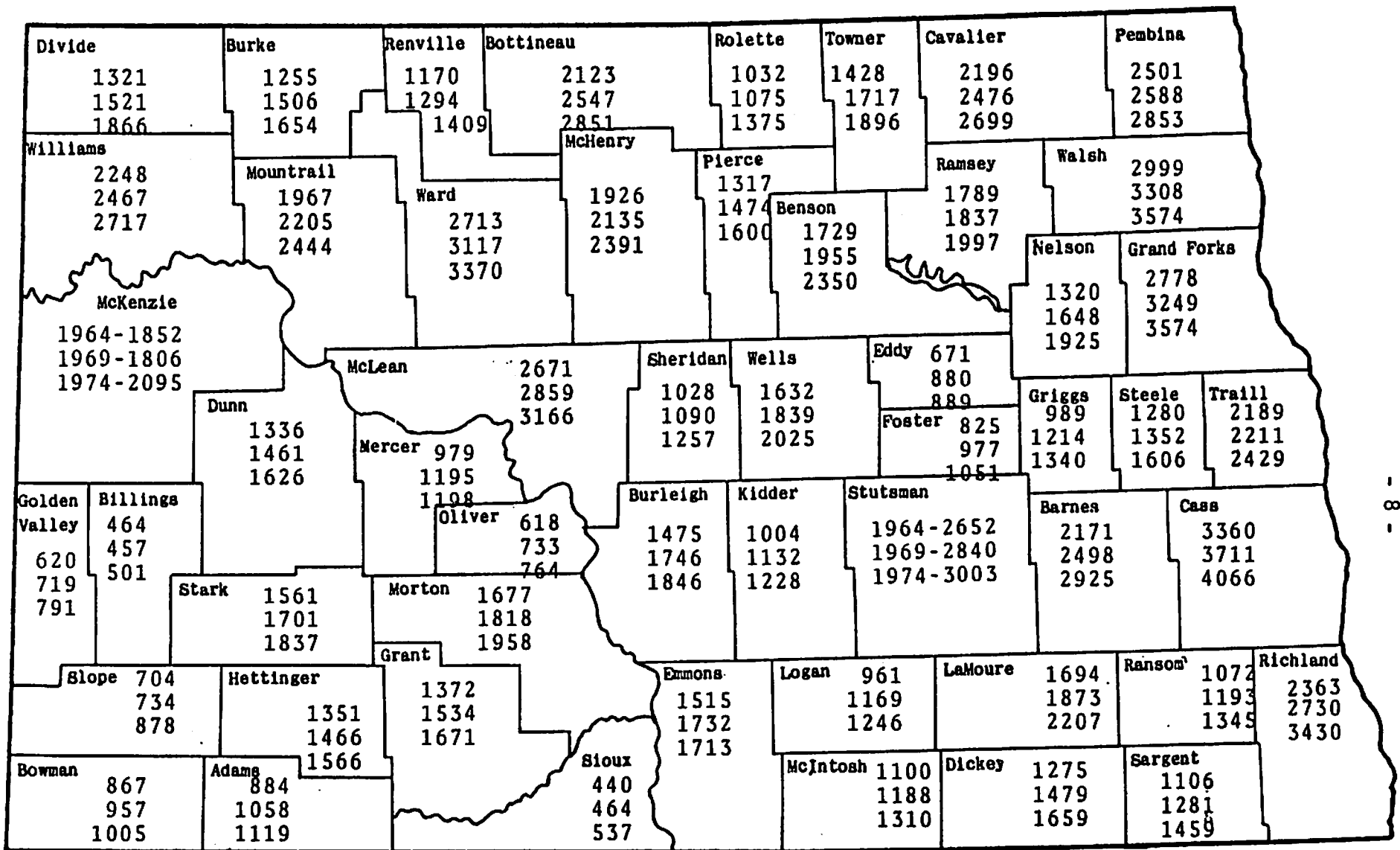


Figure 4. Total Number of Motor Trucks and Pickups on All Farms by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

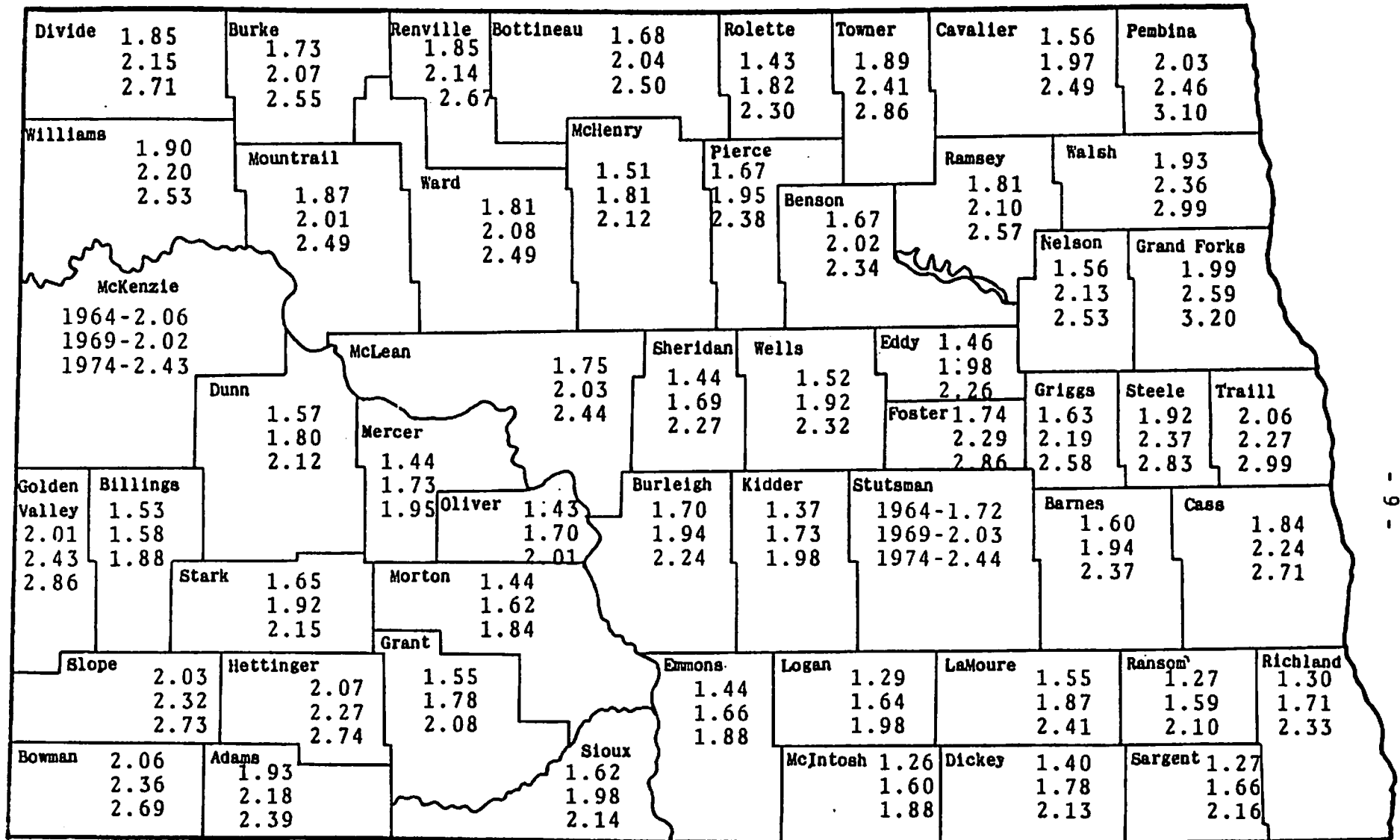


Figure 5. Average Number of Motor Trucks and Pickups Per Farm by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

About 31 percent of the trucks on farms in 1974 were late models (manufactured in the past five years). The percentages range from 24.3 percent in Sheridan County to 43.8 percent in Sioux County (Figure 6).

Self-Propelled Combines

Figures 7 and 8 indicate the relative location of self-propelled combines in North Dakota. It is expected that the size of combines is larger than the average size in earlier years. In spite of this, the number of combines is also increasing. This is not a complete picture since data on pull-type implements are not available, and this lack distorts the situation. Nevertheless, the trends are clear. The total number of self-propelled combines increased from 24,258 in 1964, to 26,952 in 1969, to 27,273 in 1974. The average number of self-propelled combines per farm has also increased, from 0.50 in 1964, to 0.59 in 1969, and to 0.65 in 1974.

In 1974, Cass County had the largest number, with 1,115 machines (Figure 7). Towner County had the largest average number per farm, with 0.88 (Figure 8).

About 21 percent of the self-propelled combines on farms in 1974 were late models (five years old or newer). Richland County had 31.3 percent of its total self-propelled combines manufactured within the past five years, while Billings had 7.7 percent late models (Figure 9). Comparable figures are given in Appendix Table 1 for all counties.

Machinery Purchases

Machinery purchases closely follow the general economic conditions within agriculture. Sales of farm implements increase when farm prices and incomes are high. Volume of sales also falls as farm incomes decline.

Sales of Equipment in the United States

This section examines the sales patterns for tractors, combines, and windrowers in the nation from 1965 to 1977.

Farm Wheel Tractors

Annual sales of tractors decreased from 185,061 in 1966 to 131,523 in 1971, then reversed, increasing to 196,994 units in 1973. Since then the numbers dropped to 130,912 in 1977 (Table 3). The large number

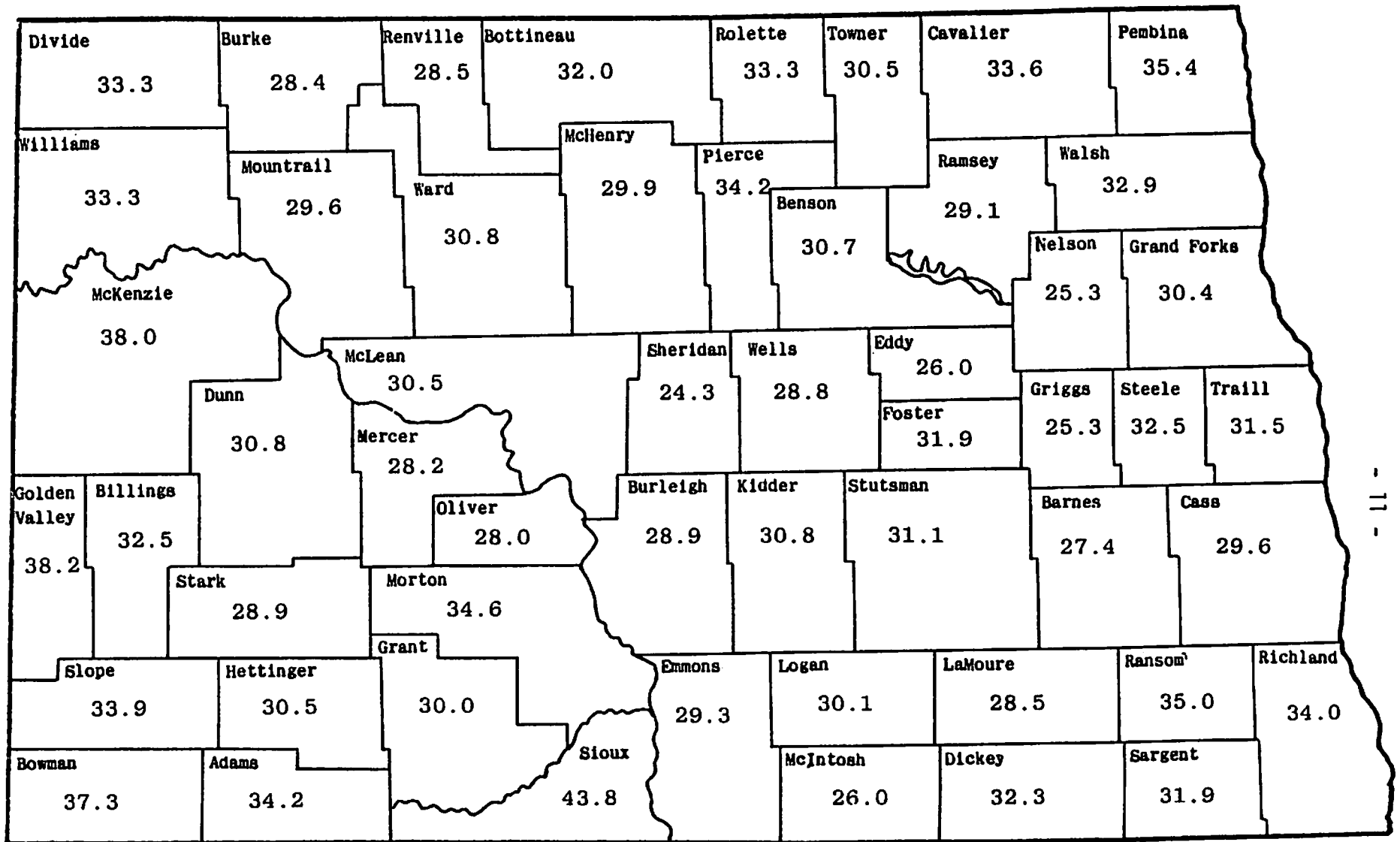


Figure 6. Percent of Motor Trucks and Pickups by County on North Dakota Farms Manufactured in the Last Five Years, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1974.

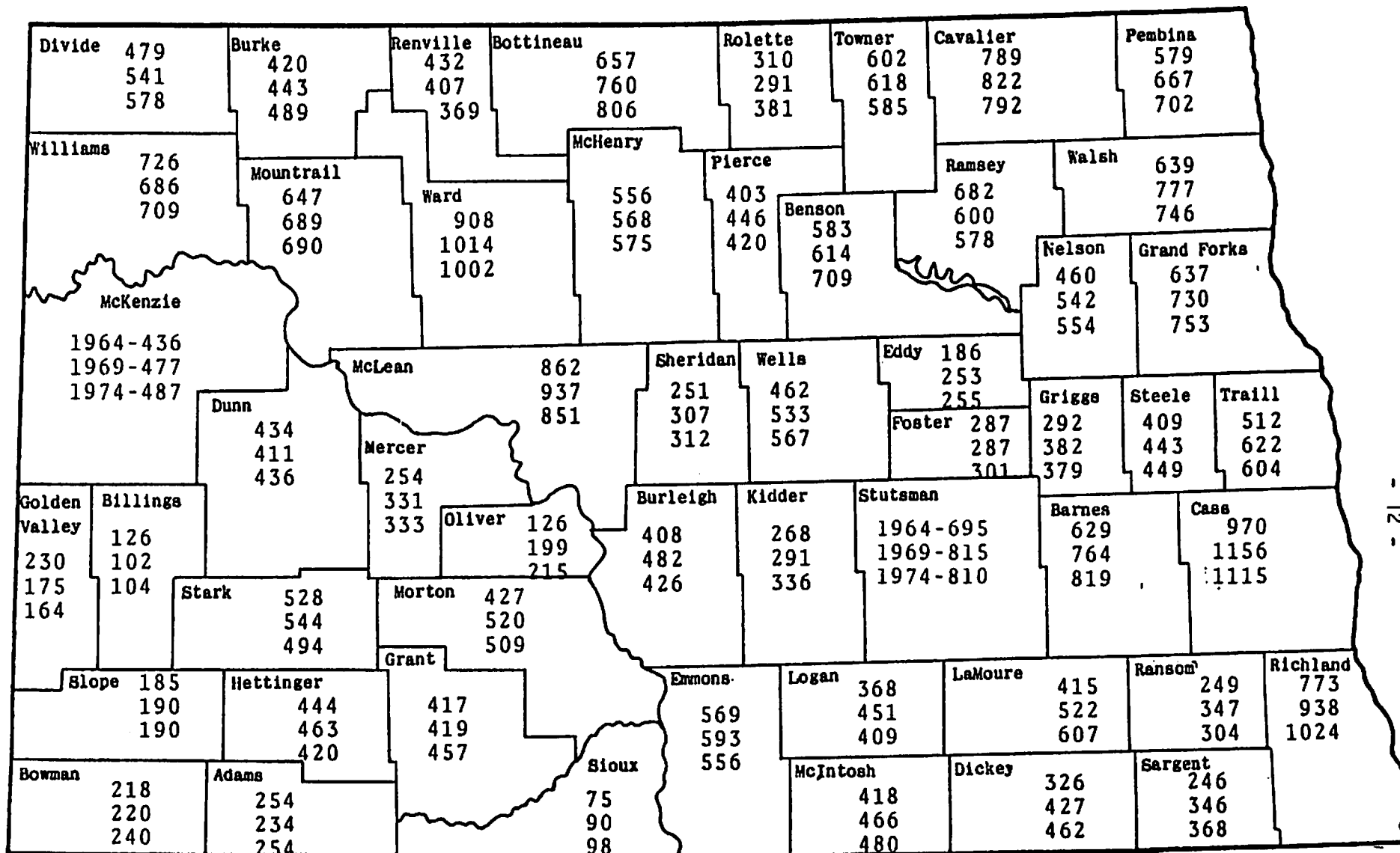


Figure 7. Total Number of Self-Propelled Combines on All Farms by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

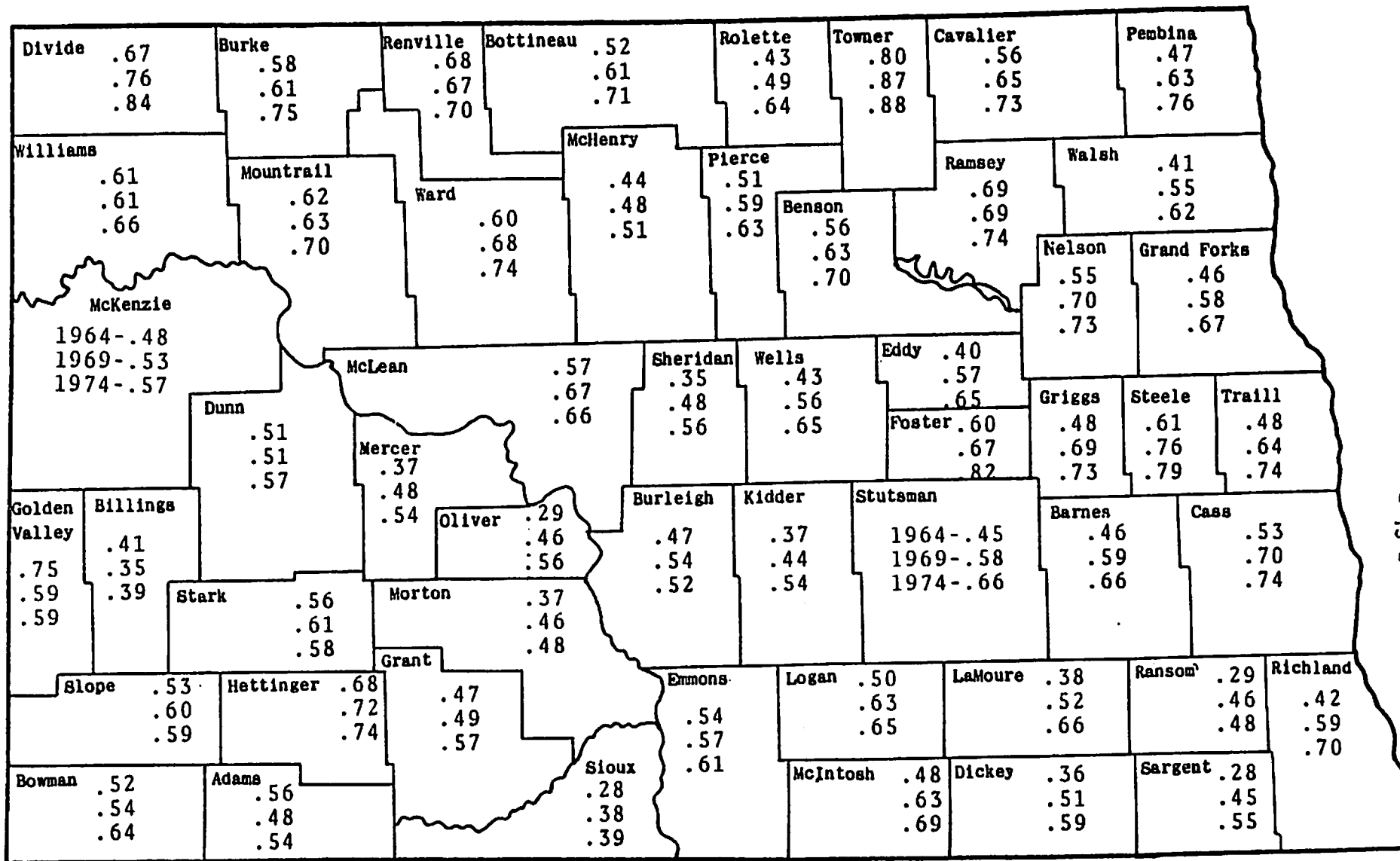


Figure 8. Average Number of Self-Propelled Combines Per Farm by County in North Dakota in 1964, 1969, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

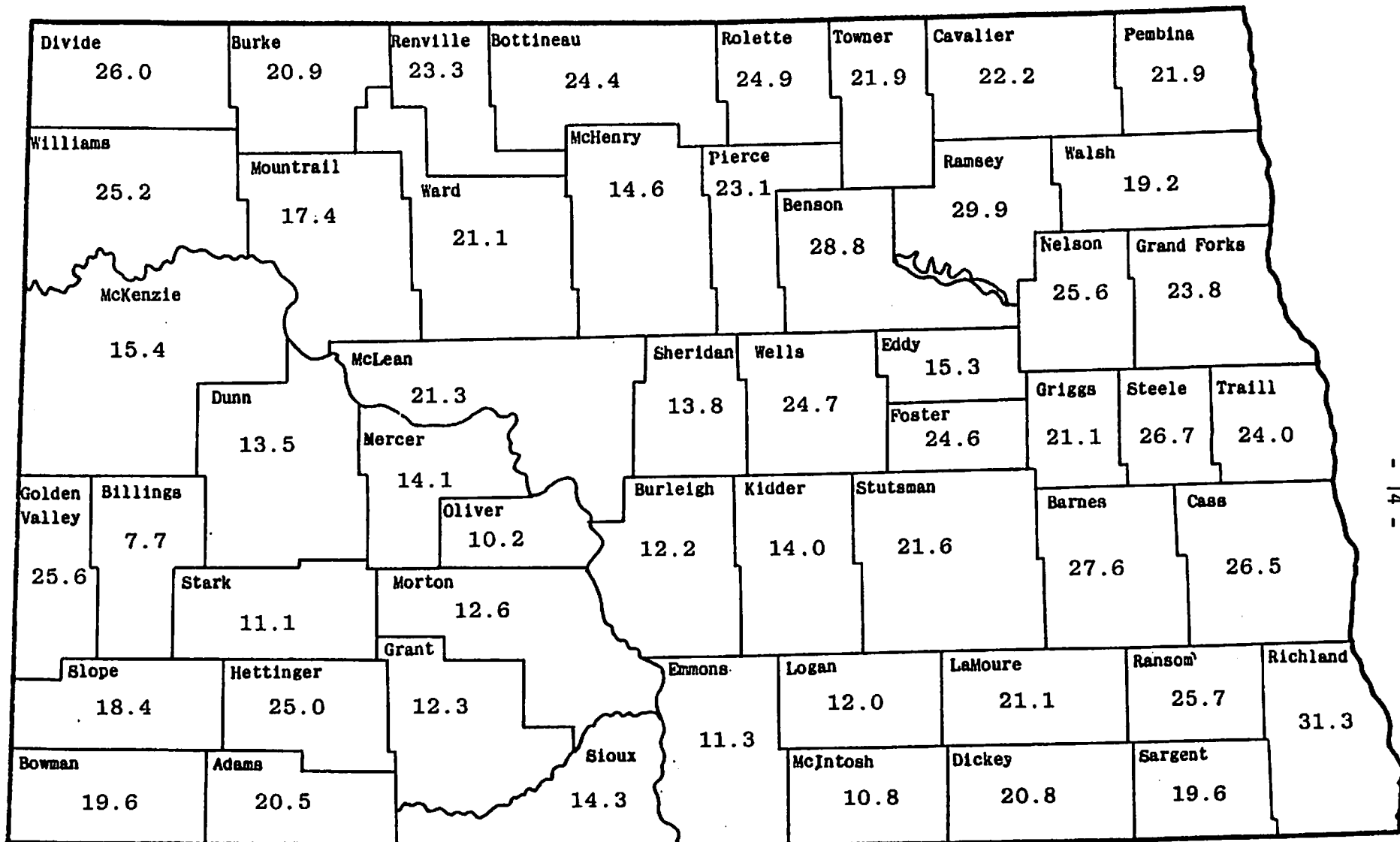


Figure 9. Percent of Self-Propelled Combines by County on North Dakota Farms Manufactured in the Last Five Years, 1974

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1974.

TABLE 3. RETAIL SALES OF FARM WHEEL TRACTORS BY HORSEPOWER CLASS, UNITED STATES, 1965-1977

Horsepower Class	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
	-----number sold-----												
To 34	11,688	9,513	11,119	9,744	8,062	7,847	8,593	11,790	15,071	9,764	7,762	8,410	a
35-39	24,976	29,488	28,156	25,339	22,874	23,974	19,648	21,382	25,182	22,246	14,686	7,499	a
40-49	20,988	18,636	14,433	9,794	6,775	5,400	5,850	8,901	9,911	10,851	12,588	16,012	18,170
50-59	15,440	26,145	24,764	22,003	19,142	17,635	15,944	16,464	18,671	15,824	13,736	14,140	12,642
60-69	27,801	30,730	19,534	19,615	20,741	18,811	14,804	18,795	21,665	16,424	15,916	15,810	12,625
70-79	15,550	11,550	17,960	14,534	10,561	7,809	6,742	6,143	5,711	7,317	7,909	8,446	7,140
80-89	5,847	7,890	6,595	4,948	4,710	5,309	4,180	4,731	10,075	9,317	9,938	9,857	11,115
90-99	36,496	40,998	40,744	37,443	25,903	23,312	22,969	22,600	12,854	6,004	3,374	1,201	833
100-over	<u>3,696</u>	<u>10,111</u>	<u>13,367</u>	<u>14,522</u>	<u>24,893</u>	<u>25,435</u>	<u>32,793</u>	<u>45,956</u>	<u>77,854^b</u>	<u>76,054^b</u>	<u>75,236^b</u>	<u>71,814^b</u>	<u>68,387^b</u>
TOTAL	162,482	185,061	176,672	157,942	143,661	135,532	131,523	156,762	196,994	173,801	161,145	153,189	130,912

^aFIEI has discontinued reporting retail sales of farm tractors under 40 p.t.o. h.p.

^bIncludes all four-wheel drive tractors of which a small number are under 100 h.p.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, Kansas City, Missouri.

sold in 1973 accompanied the favorable farm income situation in that year. A number of important trends can be identified. A popular size in 1965 was the 60 to 69 horsepower tractor. Sales in that size decreased from nearly 18 thousand in 1965 to below 13 thousand in 1977. This same trend is discernible in all size categories less than 80 horsepower. Four-wheel drive tractors became generally available to farmers during the 1960's, and the availability of these power units is reflected in the sales of tractors in the larger sizes. Over 68 thousand tractors of 100 horsepower or more were sold in 1977. Less than four thousand were sold in 1965.

Sales of tractors in terms of total horsepower had remained rather stable from 1965 until the surge in sales in 1973. Here again, the increase in numbers sold plus the availability of bigger tractors combined to cause horsepower to increase. About 10 million total horsepower was sold in 1965 as compared to nearly 17 million in 1973. The number of total horsepower has since declined to about 14 million. The average-size tractor sold in the United States has likewise increased. The average size sold in 1965 was 63 h.p. The comparable figure for 1977 was 103 h.p. (see Table 4). The average size of tractor purchased in the United States exceeded 100 H.P. for the first time in 1977.

Combines and Windrowers

Sales of combines have declined in the United States during the period of observation from 42,230 in 1967 to below 30,000 in 1977 (Table 5). Figures are not available to show the trend in capacity of combines, but the decrease in numbers is obviously closely related to the increased size of implements.

The number of purchases of windrowers has been relatively stable over time, with about 10,000 sold annually in the United States. Part of the stability of sales is due to the increased use of windrowers in cutting and conditioning hay, rather than being used for swathing grain exclusively.

Sales of Implements in North Dakota

North Dakota has frequently led the nation in purchases of certain farm implements, notably large-size tractors. This section presents data on purchases of farm tractors, grain combines, and windrowers.

TABLE 4. TOTAL TRACTOR SALES IN TERMS OF HORSEPOWER BY SIZE CLASS, UNITED STATES, 1965-1977

Horsepower Class	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977 ^a
-----thousands of horsepower-----													
To 34	350.6	304.4	355.8	297.2	248.6	241.4	266.4	378.1	467.2	270.5	242.1	256.5	b
35-39	924.1	1,120.5	1,084.0	950.2	868.8	899.0	746.6	822.8	956.9	838.7	565.4	288.7	b
40-49	944.5	857.3	664.4	455.4	314.9	243.0	253.3	374.2	416.3	469.8	575.3	672.5	797.0
50-59	849.2	1,411.8	1,306.8	1,210.2	1,023.9	969.9	845.0	888.5	989.6	854.5	714.3	749.4	664.0
60-69	1,807.1	1,997.4	1,279.5	1,294.6	1,386.1	1,222.7	962.3	1,245.2	1,408.2	1,059.3	1,037.7	972.3	800.0
70-79	1,135.1	854.7	1,347.0	1,104.6	802.5	585.7	495.5	448.4	434.0	537.1	560.0	599.7	506.0
80-89	508.7	686.4	573.8	430.5	405.3	451.3	355.3	399.2	836.2	778.9	824.9	818.1	923.0
90-99	3,357.6	3,771.8	3,768.8	3,542.1	2,458.8	2,214.6	2,159.1	2,145.7	1,208.3	563.8	325.3	115.3	80.0
100-over	<u>388.1</u>	<u>1,193.1</u>	<u>1,590.7</u>	<u>1,622.1</u>	<u>2,939.5</u>	<u>2,992.6</u>	<u>3,978.3</u>	<u>5,465.9</u>	<u>10,122.3^c</u>	<u>10,333.8^c</u>	<u>10,859.9^c</u>	<u>10,140.8^c</u>	<u>9,762.0^c</u>
TOTAL	10,265.0	12,197.4	12,050.8	10,906.9	10,448.4	9,820.2	10,061.8	12,168.0	16,839.0	15,706.4	15,704.9	14,613.3	13,532.0

Average Size Sold	63.2	65.9	68.2	69.1	72.7	72.5	76.5	77.6	85.5	90.4	97.5	95.4	103.4

^a1977 based on Department of Agricultural Economics estimates; other years are I&T estimates.

^bFIEI has discontinued reporting retail sales of farm tractors under 40 p.t.o. h.p.

^cIncludes all four-wheel drive tractors of which a small number are under 100 h.p.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 5. ANNUAL RETAIL SALES OF TRACTORS, COMBINES, AND WINDROWERS IN UNITED STATES AND NORTH DAKOTA, 1967-1977

Year	Tractors		Combines		Windrowers	
	U.S.	N.D.	U.S.	N.D.	U.S.	N.D.
1967	176,672	3,819	42,230	1,661	8,973	2,284
1968	157,942	3,375	34,595	2,180	9,549	2,588
1969	143,661	3,444	28,052	1,863	10,119	2,287
1970	135,532	2,747	27,304	1,045	N.A. ^a	N.A. ^a
1971	131,523	2,598	27,965	1,471	10,652	2,191
1972	156,762	3,504	28,567	1,201	10,927	2,156
1973	196,994	4,807	35,956	1,617	12,904	2,613
1974	173,801	4,439	31,595	1,086	11,333	2,485
1975	161,145	5,273	33,084 ^b	1,087 ^b	10,079	2,569
1976	153,189	3,584	32,513 ^b	1,174 ^b	10,198	2,757
1977	130,912	2,336	28,821 ^b	860 ^b	7,873 ^b	992 ^b

^aNot available.

^bOnly data for self-propelled units available.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

Farm Wheel Tractors

Annual sales of tractors in North Dakota have followed the same general downward trend in numbers that has been true of the national situation. The exception to this downward trend was the bulge in sales during the favorable agricultural income period of 1973-1975. This downward trend was accompanied by an increase in the average size of tractor sold. In 1967, the most popular-sized tractor sold was in the 90 to 99 horsepower category, when 1,506 units were purchased by North Dakota farmers. Only 11 tractors of this size were purchased in 1977 (Table 6). In the meantime, larger sizes became more readily available, and tractors greater than 140 horsepower captured most of the sales (over 50 percent in 1975 and 1976). Tractors with less than 100 horsepower accounted for about 10 percent of the 1977 sales, as compared with about 48 percent nationally (Table 7).

TABLE 6. RETAIL SALES OF FARM WHEEL TRACTORS IN NORTH DAKOTA BY HORSEPOWER CLASS, 1967-1977

Horsepower Class	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
	-----number sold-----										
To 34	16	11	11	10	7	24	11	6	4	14	a
35-39	76	73	65	48	43	24	23	50	36	8	a
40-49	73	39	49	35	29	47	45	51	52	53	36
50-59	178	158	180	105	81	190	501	192	225	63	46
60-69	274	247	266	202	145	153	161	113	176	96	60
70-79	271	236	178	129	93	100	67	124	125	86	37
80-89	379	258	264	243	125	66	132	135	114	63	47
90-99	1,506	1,395	907	568	507	460	316	140	93	31	11
100-109				531	303	253	466	398			
110-119	(100 h.p. and Over)			298	401	700	319	138	604 ^b	368 ^b	290 ^b
120-129	1,046	958	1,524	236	146	248	952	1,055	898	657	394
130-139				174	343	463	255	106	159	165	346
140-over				168	375	776	1,559 ^c	1,931 ^c	2,787 ^c	1,980 ^c	1,069 ^c
TOTAL	3,819	3,375	3,444	2,747	2,598	3,504	4,807	4,439	5,273	3,584	2,336

^aFIEI has discontinued reporting retail sales of farm tractors under 40 p.t.o. h.p.

^b100-119 horsepower class.

^cIncludes all four-wheel drive tractors of which a small number are under 140 h.p.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 7. RETAIL SALES OF FARM WHEEL TRACTORS OF 100 HORSEPOWER OR MORE, AS A PERCENTAGE OF TOTAL SALES, NORTH DAKOTA AND UNITED STATES, 1965-1977

Year	North Dakota	United States
	-----percent of total sales-----	
1965		2.3
1966		5.5
1967	27.4	7.6
1968	28.4	9.2
1969	44.3	17.3
1970	51.2	18.8
1971	60.4	24.9
1972	69.6	29.3
1973	73.9	39.5
1974	81.7	43.8
1975	84.4	46.7
1976	88.5	46.9
1977	89.9	52.2

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

Information in Table 8 reflects the dominance of sales of the larger-sized tractors. About 95 percent of the total horsepower sold in 1977 was in the greater-than-100 horsepower category. The average-sized tractor purchased increased from 92 horsepower in 1967 to 151 horsepower in 1976, and then declined slightly to 144 in 1977.

Data on sales of four-wheel drive tractors by states are available since 1973 (Table 9). The top 10 states in sales of four-wheel drive tractors have accounted for 63 percent of total sales over the five years. These states are located in the Corn Belt, Central Plains, and Far-West. There has been some change in the composition of the 10 states, but the makeup has been relatively stable and reflects the regionality of sales of four-wheel drives. North Dakota led all states in purchases in four of the five years, and more units were sold in North Dakota in the five-year period than in any other state (Table 10).

TABLE 8. TOTAL TRACTOR SALES IN TERMS OF HORSEPOWER BY SIZE CLASS SOLD IN NORTH DAKOTA, 1967-1977

Horsepower Class	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977 ^a
-----thousands of horsepower-----											
To 34	0.5	0.3	0.3	0.3	0.2	0.8	0.3	0.2	0.1	0.4	b
34-39	2.9	2.7	2.5	1.8	1.6	0.9	0.9	1.9	1.4	0.3	b
40-49	3.4	1.8	2.3	1.6	1.3	2.0	1.9	2.2	2.4	2.2	1.5
50-59	10.0	8.7	9.6	5.8	4.3	10.3	26.5	10.3	11.6	3.3	2.4
60-69	17.9	16.3	17.8	13.1	9.4	10.1	10.4	7.2	11.4	5.8	3.8
70-79	20.3	17.9	13.5	9.7	6.8	7.3	5.1	9.1	8.9	6.1	2.6
80-89	33.0	22.5	22.7	20.7	10.6	5.6	11.0	11.2	9.4	5.2	3.9
90-99	139.3	131.9	86.1	54.0	47.7	43.7	29.6	13.1	8.9	3.0	1.1
100-over	<u>124.5</u>	<u>107.0</u>	<u>180.0</u>	<u>165.5</u>	<u>196.9</u>	<u>313.1</u>	<u>497.2^c</u>	<u>536.2^c</u>	<u>709.3^c</u>	<u>515.4^c</u>	<u>321.9^c</u>
TOTAL	351.8	309.1	334.8	272.5	278.8	393.8	582.9	591.4	763.4	541.7	337.2

Average Size Sold	92.1	91.5	97.2	99.2	107.3	112.4	121.3	133.2	144.8	151.1	144.3

^a1977 based on Department of Agricultural Economics estimates; other years are I&T estimates.

^bFIEI has discontinued reporting retail sales of farm tractors under 40 p.t.o. h.p.

^cIncludes all four-wheel drive tractors of which a small number are under 140 h.p.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 9. RANK OF STATES IN SALES OF FOUR-WHEEL DRIVE FARM TRACTORS, 1973-1977

Rank	1973		1974		1975		1976		1977						
	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.			
1	ND	841	13.0	ND	1,091	13.2	ND	1,538	14.5	ND	1,229	11.7	IL	849	11.0
2	MT	554	8.4	KS	665	8.0	KS	770	7.3	IL	1,024	9.7	IA	500	6.5
3	KS	514	8.0	MT	637	7.7	MN	725	6.9	KS	676	6.4	ND	491	6.4
4	TX	428	6.6	MN	535	6.4	IL	711	6.7	MN	626	6.0	TX	477	6.2
5	MN	411	6.4	TX	498	6.0	MT	682	6.4	MT	609	5.8	IN	440	5.7
6	IL	327	5.1	CA	437	5.3	TX	587	5.5	IA	567	5.4	MN	421	5.5
7	CA	309	4.8	IL	420	5.1	IA	517	4.9	TX	514	4.9	OH	368	4.8
8	IA	300	4.6	IA	379	4.6	CA	472	4.5	IN	441	4.2	KS	328	4.3
9	WA	293	4.5	OK	333	4.0	OK	418	3.9	OK	438	4.2	AR	327	4.3
10	OK	274	4.2	WA	304	3.6	WA	387	3.6	CA	379	3.6	CA	319	4.1
Total, Top 10	--	4,241	65.6	--	5,299	63.9	--	6,807	64.2	--	6,503	61.9	--	4,520	58.8
Total, U.S.	--	6,460	100.0	--	8,287	100.0	--	10,605	100.0	--	10,511	100.0	--	7,687	100.0

SOURCE: Implement and Tractor, Intertec Publishing Corporation, Kansas City, Missouri.

TABLE 10. RANK OF STATES IN SALES OF FOUR-WHEEL DRIVE FARM TRACTORS, 1973-1977

Rank	State	Total Number Sold (Five-Year Total)
1	North Dakota	5,190
2	Illinois	3,331
3	Kansas	2,953
4	Montana	2,732
5	Minnesota	2,718

SOURCE: Implement and Tractor, Intertec Publishing Corporation, Kansas City, Missouri.

Combines and Windrowers

Retail sales of combines in North Dakota ranged from 2,180 units in 1968 to 860 units in 1977 (Table 5). The variation in retail sales of windrowers has been relatively stable, ranging within narrow limits of from 2,200 to 2,800 per year. Well over half of the windrowers sold annually are purchased in five Northern Plains states (Table 11). North Dakota farmers purchase from 20 to 25 percent of the total number sold each year, and lead all other states.

Seasonality

Seasonal indexes were used to measure seasonality of sales for farm wheel tractors, grain combines, and windrowers. A seasonal index was prepared for each month and was the average of the ratios of sales to trend (moving average). It is expressed as a percentage. If all months had equal sales, the seasonal index would equal 100. Departures from 100 indicate sales below or above "normal." January's index value of 62.2, for example, indicates 62.2 percent of a "normal month" (Table 12). Projections of total sales for the coming year may be made by dividing the number of units sold in January (when this becomes known) by 0.622 and multiplying by 12. Projections are always hazardous, but an indication of the year to follow may be obtained by using the seasonality index and early sales data in this way.

TABLE 11. RANK OF STATES IN SALES OF WINDROWERS, 1967-1977^a

Rank	1967			1968			1969			1971			1972		
	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.
1	ND	2,284	25.5	ND	2,588	27.1	ND	2,287	22.6	ND	2,191	20.6	ND	2,156	19.7
2	SD	1,032	11.5	SD	1,096	11.5	SD	1,222	12.1	SD	1,341	12.6	SD	1,284	11.8
3	MN	740	8.2	MN	873	9.1	MN	1,120	11.1	MN	1,330	12.5	MN	1,187	10.9
4	MT	674	7.5	MT	614	6.4	MT	691	6.8	MT	684	6.4	MT	764	7.0
5	ID	574	6.4	CA	441	4.6	NE	560	5.5	NE	533	5.0	NE	609	5.6
Total, Top 5	--	5,304	59.1	--	5,612	58.8	--	5,880	58.1	--	6,079	57.1	--	6,000	54.9
Total, U.S.	--	8,973	100.0	--	9,549	100.0	--	10,119	100.0	--	10,652	100.0	--	10,927	100.0

Rank	1973			1974			1975			1976			1977 ^b		
	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.	State	Number Sold	% of U.S.
1	ND	2,613	20.2	ND	2,485	21.9	ND	2,569	25.5	ND	2,757	27.0	MN	1,175	14.9
2	MN	1,576	12.2	MN	1,385	12.2	MN	1,343	13.3	MN	1,520	14.9	ND	992	12.6
3	SD	1,572	12.2	SD	1,353	11.9	SD	1,174	11.6	SD	998	9.8	SD	933	11.9
4	MT	808	6.3	MT	732	6.5	NE	608	6.0	MT	587	5.8	NE	543	6.9
5	NE	753	5.8	NE	636	5.6	MT	600	6.0	NE	550	5.5	MT	428	5.4
Total, Top 5	--	7,322	56.7	--	6,591	58.2	--	6,294	62.4	--	6,420	63.0	--	4,071	51.7
Total, U.S.	--	12,904	100.0	--	11,333	100.0	--	10,079	100.0	--	10,198	100.0	--	7,873	100.0

^aData not available for 1970.

^bOnly data for self-propelled units available.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 12. ADJUSTED SEASONAL INDEXES FOR FARM WHEEL TRACTORS, GRAIN COMBINES, AND WINDROWERS IN NORTH DAKOTA

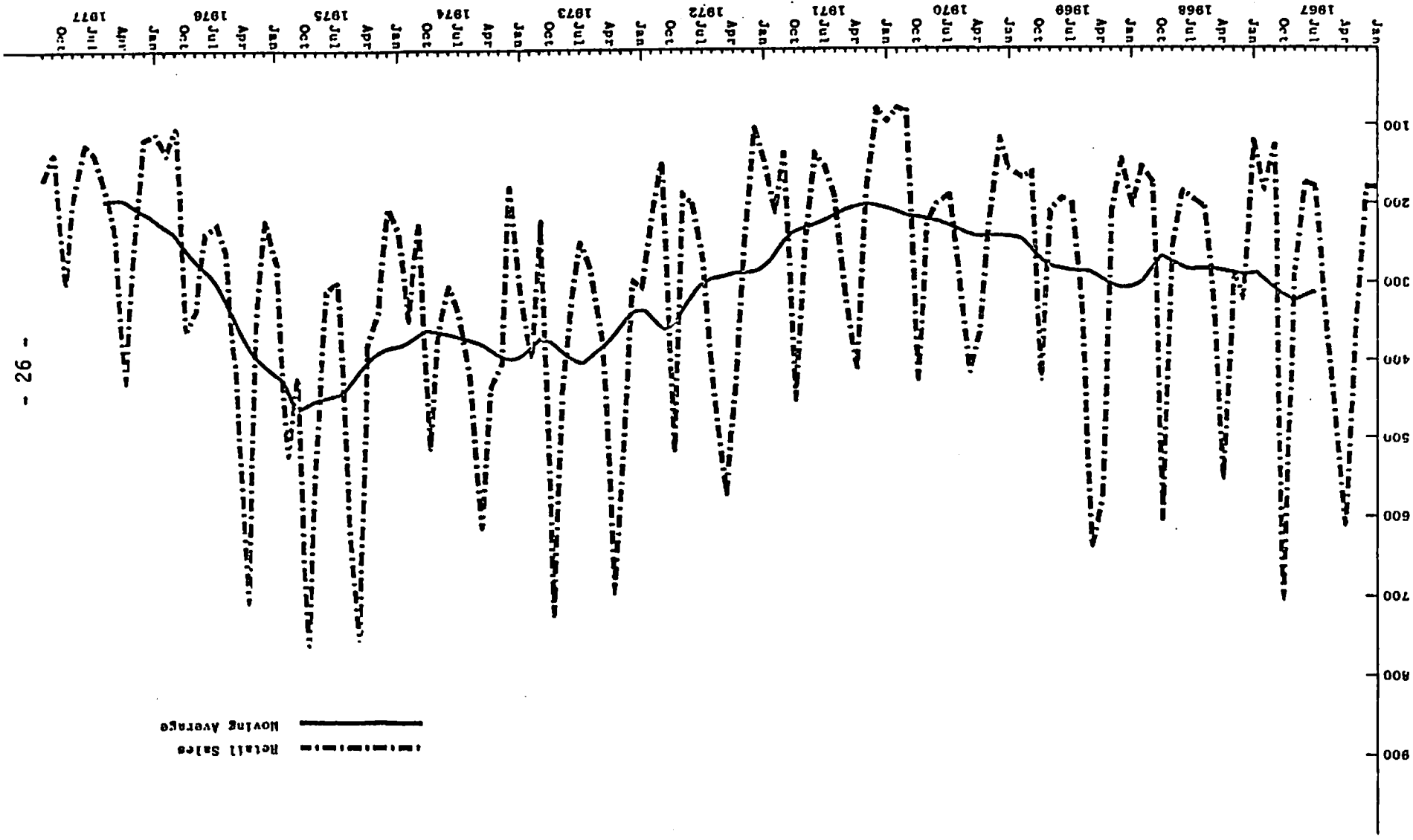
Month	Tractors	Combines	Windrowers
January	62.2	22.8	19.9
February	57.5	22.3	18.4
March	98.5	32.6	16.4
April	170.2	42.3	23.8
May	155.2	43.2	25.9
June	105.2	66.8	106.4
July	73.7	137.9	297.7
August	72.1	422.8	409.0
September	97.2	229.7	184.1
October	178.7	114.7	67.0
November	55.6	23.0	12.7
December	73.9	41.9	18.7

Farm Wheel Tractors

The sales of farm wheel tractors in North Dakota follow a definite seasonal pattern as is shown in Figures 10 and 11, and is also apparent by examining the adjusted seasonal indexes for tractors in Table 12. Two peaks in sales occurred in each year of the 11 years studied. The first peak occurred during the spring (April and May) when seed-bed preparation and planting took place and the second peak occurred in October when the fall work was done. Also, it can be seen in Figure 10 and Table 13 that there was a small increase in sales during December in nine of the 11 years studied. These year-end sales would suggest that some farmers were taking advantage of tax adjustments such as investment tax credits. Sales were usually lowest during the late fall and winter months (November through February) when there was very little activity either on the farms or within the dealerships (Figures 10 and 11).

Tractor sales have had a large amount of variability from year to year for any one month as is shown in Figure 11 and Table 13. The degree of this variability depends on certain conditions that also vary from year to year, such as farmers' incomes and availability and prices of tractors.

Number
of Units



--- Retail Sales
— Moving Average

Figure 10. Retail Sales and Moving Average of Farm Wheel Tractors in North Dakota, 1967-1977
SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

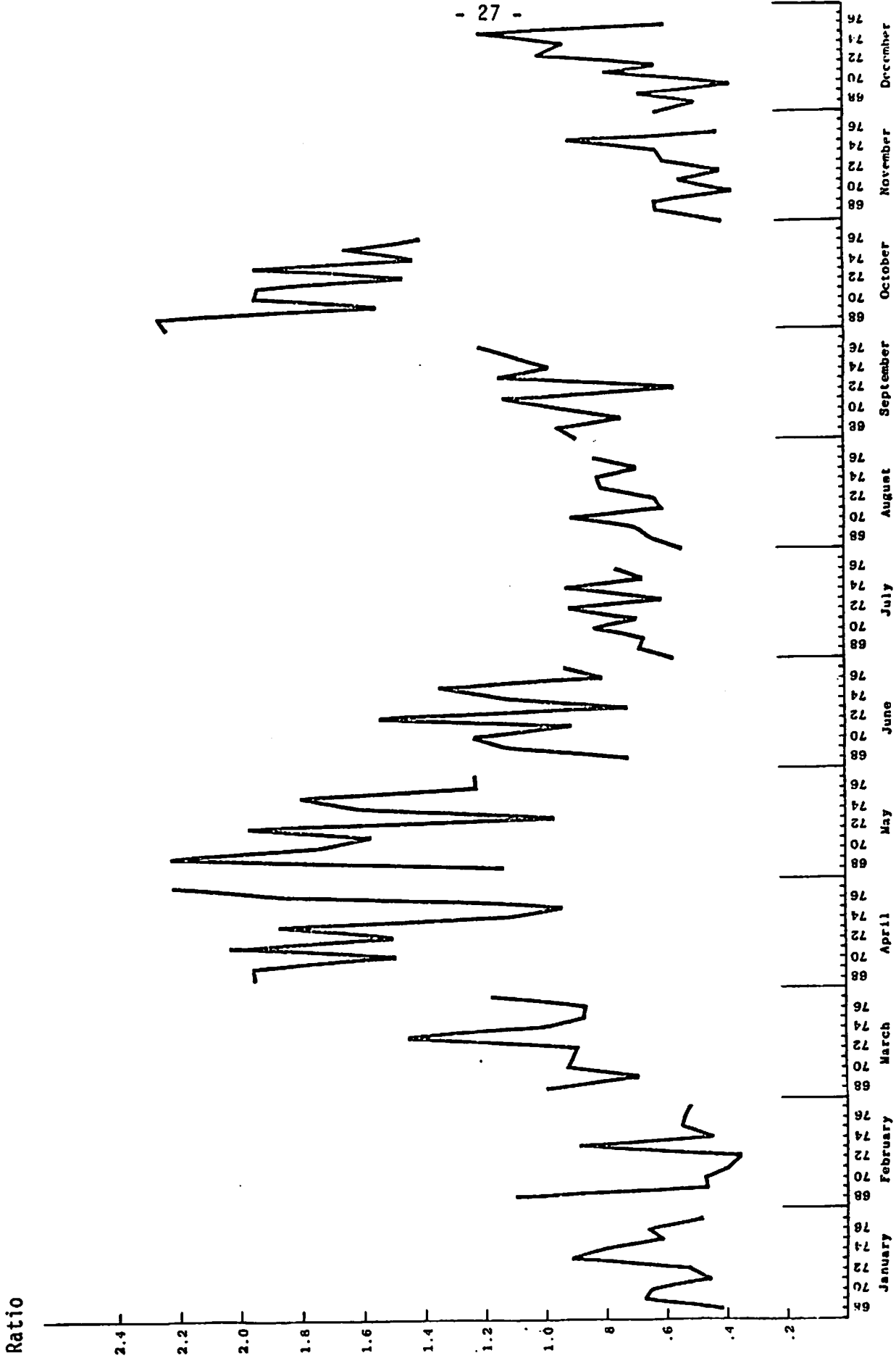


Figure 11. Ratio of Monthly Farm Wheel Tractor Sales to the Moving Average, 1967-1977

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 13. RETAIL SALES OF FARM WHEEL TRACTORS IN NORTH DAKOTA BY MONTH, 1967-1977

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
1967	178	177	368	615	467	346	180	175	285	704	126	186	3,807
1968	118	322	289	554	322	204	195	184	257	604	175	152	3,376
1969	206	142	212	576	637	326	193	193	208	425	160	166	3,444
1970	157	114	223	363	413	287	187	200	212	427	82	79	2,744
1971	94	78	184	411	326	196	154	136	260	451	135	212	2,637
1972	148	101	259	432	573	450	272	200	189	517	148	215	3,504
1973	303	298	511	693	372	287	248	319	442	720	221	393	4,807
1974	318	178	398	432	611	419	339	302	358	513	224	347	4,439
1975	234	205	335	380	749	581	299	308	488	756	418	520	5,273
1976	275	220	346	701	415	254	222	233	328	359	98	133	3,584
1977	107	112	236	426	234	180	137	122	186	300	132	164	2,336

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

For instance, there were 79 tractors sold in December, 1970, and 520 tractors sold in December, 1975. This was a 650 percent increase over a five-year period. In December, 1976, there was a 75 percent decrease in sales from the previous December as only 133 tractors were sold. This same variability can be found in each month, although it may not be quite as large.

The highest monthly sales for this 11-year period occurred in October, 1975, when 756 tractors were sold. The lowest monthly sales was 78 tractors sold in February, 1971.

Grain Combines

Retail sales of grain combines in North Dakota also have followed a pronounced seasonal pattern, as shown in Figures 12 and 13. The adjusted seasonal indexes (Table 12) indicate that combines are sold during the four-month period from July through October¹ when the farmers are preparing for harvest and when harvesting. The peak in combine sales has occurred in August of every year of the 11 years studied.² The most combines sold in one month during these 11 years was 715 sold in August, 1973 (Table 14). There has been a small increase in combine sales during December in every year except 1972. These year-end sales would suggest that a few farmers were taking advantage of tax adjustments as was the case with year-end tractor sales.

Sales were usually low the other eight months with the lowest months being January, February, and November (Table 12) when there was little activity on the farm and at the dealerships. The least number of combines sold in one month occurred in February, 1977, when only 12 were sold in the state.

Figure 13 and Table 14 show that there was a large amount of variability from year to year for any one month in combine sales like there was in tractors. However, the degree of variability depends on different conditions. A short harvest period may cause sales to be higher in the earlier months and lower in the later months. Also, another condition that could have an effect on variability is that later maturing crops, such

¹Of the total number of combines sold in this 11-year period, 76.3 percent were sold during the four months of July through October.

²August sales account for 35 percent (5,333) of the total number (15,245) of combines sold.

Number
of Units

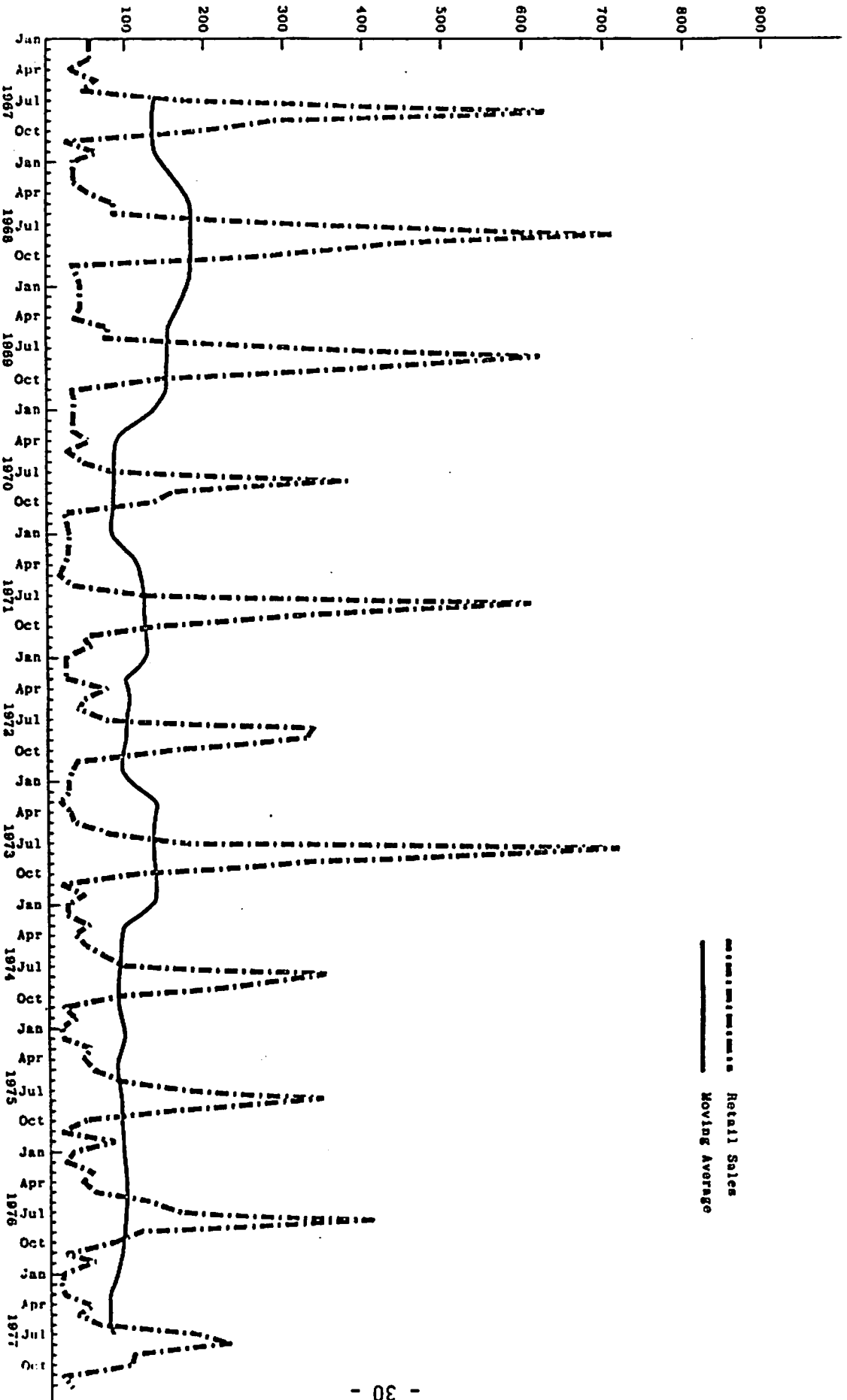


Figure 12. Retail Sales and Moving Average of Grain Combines in North Dakota, 1967-1977 (Only data for self-propelled units are available for 1975-1977)

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

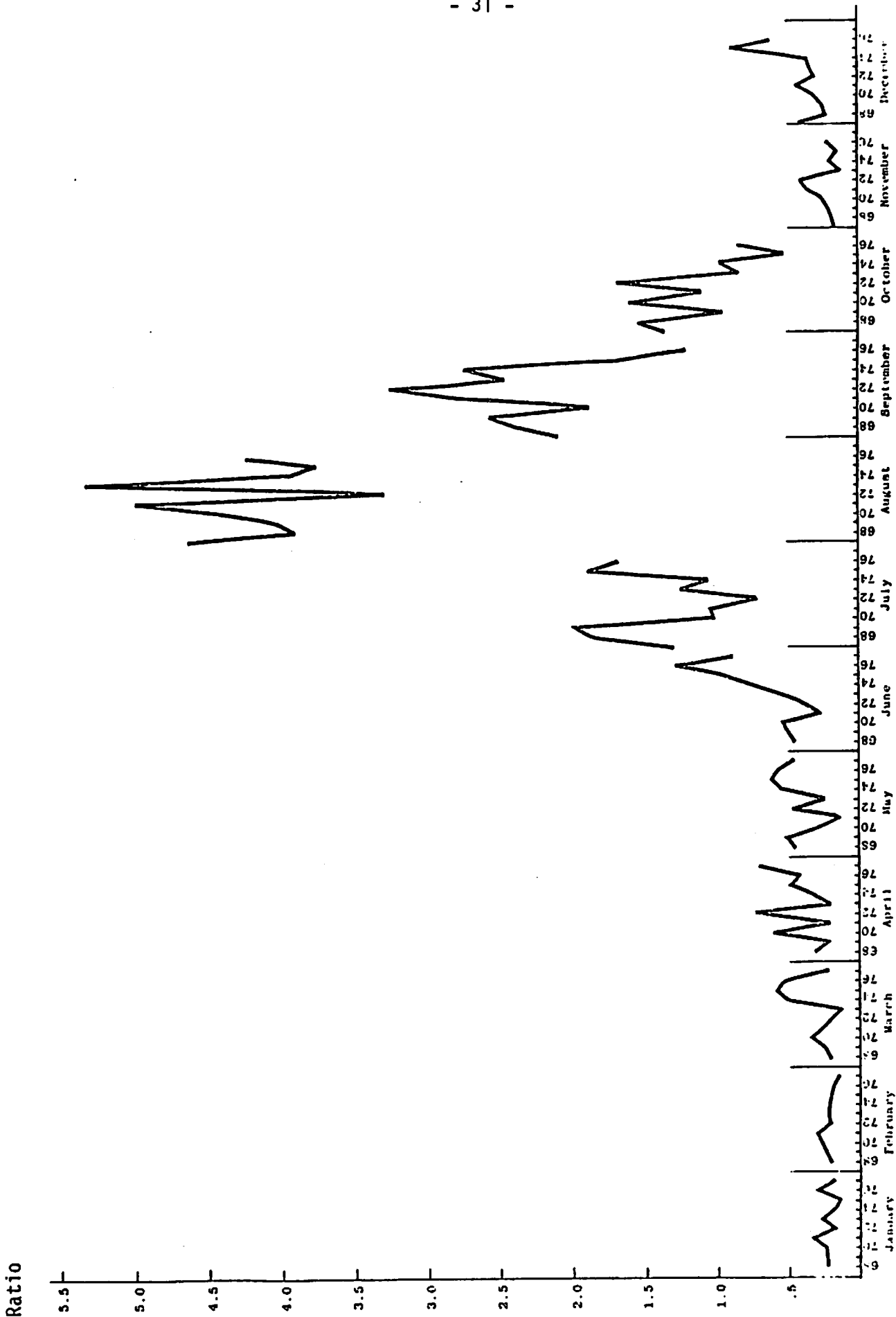


Figure 13. Ratio of Monthly Grain Combine Sales to the Moving Average, 1967-1977 (Only data for self-propelled units are available for 1975-1977)

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 14. RETAIL SALES OF GRAIN COMBINES IN NORTH DAKOTA BY MONTH, 1967-1977

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
1967	54	54	55	28	61	48	179	629	281	185	23	64	1,661
1968	34	34	34	56	84	84	341	713	440	284	36	40	2,180
1969	42	42	43	37	80	78	308	621	395	149	32	36	1,863
1970	33	33	33	54	27	48	89	382	163	136	21	26	1,045
1971	28	28	28	24	17	33	129	609	335	138	46	56	1,471
1972	23	23	23	75	49	40	73	332	327	166	39	31	1,201
1973	28	29	18	28	33	79	169	715	336	116	19	47	1,617
1974	25	26	51	31	49	71	96	352	245	88	19	33	1,086
1975 ^a	14	20	54	43	54	87	172	344	153	49	14	83	1,087
1976 ^a	28	19	54	42	57	128	164	408	117	81	20	56	1,174
1977 ^a	15	12	17	53	35	65	188	228	106	103	14	24	860

^aOnly data for self-propelled combines available.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

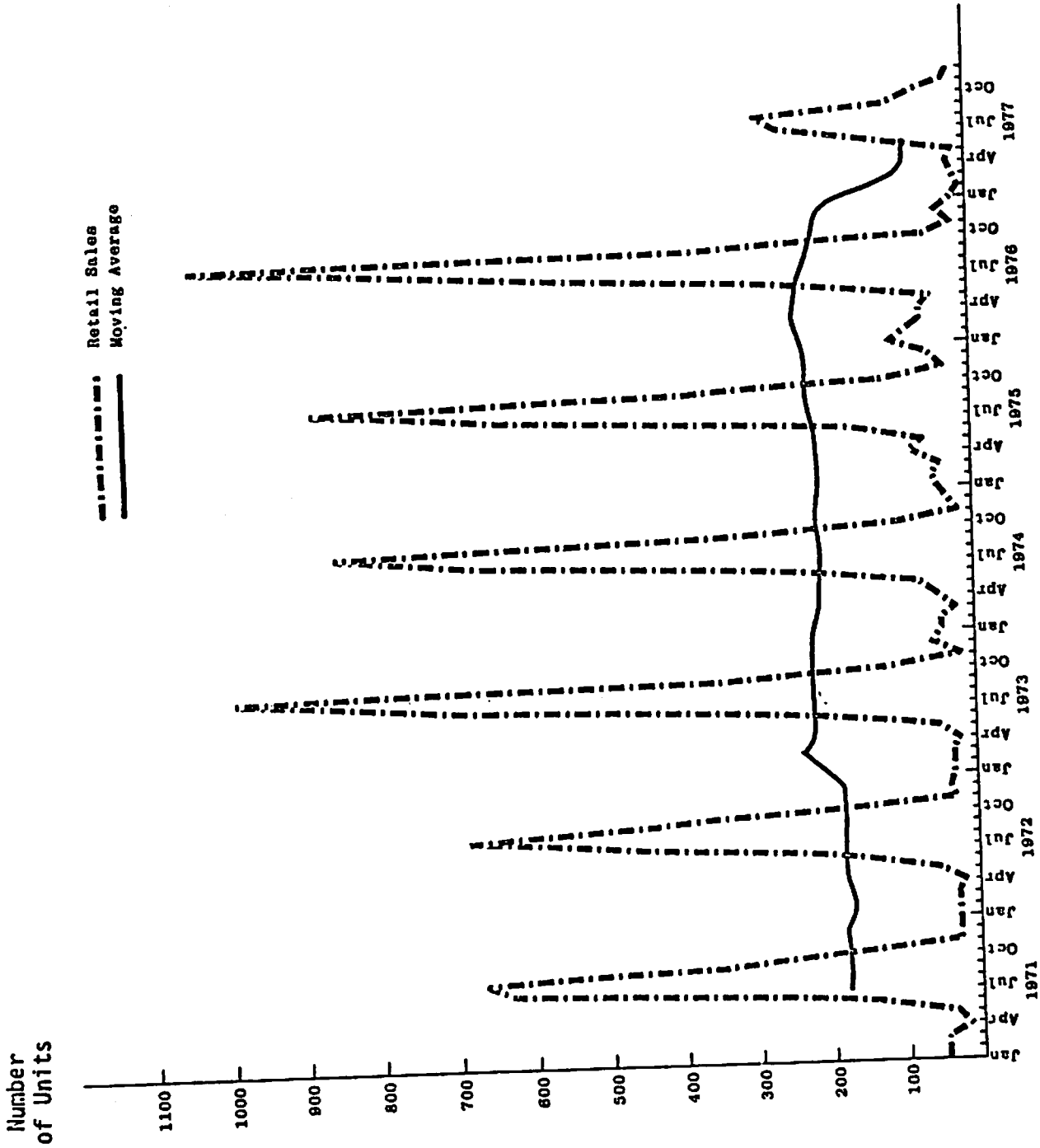


Figure 14. Retail Sales and Moving Average of Windrowers in North Dakota, 1971-1977 (Only data for self-propelled windrowers are available for 1977)

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

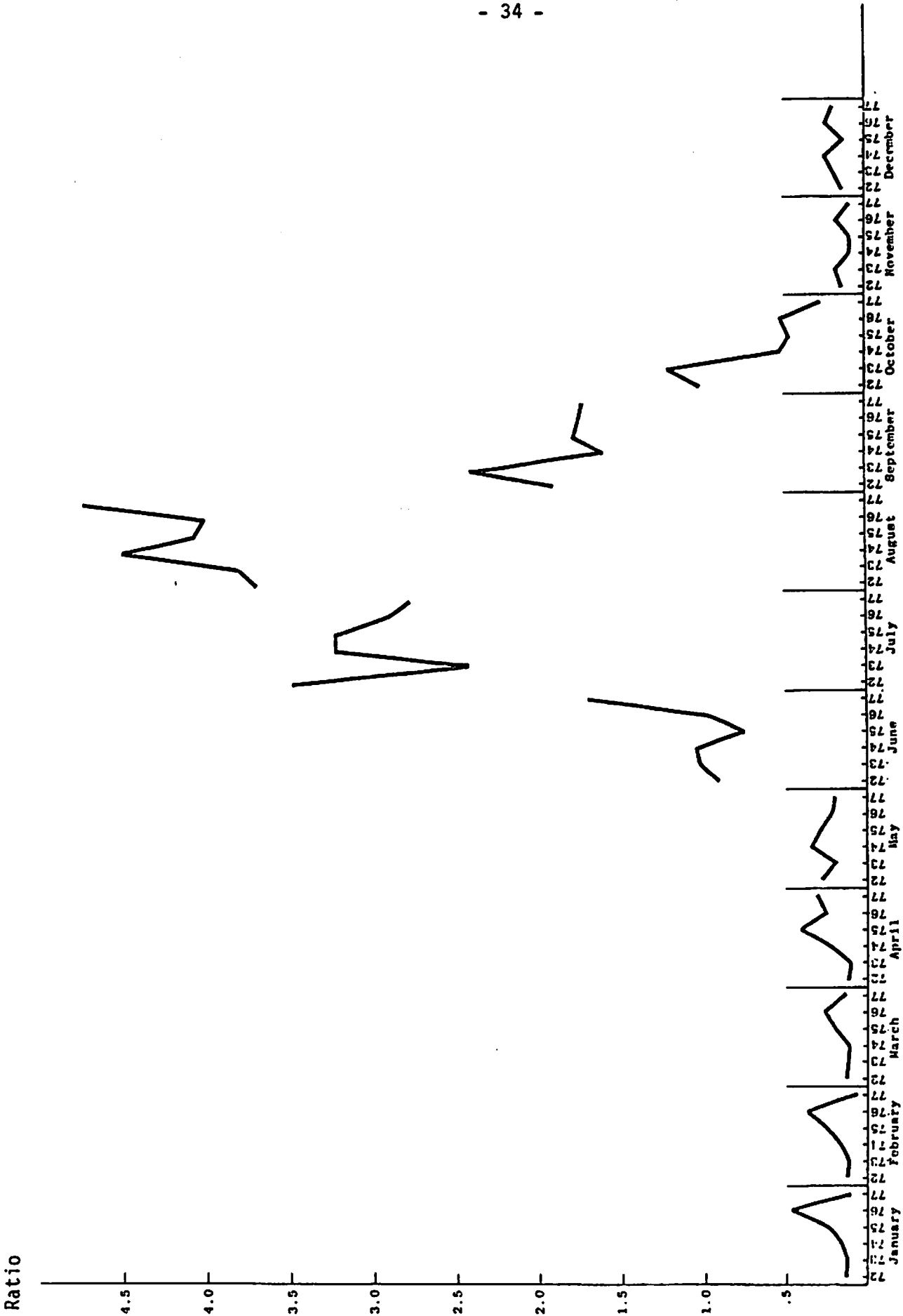


Figure 15. Ratio of Monthly Windrower Sales to the Moving Average, 1971-1977 (Only data for self-propelled windrowers are available for 1977)

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

as beans and corn, may lead the farmer to purchase a combine in the fall instead of the summer.

Windrowers

Windrower sales in North Dakota follow a similar seasonal pattern to that of grain combines, presented earlier (Figures 14 and 15). The four-month period of June through September accounted for 82.7 percent of the windrower sales for the 1971-1977 period (Tables 12 and 15). August was the peak month in sales every year and had an average of 34.3 percent of the total sales for this period (Table 15). The most windrowers sold in one month was 1,040 during August, 1976. Sales usually began to gradually increase in June and July as the hay harvest approached; it then peaked in August when the grain harvest began; and then dropped sharply in September and October when the harvest was nearing completion (Figures 14 and 15). It can be seen in Table 15 that December sales increased slightly from November sales in five of the seven years. These year-end sales would suggest that a few farmers were taking advantage of tax adjustments.

Sales were usually low the other eight months (October through May) with November having the lowest average (Figure 15 and Table 12). The lowest month in windrower sales was in February, 1977, with only 10 windrowers sold in the state.

Year to year variability in windrower sales for any one month is apparent by examining Figure 15 and Table 15. This variability is similar to the variability explained for tractor and combine sales, but the conditions responsible for the degree of variability are different. Weather conditions may hasten or delay harvest for either hay or grain. Sales are then advanced or delayed accordingly.

Other Related Topics

Expenditures For Repair of Farm Machinery

The annual cost of repairing farm machinery in the United States has increased from \$49 million in 1915 to \$1,521 million in 1977 (Table 16). Expenditures more than doubled from 1973 to 1977. A direct comparison with North Dakota is not possible, but a similar figure revealing expenditures for repair and operation of capital items shows an increase from \$88 million in 1949 to \$259 million in 1977 (Table 17). These figures

TABLE 15. RETAIL SALES OF WINDROWERS IN NORTH DAKOTA BY MONTH, 1971-1977

Year	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
1971	38	38	39	28	35	144	633	669	343	186	27	26	2,191
1972	23	23	23	22	51	165	440	686	435	220	32	36	2,156
1973	24	25	29	24	47	225	704	989	353	118	21	54	2,613
1974	35	36	25	49	73	219	672	854	373	101	21	27	2,485
1975	48	52	42	85	63	165	633	886	390	117	36	52	2,569
1976	103	87	63	62	52	228	632	1,040	373	59	19	39	2,757
1977 ^a	20	10	14	26	17	142	255	279	113	71	26	19	992

^aOnly data for self-propelled units are available.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

TABLE 16. EXPENDITURES FOR REPAIRS AND OPERATION OF MOTOR VEHICLES AND FARM MACHINERY IN THE UNITED STATES, 1915-1977

Year	Machinery Repair	Fuel and Oil	Other Vehicle Operation ^a	Total	Year	Machinery Repair	Fuel and Oil	Other Vehicle Operation ^a	Total
(million dollars)					(million dollars)				
1915	49	31	27	107	1947	318	823	635	1,776
1916	53	47	39	139	1948	379	1,009	729	2,117
1917	60	69	69	198	1949	386	1,134	752	2,272
1918	74	100	105	279	1950	364	1,192	779	2,335
1919	74	126	128	328	1951	400	1,250	927	2,577
1920	73	182	141	396	1952	462	1,288	1,010	2,760
1921	73	147	138	358	1953	462	1,338	1,001	2,801
1922	60	145	126	331	1954	459	1,366	957	2,782
1923	57	157	127	341	1955	456	1,403	1,002	2,861
1924	56	171	142	369	1956	463	1,434	1,145	3,042
1925	52	210	171	433	1957	468	1,464	1,231	3,163
1926	53	249	198	500	1958	504	1,447	1,246	3,197
1927	51	246	202	499	1959	542	1,447	1,292	3,281
1928	52	270	211	533	1960	495	1,484	1,247	3,226
1929	58	304	200	562	1961	463	1,434	1,145	3,042
1930	59	306	182	547	1962	462	1,512	1,182	3,156
1931	47	245	173	465	1963	447	1,535	1,149	3,131
1932	39	227	152	418	1964	433	1,549	1,117	3,099
1933	38	226	141	405	1965	439	1,567	1,116	3,122
1934	42	251	149	442	1966	457	1,616	1,213	3,286
1935	48	273	155	476	1967	498	1,657	1,292	3,447
1936	52	284	177	513	1968	513	1,662	1,333	3,508
1937	61	324	202	587	1969	509	1,717	1,337	3,563
1938	67	329	210	606	1970	558	1,711	1,352	3,621
1939	70	323	217	610	1971	574	1,722	1,455	3,751
1940	77	350	229	656	1972	584	1,688	1,524	3,796
1941	92	402	241	735	1973	725	1,877	1,614	4,216
1942	147	444	294	885	1974	1,035	2,690	1,957	5,682
1943	206	474	399	1,079	1975	1,223	3,318	2,194	6,735
1944	233	509	483	1,225	1976	1,383	3,812	2,441	7,636
1945	263	544	497	1,304	1977	1,521	4,050	2,739	8,310
1946	277	643	536	1,456					

^aFor farm business use only.

SOURCE: Farm Income Situation, Economic Research Service, United States Department of Agriculture, Washington, D.C.

TABLE 17. REPAIRS AND OPERATION OF CAPITAL ITEMS IN NORTH DAKOTA AND THE UNITED STATES, 1949-1977^a

Year	ND	US	Year	ND	US
	(million dollars)			(million dollars)	
1949	88.8	2,896	1964	115.9	3,931
1950	89.0	2,975	1965	118.7	3,943
1951	95.3	3,282	1966	122.7	4,164
1952	101.1	3,506	1967	130.2	4,409
1953	102.4	3,541	1968	141.7	4,387
1954	100.9	3,506	1969	143.3	4,507
1955	102.4	3,600	1970	145.1	4,539
1956	106.8	3,785	1971	130.2	4,707
1957	107.8	3,917	1972	116.1	4,708
1958	108.2	3,921	1973	136.7	5,229
1959	113.6	4,116	1974	184.9	6,659
1960	110.8	3,982	1975	225.5	7,806
1961	108.0	3,976	1976	248.2	8,775
1962	110.1	3,993	1977	259.2	9,510
1963	112.4	3,973			

^aIncludes the repairs and maintenance of buildings, repairs and operation of motor vehicles and other machinery, and petroleum fuel and oil used in the farm business.

SOURCE: Farm Income Situation, Economic Research Service, United States Department of Agriculture, Washington, D.C.

include repair and maintenance of buildings, as well as petroleum. North Dakota farmers experienced a doubling of expenditures between 1972 and 1977. Much of this increase was due to inflation and rising petroleum prices.

Wholesale Prices Paid for Farm Wheel Tractors

Farmers have readily made expenditures for tractors as they substituted capital for labor. Data in Table 18 present average wholesale prices of farm wheel tractors from 1943-1977. Wholesale prices increased from \$579 per tractor in 1943 to \$14,273 per tractor in 1978. However, the size of tractor and its usefulness increased dramatically over this period. By dividing the price by the average horsepower, it is apparent that the increase

TABLE 18. AVERAGE WHOLESALE PRICES OF WHEEL TRACTORS, 1943-1978^a

Year	Dollars Per Unit	Dollars Per Horsepower		Year	Dollars Per Unit	Dollars Per Horsepower	
		Current Dollars	Constant Dollars			Current Dollars	Constant Dollars
1943	\$ 579	\$21	\$37	1961	\$ 2,578	\$50	\$54
1944	658	24	40	1962	2,819	51	54
1945	665	25	41	1963	3,046	53	56
1946	733	28	42	1964	3,443	53	56
1947	783	30	38	1965	3,541	56	58
1948	890	33	38	1966	3,886	58	58
1949	994	35	42	1967	4,257	62	62
1950	1,073	37	43	1968	4,709	66	66
1951	1,234	42	44	1969	4,976	71	68
1952	1,297	42	44	1970	5,560	76	70
1953	1,359	39	44	1971	6,190	80	71
1954	1,513	39	44	1972	6,486	84	69
1955	1,554	39	45	1973	6,953	85	58
1956	1,682	41	47	1974	7,294	86	52
1957	1,842	41	46	1975	8,459	91	50
1958	2,111	46	50	1976	11,220	112	58
1959	2,189	48	52	1977	12,692	124	62
1960	2,338	49	53	1978	14,273	132	--

^aEstimated at wholesale level by dividing value of Manufacturers' Shipments by Units Shipped and by Maximum Belt Horsepower, data are published in "Current Industrial Reports" of the Bureau of the Census.

SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

in price is more modest. Further adjustment by the Index of Prices Paid by Farmers yields the cost per horsepower in constant dollar terms. It is significant that the average wholesale price of the 1977 unit is precisely the same as the 1967 model when adjusted for size and measured in constant dollar terms.

TABLE 19. ADVERTISING EXPENDITURES BY SELECTED FARM EQUIPMENT MANUFACTURERS FOR 1969-1970 AND 1975-1977

1977 Rank ^a	Company	Expenditures				
		1969	1970	1975	1976	1977
3	Deere & Co.	\$1,216,627	\$1,060,937	\$1,868,894	\$1,858,682	\$3,242,493
7	Sperry New Holland	1,079,774	1,008,997	1,069,273	1,427,111	2,094,826
9	International Harvester	1,227,049	1,117,551	1,943,063	2,272,974	1,944,775
10	Ford Motor Co.	1,429,953	1,489,850	1,030,721	2,190,093	1,871,467
21	Allis-Chalmers	778,351	404,022	905,129	954,525	1,167,266
22	J. I. Case	857,031	522,869	903,954	1,008,387	1,037,733
24	White Farm Equipment Co.	355,256	261,995	763,084	568,932	955,045
28	Massey-Ferguson, Inc.	1,241,392	567,699	855,941	1,006,484	885,178
55	Gehl Co.	290,679	286,959	324,528	418,741	404,767
65	Kewanee Machinery Co.	234,508	116,960	208,783	268,638	322,466
66	Caterpillar Tractor Co.	170,870	177,268	N.A.	203,349	304,671
80	Avco-New Idea	411,707	137,306	348,706	336,321	238,241
81	Brillion Iron Works	169,777	139,037	246,482	251,876	237,261
84	Versatile Mfg. Co.	N.A.	N.A.	38,741	133,892	234,874
85	Melroe Division	64,548	67,993	N.A.	275,739	234,218
88	Vermeer Mfg. Co.	N.A.	N.A.	144,210	231,049	227,513
90	Hesston Corp.	151,546	239,095	1,015,199	702,181	220,595
114	Farmhand, Inc.	169,801	211,838	294,400	161,730	169,815
123	Lilliston Corp.	90,567	109,538	104,746	121,293	150,692

^aRank of 150 top agribusiness firms advertising in farm and agricultural trade publications.

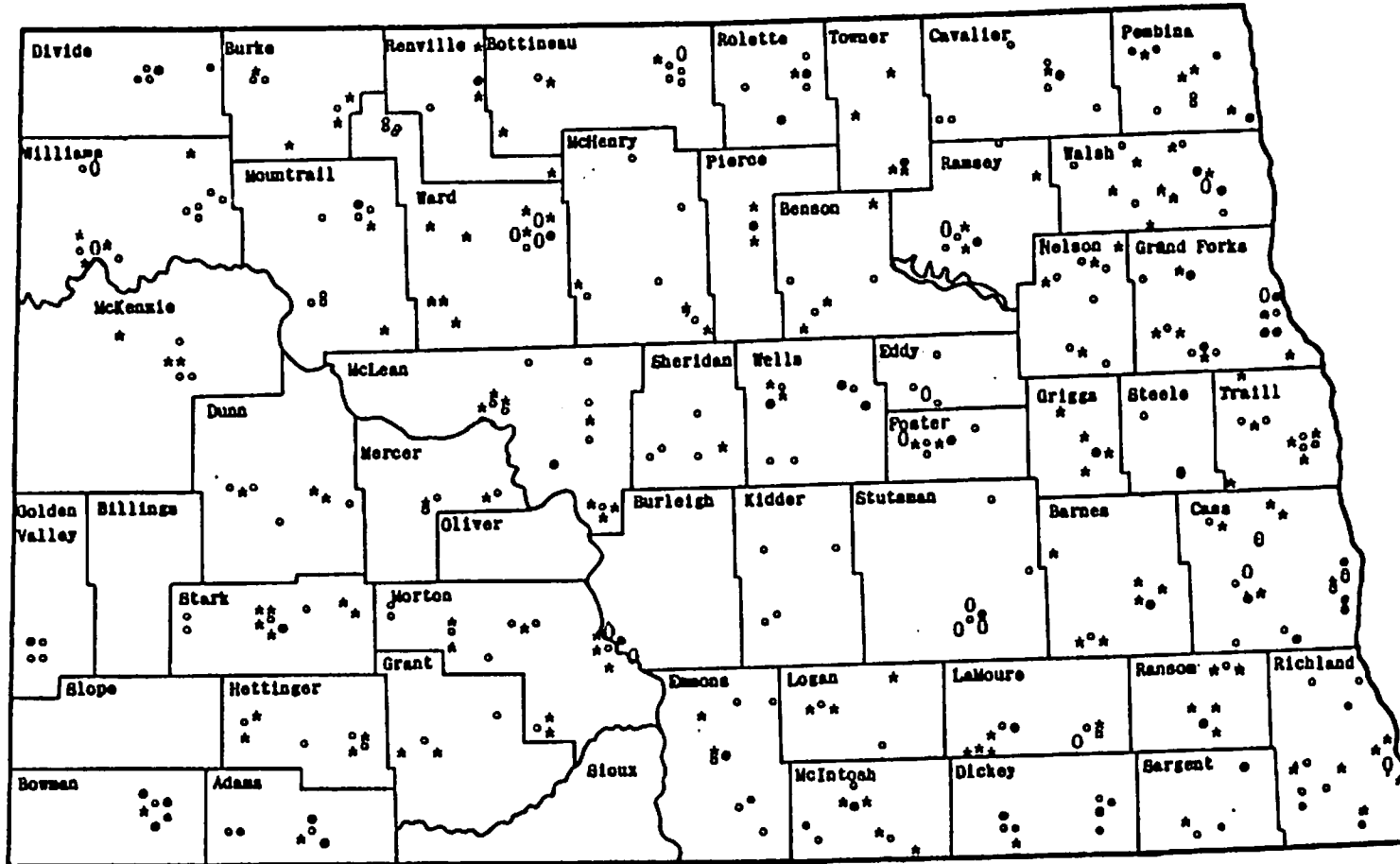
SOURCE: Implement and Tractor, Intertec Publishing Corporation, monthly issues, Kansas City, Missouri.

Advertising Expenditures

Sketchy data on advertising expenditures by farm machinery manufacturers are available (Table 19). Considerable variation in dollars spent for advertising exists from year to year. Some of this may be linked to the introduction of major items.

Farm Machinery Retailing Firms in North Dakota

Figure 16 depicts the location of the farm machinery retail firms in North Dakota in 1969. The larger dealers are generally located in the larger towns and there is a relationship between number of dealers and type of agriculture. Heaviest concentration occurs in the eastern counties where a more intensive type of agriculture prevails. The more intensive farming can support a higher density of retailers.



Annual Retail Sales of:

- \$100,000 or less
- * \$100,000 to \$300,000
- \$300,000 to \$500,000
- \$500,000 and above

Figure 16. Location of Farm Machinery Retail Firms in North Dakota, 1969

SOURCE: Elliott, Michael J., "Market Structure of the North Dakota Farm Machinery Retailing Industry," Unpublished M.S. Thesis, Department of Agricultural Economics, North Dakota State University, Fargo, August, 1970, p. 36.

APPENDIX TABLE 1. LATE MODEL FARM EQUIPMENT IN NORTH DAKOTA AND PERCENT OF TOTAL, BY COUNTY, 1974^a

North Dakota Counties	Motor Trucks and Pickups		Farm Wheel Tractors		Self-Propelled Combines	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Adams	383	34.2	255	19.6	52	20.5
Barnes	802	27.4	691	18.5	226	27.6
Benson	722	30.7	620	21.4	204	28.8
Billings	163	32.5	84	12.0	8	7.7
Bottineau	911	32.0	587	20.2	197	24.4
Bowman	375	37.3	227	21.2	47	19.6
Burke	470	28.4	299	17.3	102	20.9
Burleigh	534	28.9	387	15.0	52	12.2
Cass	1,204	29.6	1,104	24.6	295	26.5
Cavalier	908	33.6	615	21.7	176	22.2
Dickey	536	32.3	416	17.8	96	20.8
Divide	621	33.3	393	20.9	150	26.0
Dunn	500	30.8	306	14.0	59	13.5
Eddy	231	26.0	171	13.1	39	15.3
Emmons	502	29.3	354	13.0	63	11.3
Foster	335	31.9	273	21.8	74	24.6
G Valley	302	38.2	184	24.8	42	25.6
G Forks	1,085	30.4	831	23.4	179	23.8
Grant	501	30.0	286	11.9	56	12.3
Griggs	339	25.3	243	15.2	80	21.1
Hettinger	478	30.5	348	21.9	105	25.0
Kidder	378	30.8	291	13.9	47	14.0
LaMoure	630	28.5	478	16.7	128	21.1
Logan	375	30.1	301	15.0	49	12.0
McHenry	715	29.9	489	15.0	84	14.6
McIntosh	341	26.0	322	15.3	52	10.8
McKenzie	797	38.0	378	16.4	75	15.4
McLean	966	30.5	669	19.3	181	21.3
Mercer	338	28.2	265	15.0	47	14.1
Morton	678	34.6	454	15.2	64	12.6
Mountrail	723	29.6	435	17.4	120	17.4
Nelson	487	25.3	417	18.8	142	25.6
Oliver	214	28.0	166	13.8	22	10.2
Pembina	1,011	35.4	658	23.9	154	21.9
Pierce	547	34.2	363	18.7	97	23.1
Ransey	581	29.1	500	22.4	173	29.9
Ransom	471	35.0	359	18.3	78	25.7
Renville	402	28.5	278	19.7	86	23.3
Richland	1,165	34.0	868	19.9	321	31.3
Rolette	458	33.3	284	18.4	95	24.9
Sargent	466	31.9	351	16.8	72	19.6
Sheridan	305	24.3	249	15.6	43	13.8
Sioux	235	43.8	121	16.6	14	14.3
Slope	298	33.9	146	16.5	35	18.4
Stark	530	28.9	416	18.6	55	11.1
Steele	522	32.5	403	24.6	120	26.7
Stutsman	935	31.1	766	19.3	175	21.6
Towner	578	30.5	383	21.4	128	21.9
Traill	766	31.5	603	24.9	145	24.0
Walsh	1,175	32.9	848	24.0	143	19.2
Ward	1,037	30.8	662	18.4	211	21.1
Wells	583	28.8	453	18.3	140	24.7
Williams	904	33.3	564	21.4	179	25.2
TOTALS	31,513	31.1	22,614	18.8	5,777	21.2

^aFarm equipment manufactured in last five years.

SOURCE: United States Department of Commerce, Bureau of the Census, Agricultural Census, 1964, 1969, 1974, Washington, D.C.

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