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Staff Paper Series

Potential Impacts of Reduced Farm Spending on the Economies of Minnesota and Three Selected Counties

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The analyses and views reported in this paper are those of the author. They are not necessarily endorsed by the Department of Applied Economics or by the University of Minnesota.

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By William F. Lazarus
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Executive Summary

- Low crop prices have reduced farm incomes in Minnesota and elsewhere in the U.S., with forecasts of more the same for at least another year.
- Crop producers are being encouraged to "tighten their belts". Capital expenditures for machinery and buildings, land rents, and fertilizer are the most likely areas to cut back.
- IMPLAN input-output software was used to calculate the impacts of a potential 50% reduction in farm machinery and building purchases, a 10% reduction in cropland rental rates, and a 30% reduction in fertilizer expenditures on employment in Kandiyohi, Nobles, and Jackson Counties and for Minnesota statewide.
- Jackson County is home to a large farm machinery manufacturer that sells nationally, so a 25% reduction in their output was also considered along with those cutbacks in in-county purchases.
- Those percentages seem consistent with reductions already observed in farm record summaries between 2014 and 2015 and machinery sales trends, but are NOT predictions.

What does this all mean for rural MN communities? From the data that's currently available we conclude the following:

- The economic impacts are likely to vary by community. Some communities and counties are more vulnerable to sustained grain price swings due to their economic composition. For instance, Jackson County's extreme share of output related to farm machinery manufacturing make it far more vulnerable to continued low grain prices. However, that doesn't discount the impacts that Nobles and Kandiyohi Counties will experience. It's possible that counties without a regional center will have a slightly smaller overall impact due to grain prices because the indirect and induced purchases related to agriculture shifted to regional centers long ago.
- The impact of grain prices on individual farmers is not discussed in detail here. It can be assumed that the financial impacts will be significant. Additionally, psychological impacts from the added stress that challenging economic times will cause is also not accounted for.
- Job losses at farm machinery dealers, construction firms, fertilizer dealers, and in other sectors supplying them would be: Kandiyohi – 129, Nobles – 138, Jackson – 650, and Minnesota – 14,140. These job losses would be a severe economic hit to those workers and their families, although total employment and labor income reductions would be around one percent or less except for Jackson County which would see a 7.5% job loss, driven mainly by the assumed 25% output reduction in farm machinery manufacturing.
- If the county total labor income reduction from these cutbacks is divided by county population, they would amount to $192 per capital in Kandiyohi, $348 per capita in Nobles, and $3,229 in Jackson. The statewide reduction would be $177 per capita.
- Machinery and fertilizer dealers are grouped into the general industry category of "Trade", which the most heavily impacted sector except in Jackson County, where manufacturing is most affected. The finance, insurance, and real estate sector is also heavily affected along with construction.

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Introduction

Minnesota crop producers experienced several years of relatively high crop prices in 2008-2013. The monthly average price received by Minnesota producers for corn peaked at $7.54/bushel in August, 2012 and remained above $5.00/bushel through October of 2013 (Figure 1). By comparison, monthly Minnesota corn prices averaged $2.36 in 2004, a decade earlier. But, "all good things must come to an end", and the corn price moved down to under $4.00/bushel by July, 2014 (USDA National Agricultural Statistics Service 2015).

The low prices obviously can have a negative impact on farm income. But, concerns have also been raised about the impacts of reduced farm spending on rural communities. That is the focus of this paper. The community impact concern was first expressed to me over two years ago. At that time, however, there was optimism that producers would have sufficient financial reserves to tide them over until prices would rebound, so that there would be little impact on farm spending. The corn price has now been below $4.00 for over two years, and has averaged under $3.50 for half of that time. Prospects are for large U.S. corn and soybean crops in 2016, so commentators are now suggesting that prices are not likely to rebound until some other part of the world experiences a short crop (Good, Farmdoc, 9/12/16).

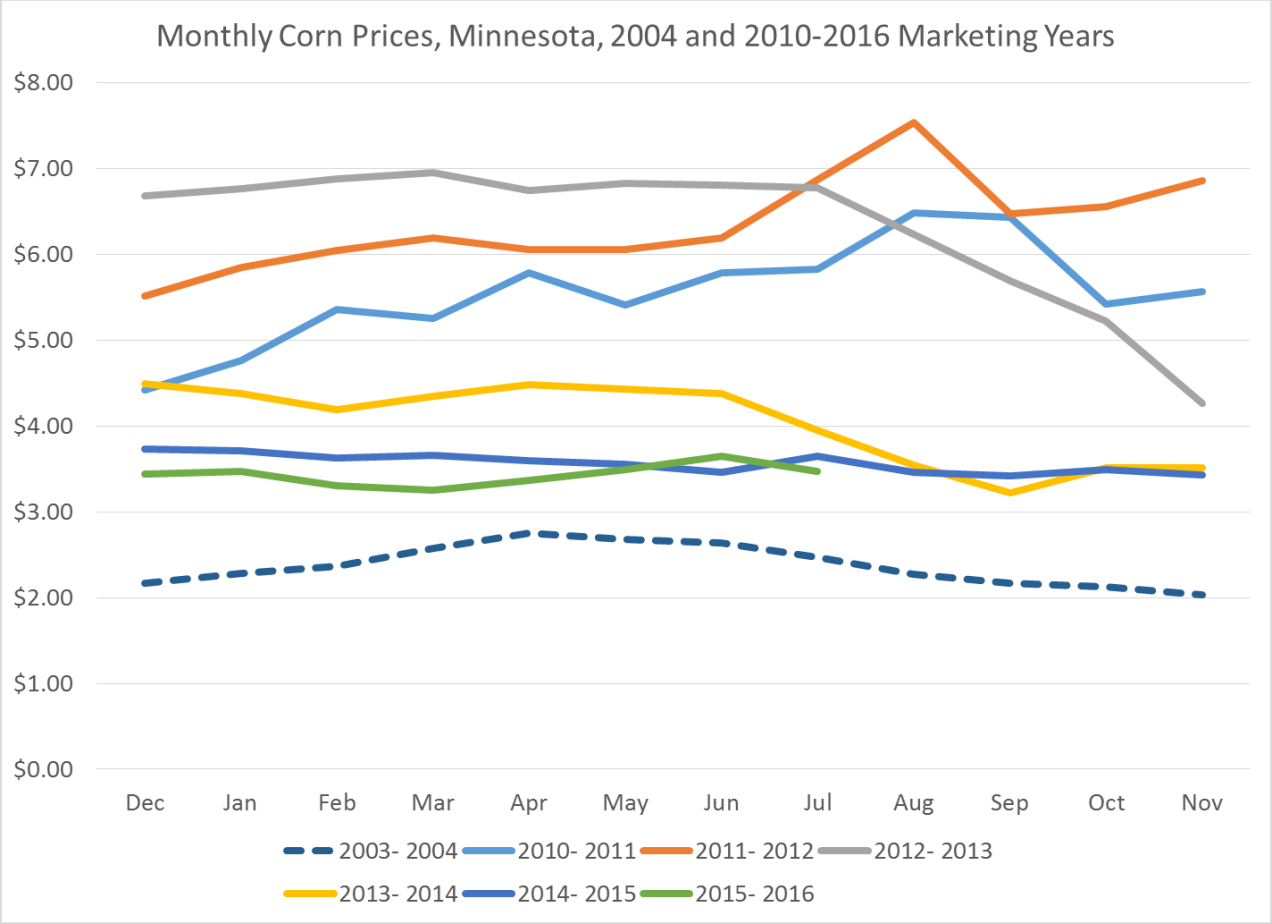
The goal of this analysis is to quantify the extent to which future reductions in farm spending are likely to affect rural communities in Minnesota. If farm spending is reduced in a way that affects the local community, what categories of spending are likely to be observed? The first category that comes to mind is farmland rental payments, since extension economists have been recommending that producers renegotiate rental rates as a cost-cutting move. Capital expenditures for new machinery and buildings are also likely to be affected as in general they are easier to defer than, say, operating inputs such as seed. Fertilizer prices have also declined, while it is unclear yet how much producers will cut back on fertilizer rates to cut costs.

Four areas of reduced spending are considered here, based on the logic above: 1) farm machinery purchases, 2) farm building construction, 3) cropland rental payments, and 4) fertilizer expenditures. The main data sources used are the FINBIN database of farm business and financial summaries, the U.S. Census Bureau's County Business Patterns database, and the IMPLAN input-output software package (Minnesota IMPLAN Group ; Center for Farm Financial Management 2013; U.S. Census Bureau Undated). Both of these sources are available at the county level.

Farm household discretionary spending on goods such as televisions and sofas might also see cutbacks with reduced incomes, but is not considered in this analysis.

An implicit assumption is that the farms in the county make all of their machinery and building purchases from businesses in the county, and pay most of their rent payments to landowners who live there, as discussed in more detail later.

Figure 1.


Monthly Corn Prices, Minnesota, 2004 and 2010-2016 Marketing Years
$8.00
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
2003- 2004
2010- 2011
2011- 2012
2012- 2013
2013- 2014
2014- 2015
2015- 2016

FINBIN Data for Three Selected Counties and the State as a Whole

The latest data available in FINBIN is for the 2015 calendar year, since the data is not summarized until the end of the year. Also, rent payments made in a given year such as 20115 were most likely negotiated during the fall of the previous year, 2014. Table 1 shows average cash outflows per farm for crop farms in Kandiyohi, Nobles, and Jackson Counties and statewide in 2012-15. The 2004 averages are also shown for comparison, to represent the situation before the recent period of high crop prices. It is not entirely clear from Table 1 which year best represents the high-price period to use as a comparison benchmark. Looking at the average of the two counties, machinery purchases were highest in 2012 and had already declined by a third by 2014. Land rent payments peaked in 2014, on the other hand. The 2014 year is used as the starting benchmark in the calculations below.

The machinery and building purchase data is from the whole farm statement of cash flows, while the rental payments are from the detailed income statement. "Crop farms" are defined as farms with at least 70% of revenue from the sale of crops. There are doubtless also other farms in the county affected by low crop prices but which have livestock enterprises making up more than 30% of revenue so were not included in these averages, but the analysis is confined to the crop farms for clarity.

For Kandiyohi and Nobles Counties, the direct impact of reduced machinery purchases is expected to be felt mainly by machinery dealers rather than machinery manufacturers, because the data shows little or no farm machinery manufacturing in those counties. IMPLAN shows that less than one percent of the farm machinery demand in Kandiyohi County is supplied from county firms, and none in Nobles County.

The farm machinery situation is different in Jackson County, located just east of Nobles County. IMPLAN shows that only four percent of the county's farm machinery demand is supplied from the county's sector. However, the city of Jackson in that county is the home of a manufacturer of large applicators for fertilizer and farm chemicals. The IMPLAN data for 2014 shows employment of 1,165 and annual output or sales of $674 million for the farm machinery and equipment manufacturing sector in that county. That output number would make that sector equal to 39% of the entire county economy's $1.743 billion output/year. That compares to 1.5% in Kandiyohi County, none listed in Nobles County, and 0.3% for Minnesota overall. The farm machinery and equipment manufacturing sector's share of the county is less if measured by employment or labor income – 14% and 21%, respectively.

The market for such specialized equipment is obviously much larger than Jackson County itself. The reduced farm spending resulting from low crop prices is a regional and national phenomenon, so that sector is likely to be impacted by reduced farm spending regionally and nationally more so than by reduced spending by county producers. The Jackson County results discussed below consider a percentage reduction in this farm machinery manufacturing sector based on the national situation, while the other results are based on only spending by crop producers in the county.

Table 1. Average annual cash outflows by crop farms in Nobles, Kandiyohi, and Jackson Counties and Minnesota in recent years

	2004	2012	2013	2014	2015	2014-5 chg.
Kandiyohi County						
Purchase of machinery & equip.	$50,635	$84,615	$83,828	$68,411	$33,298	-51%
Purchase of farm buildings	$5,191	$26,009	$17,405	$12,672	$5,594	-56%
Land rent	$53,118	$89,089	$81,189	$103,838	$94,057	-9%
Fertilizer	$31,837	$67,220	$70,965	$86,926	$61,343	-29%
Machinery leases	*$1,593*	*$1,108*	*$1,017*	*$816*	*$599*	*-27%*
Number of farms	11	21	26	17	18	
Total crop acres	894	627	607	753	639	
Crop acres cash rented	547	435	387	483	448	
Nobles County						
Purchase of machinery & equip.	$21,391	$101,582	$79,003	$52,393	$50,246	-4%
Purchase of farm buildings	$6,963	$30,238	$22,119	$6,786	$1,873	-72%
Land rent	$44,027	$82,841	$90,085	$79,999	$77,265	-3%
Fertilizer	$29,162	$68,108	$75,061	$47,840	$56,570	18%
Machinery leases	*$1,715*	*$6,893*	*$1,823*	*$687*	*$1,830*	*166%*
Number of farms	20	20	20	20	19	
Total crop acres	706	706	706	706	752	
Crop acres cash rented	462	462	462	462	481	
Jackson County						
Purchase of machinery & equip.	$28,409	$75,701	$88,989	$46,404	$82,426	78%
Purchase of farm buildings	$3,008	$19,938	$11,962	$14,851	$13,684	-8%
Land rent	$44,099	$85,407	$91,902	$76,728	$109,301	42%
Fertilizer	$21,899	$72,710	$68,279	$55,156	$60,829	10%
Machinery leases	*$2,029*	*$2,990*	*$1,793*	*$3,041*	*$5,646*	*86%*
Number of farms	34	34	28	24	28	
Total crop acres	637	649	665	612	733	
Crop acres cash rented	420	444	436	413	564	

	2004	2012	2013	2014	2015	2014-5 change
Average of Nobles, Kandiyohi and Jackson						
Purchase of machinery & equip.	$33,478	$87,299	$83,940	$55,736	$55,323	7%
Purchase of farm buildings	$5,054	$25,395	$17,162	$11,436	$7,050	-45%
Land rent	$47,081	$85,779	$87,725	$86,855	$93,541	10%
Fertilizer	$27,633	$69,346	$71,435	$63,307	$59,581	0%
Machinery leases	*$1,779*	*$3,664*	*$1,544*	*$1,515*	*$2,692*	*75%*
Number of farms	22	25	25	20	22	
Total crop acres/farm	746	661	659	690	708	
Crop acres cash rented	476	447	428	453	498	
Minnesota						
Purchase of machinery & equip.	$39,059	$117,447	$117,525	$67,473	$48,127	-29%
Purchase of farm buildings	$11,020	$35,720	$35,739	$20,735	$16,341	-21%
Land rent	$63,546	$122,363	$131,886	$139,863	$136,104	-3%
Fertilizer	$35,466	$121,586	$103,179	$88,329	$92,247	4%
Machinery leases	*$4,781*	*$6,491*	*$5,915*	*$6,645*	*$6,853*	*3%*
Number of farms	1,017	1,396	1,212	998	1,065	
Total crop acres	1,090	1,048	1,040	1,092	1,094	
Crop acres cash rented	770	738	717	752	771	
Machinery leases as % of mach. purchases						
Kandiyohi County	*3.1%*	*1.3%*	*1.2%*	*1.2%*	*1.8%*	*51%*
Nobles County	*8.0%*	*6.8%*	*2.3%*	*1.3%*	*3.6%*	*178%*
Jackson County	*7.1%*	*3.9%*	*2.0%*	*6.6%*	*6.8%*	*5%*
Average of Nobles, Kandiyohi and Jackson Counties	*5.3%*	*4.2%*	*1.8%*	*2.7%*	*4.9%*	*79%*
Minnesota	*12.2%*	*5.5%*	*5.0%*	*9.8%*	*14.2%*	*45%*

Source: FINBIN

Kandiyohi County, where the city of Willmar is located, and Nobles County, with the city of Worthington, are about average in employment in the "Farm and Garden Machinery and Equipment Merchant Dealers" category in the "County Business Patterns" database maintained by the U.S. Bureau of the Census. Kandiyohi County had 118 employees compared to an average of 105 for the 24 counties for which an exact number is reported (Appendix Table A2-1). The machinery dealer data for 47 other counties and the construction data for 38 counties is reported only as ranges to avoid disclosure for individual companies. Nobles County falls into that category for machinery dealers, so those employees in that county are reported as 20-99.

Figures 2-4 show the farm machinery dealer jobs by county compared to the 2014 total of corn and soybean planted acres. Figure 4 does not appear to show much if any correlation between the total of corn and soybean acres, and farm machinery dealer jobs (Hennepin County at 750 jobs is off the scale and not shown).

Machinery leases

A shift from purchasing farm machinery to leasing it is a response to reduced farm incomes that has been highlighted in the news media (Tita 2015). Machinery lease expenditures by the FINBIN farms are small relative to purchases. Leases did increase in 2015 compared to 2013 and 2014. However, as a percentage of purchases the leases are comparable or less than in 2004, during the era of low but stable crop prices and farm incomes (corn prices for the 2004-2005 marketing year are shown as the bottom line in Figure 1). Machinery leases are shown in Table 1 for comparison to the other items but are NOT included in the analysis for simplicity because the amounts are considerably less than the included items.

Figure 2

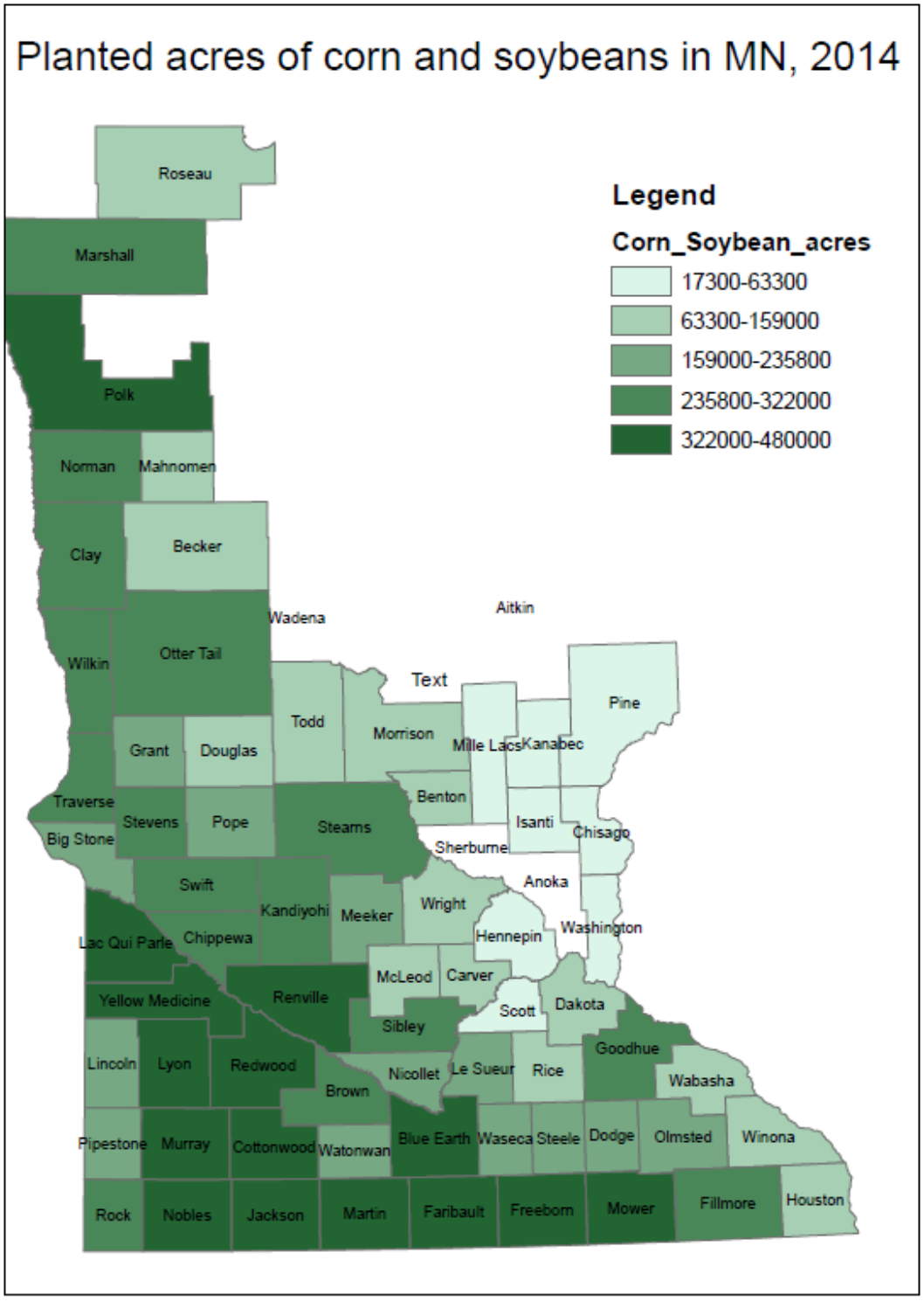
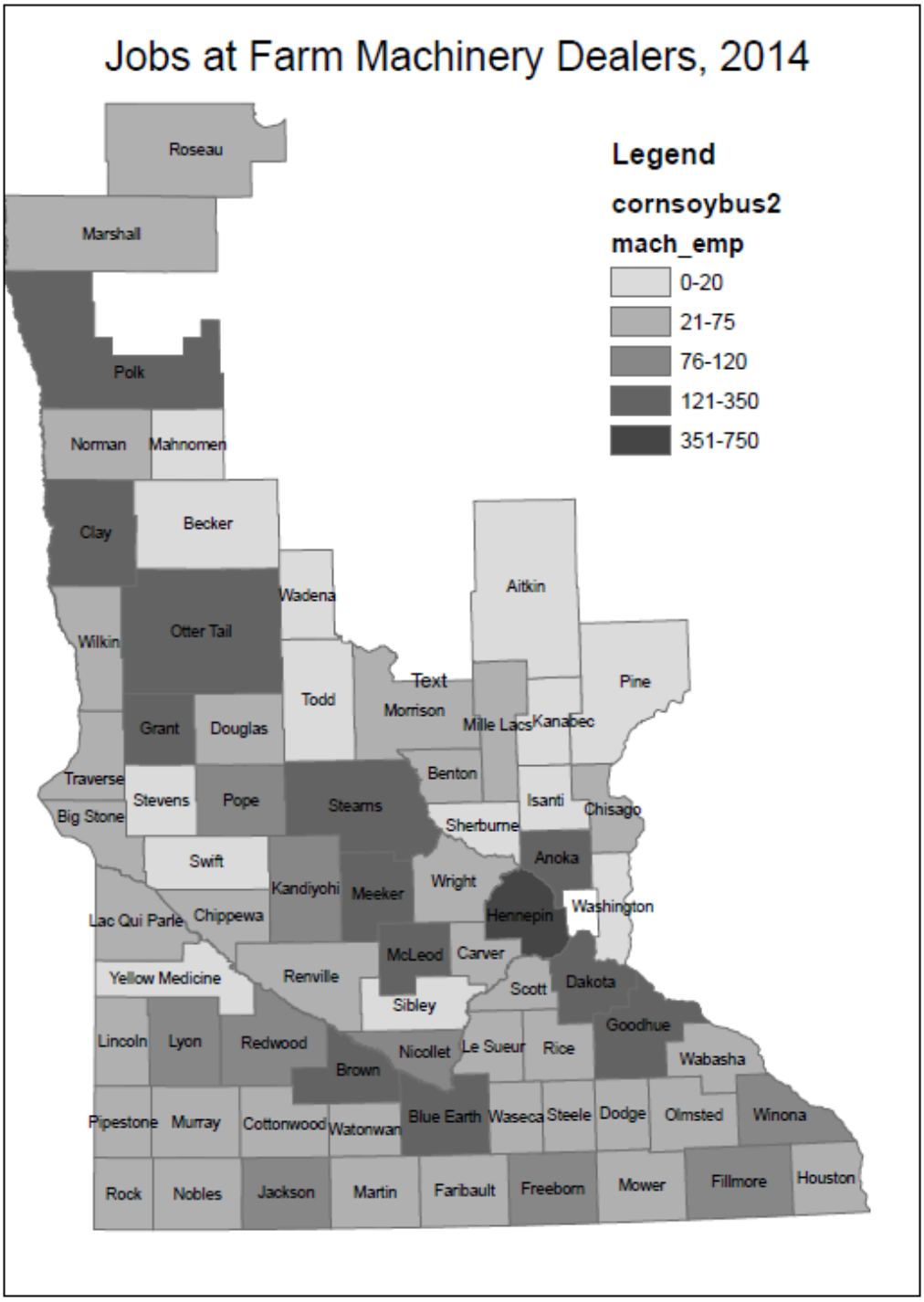

Planted acres of corn and soybeans in MN, 2014
Legend
Corn_Soybean_acres
17300-63300
63300-159000
159000-235800
235800-322000
322000-480000
Roseau
Marshall
Polk
Norman
Mahnomen
Clay
Becker
Wadena
Aitkin
Wilkin
Otter Tail
Text
Todd
Morrison
Mille Lacs
Kanabec
Pine
Grant
Douglas
Traverse
Stevens
Pope
Stearns
Benton
Isanti
Chisago
Big Stone
Sherburne
Swift
Kandiyohi
Meeker
Wright
Anoka
Lac Qui Parle
Chippewa
Hennepin
Washington
McLeod
Carver
Yellow Medicine
Renville
Scott
Dakota
Sibley
Lincoln
Lyon
Redwood
Nicollet
Le Sueur
Rice
Goodhue
Wabasha
Brown
Pipestone
Murray
Cottonwood
Watonwan
Blue Earth
Waseca
Steele
Dodge
Olmsted
Winona
Rock
Nobles
Jackson
Martin
Faribault
Freeborn
Mower
Fillmore
Houston

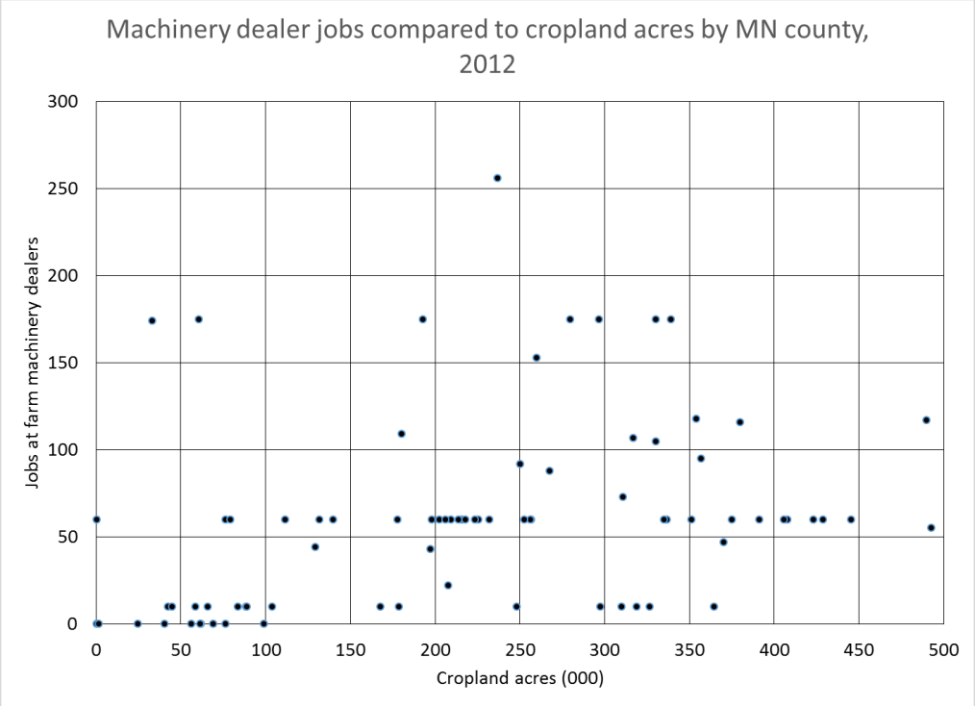
Figure 3



For the purpose of those figures, the midpoints are shown for the 47 counties where only a range is reported in County Business Patterns (and shown in Table A2-1), as follows:

Range	0-19	20-99	100-249	250-499	500-999
Midpoint	10	60	175	375	750

Figure 4



Note: Hennepin County, with 750 machinery dealer jobs, is not shown.

Farm machinery purchases reported in FINBIN for 2015 declined only slightly (4%) in Nobles County but by 51% in Kandiyohi County. Farm building purchases declined significantly in both counties: down 72% in Nobles and down 56% in Kandiyohi. The reductions in rent were much smaller: 3% and 9%. Expenditures on titled vehicles were also expected to decline so were examined, but are omitted from the analysis because they rose on average rather than declining. They declined for the Nobles County farms but rose in Kandiyohi County. Machinery purchases, land rent payments, and fertilizer purchases along with net farm income in Jackson County were higher in both 2013 and 2015 than they were in 2014.

The Association of Equipment Manufacturers reported a 33% reduction in sales of 4 wheel drive tractors and a 22% drop in combine sales for the first half of 2016 compared to the same period in 2015 (Flammini 2016).

Agriculture is an important part of the economies of all three of these counties and the state, but the service sector, retail and wholesale trade, and manufacturing are the largest sectors (Figure 5).

Putting it all together to estimate economic impacts

The scenario presented in Figure 6 and Tables 3 and 4 below assumes the following scenario for 2016 and beyond compared to 2014:

- 50% drop in spending on farm machinery,
- 50% drop in farm building construction,
- 10% decline in cropland rents,
- 30% reduction in farm fertilizer expenditures, and
- (for Jackson County only) 25% decline in farm machinery and equipment manufacturing.

The 2014 expenditures are also inflated by 4% to adjust for the intervening three years. The "secondary impacts" shown are the sum of the indirect impacts on supplier industries and the induced impacts on household. Table 2 illustrates the details of the assumed per-farm amounts for 2016 and beyond and the extrapolation to county totals, for Kandiyohi County. The same format was used for the other counties and the state.

Hopefully the actual spending declines in 2016 and beyond will be less than those listed in the scenario above. Information will become available later on the actual spending declines. Also, readers with knowledge of local conditions may wish to examine the impacts of other scenarios. The IMPLAN calculations are linear in nature, so it is fairly straightforward to calculate impacts for other percentages by applying a simple ratio. For example, the impacts of spending declines half as large as those shown above, or 25%, 5%, and 15%, will be half of those shown in Figure 6 and Table 3.

It is more complicated to calculate the impacts for other scenarios where some spending categories change by varying amounts, such as if machinery spending declines by only 25% but cropland rents decline by 20% rather than the 50% and 10% shown above. A spreadsheet is available from the author for analyzing such scenarios.

The impact on the farm machinery dealers is assumed to include the dealer margins on the purchases, which the IMPLAN database assumes is 17% of the total purchase price. The remaining 83% is allocated to the farm machinery manufacturing sector, but since the IMPLAN trade flows data shows that only 0.8% of the county machinery purchases are from county manufacturers in Kandiyohi County and none in Nobles County, very little of this 83% of machinery purchases has an impact in the county. For Minnesota overall, the IMPLAN estimate is that 39% of farm machinery purchases are from in-state manufacturing plants.

As mentioned above, since Jackson County contains a large farm machinery manufacturer selling into the national market, the farm machinery manufacturing sector estimate for Jackson County is based on the assumption that the national farm situation will reduce that sector's output by 25%, without specifically breaking out the impact of crop producers' spending in that particular county. The logic for a 25% reduction rather than the 50% drop assumed for spending by county crop producers, is that other crops and other regions have not seen as large a price drop as have corn and soybeans in Minnesota.

Table 2. Cash outflows per crop farm from the FINBIN database for 2014 and assumed for 2016 and beyond compared to county corn and soybean acres, and county populations for Kandiyohi County

Kandiyohi County Per crop farm:	2014	Change assumed	2016 and beyond
GDP deflator	108.69	4.0%	113.03
Purchase of machinery & equipment	$68,411	-50%	$34,206
Purchase of farm buildings	$12,672	-50%	$6,336
Land rent	$103,838	-10%	$93,454
Fertilizer	$86,926	-30%	$60,848
Total crop acres/farm	753		753
Total acres of corn grain and soybeans in county	257,700		
Total spending based on total corn grain and soybean acres:			
Dealer margins on machinery & equipment, in 2016 dollars	$4,212,354	-$2,106,177	$2,106,177
Manufacturer share of machinery purchases	$20,136,511	-$10,068,256	$10,068,256
Local use of local supply for the farm machinery manuf. sector		0.868%	
Machinery purchases from local manufacturers	$17,4785	-$87,392	$87,392
Purchase of farm buildings	$4,510,222	-$2,255,111	$2,255,111
Land rent (60% assumed paid to local landlords)	$22,174,832	-$2,217,483	$19,957,349
Fertilizer	$29,748,778	-$8,924,634	$20,824,145
Total spending on machinery, buildings, rent and fertilizer	$80,782,697	-$25,571,661	$55,211,038
County population, 2014	42,285		
Farm spending per capita	$1,905	-$603	$1,302

Note: The same general format was used for the other counties and Minnesota, except that all cropland was used for the Minnesota calculations rather than only corn grain and soybean acres.

The construction impacts are handled differently from machinery in that 100% of farm spending is considered rather than just dealer margins. A set of regional purchase coefficients in IMPLAN are used to allocate shares of construction firm spending between in-county and outside suppliers. The impact of the reduction in land rental payments is based on the assumption that only 60% of the land is owned by landowners who live in the county, based on estimates provided by the county directors of the USDA Farm Service Agency offices in the two counties based on their mailing lists. The land rental payments to the local landowners are included in the direct output impacts shown in Tables 3 and 4 because they are a cash flow into the local economy similar to the machinery purchases and construction, although technically rent is not normally classified as an output in IMPLAN because it is not produced as sales of an industry sector, the usual definition of "output".

Tables 3 and 4 contain several different metrics that may be of interest to different audiences. Looking at jobs, the direct employment impacts of reduced machinery purchases (70 fewer jobs in Kandiyohi County, 71 fewer in Nobles, and 358 in Jackson County) are a substantial portion of the total employment in that sector shown in Table A2-1 (118 jobs in Kandiyohi, 20-99 in Nobles, and 105 in Jackson according to County Business Patterns data). The direct statewide job loss due to reduced machinery purchases is 3,880.

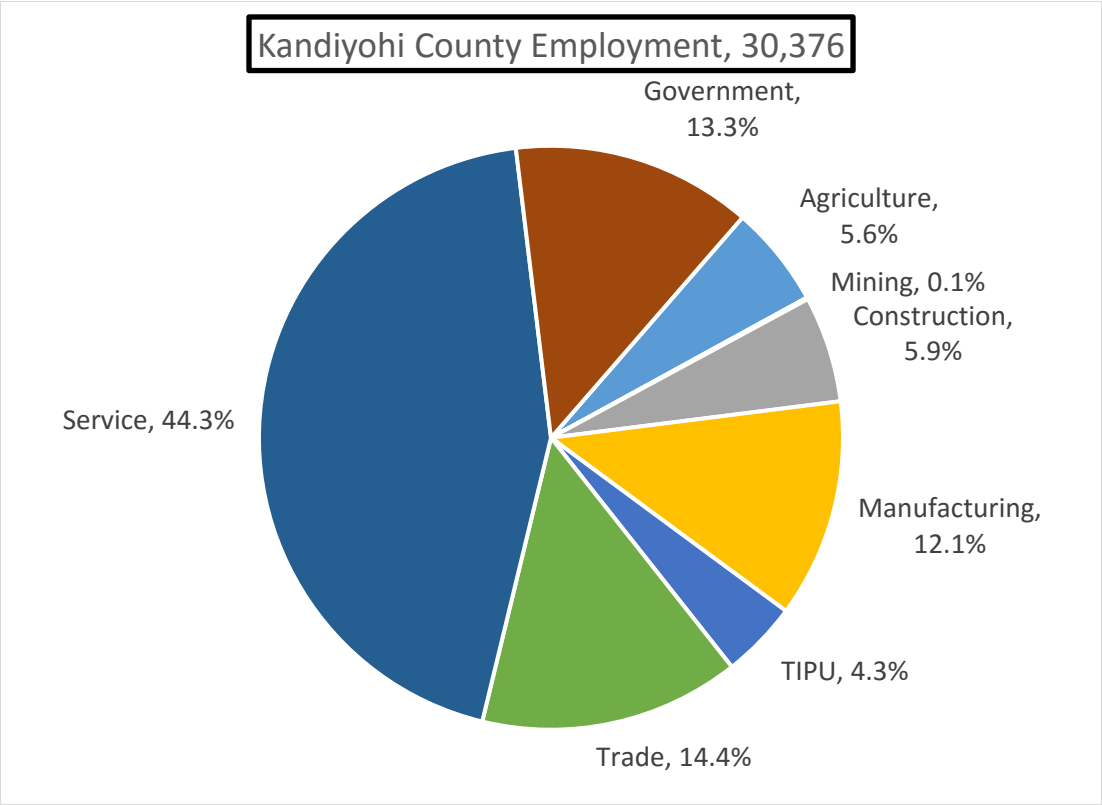
It should be noted that the impact of machinery sales on dealer employment is what is considered here. Most dealers will also have a service and parts side to the business, which is not considered here.

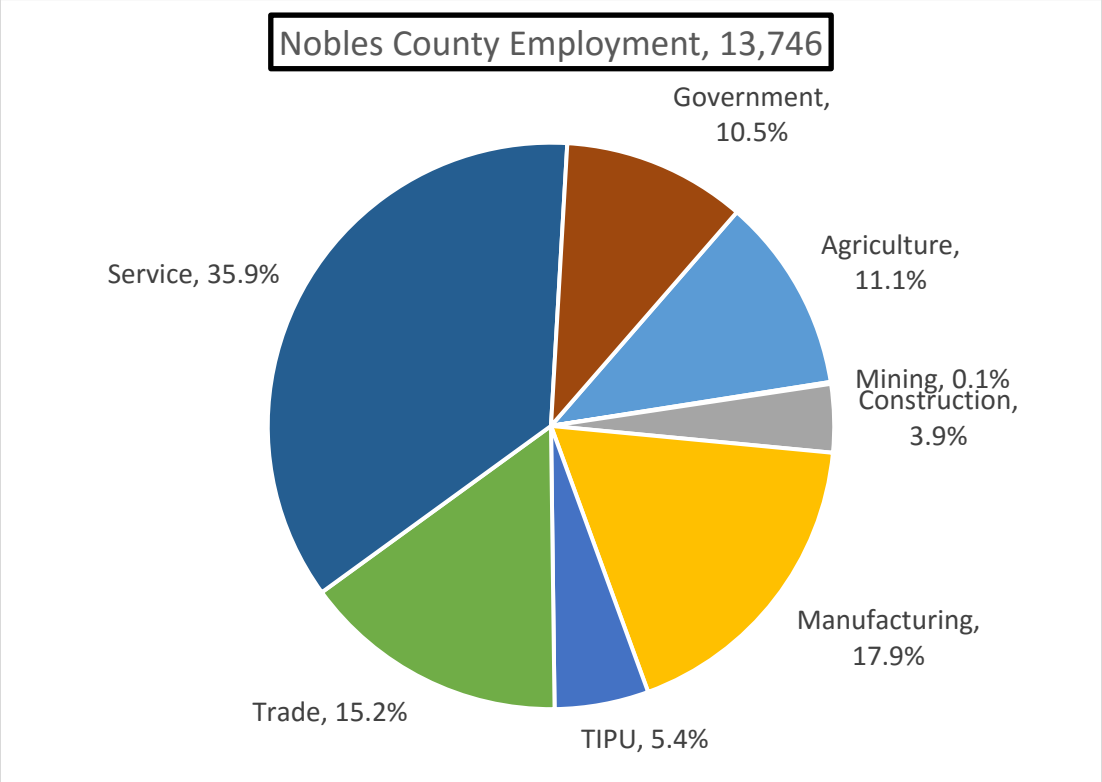
The reduced farm construction of 16 jobs in Kandiyohi County is a smaller share of the total 169 jobs there, although the reduction of 15 construction jobs in Nobles County is most of the 20 total commercial (not residential) construction jobs reported for that county in the County Business Patterns database. Crop producers in Jackson County spent more on buildings in 2014 than did those in the other counties, so the 50% spending reduction there reduces construction jobs by 35 there.

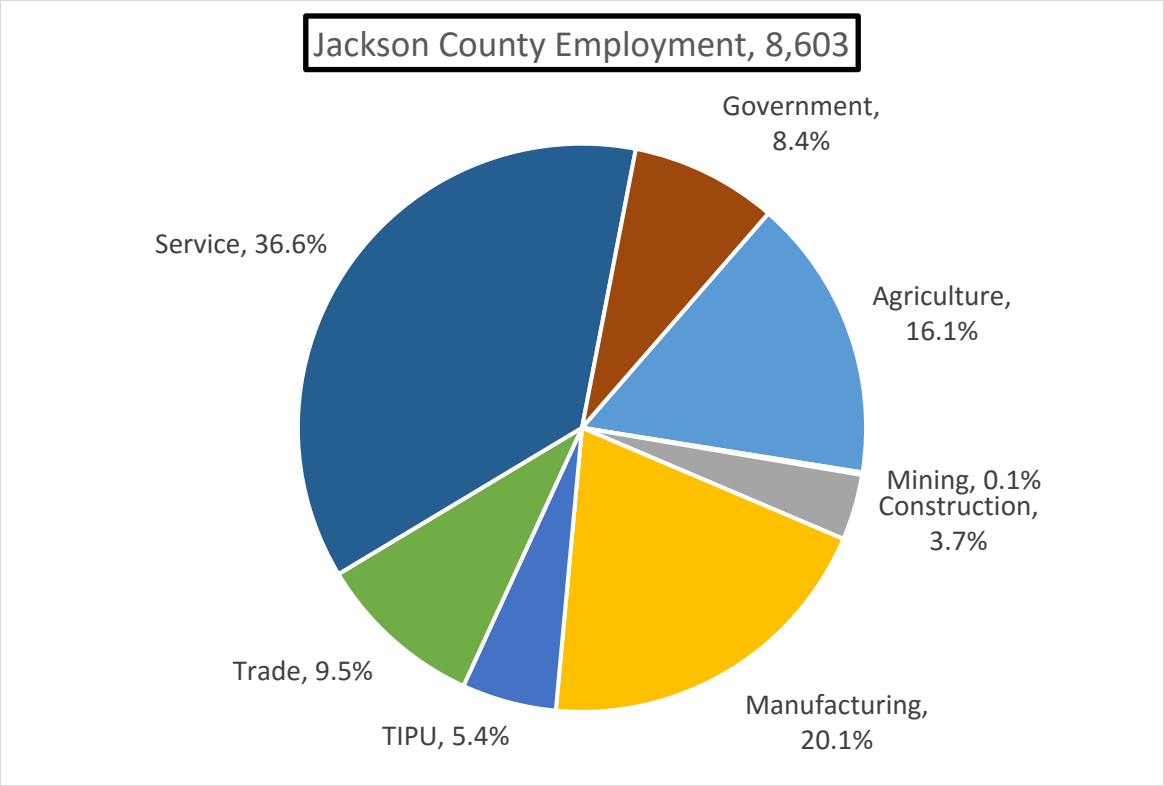
It is also notable that while 50% drops in machinery purchases and farm construction in the county sound like large numbers, in percentage terms the total impact on the county economy with secondary ripple effects is less than one percent in Kandiyohi County and around one percent in Nobles County. The job loss in Jackson County is 7.5%, due mainly to the assumed drop in machinery manufacturing due to regional or national trends rather than the county farm situation.

Another measure of community impact is that labor income would decline by $237/person in Kandiyohi County (42,285 population in 2014), $348/person in Nobles (population 21,487), $3,229 in Jackson (population 10,269) and $199/person statewide. Table 5 shows that the industry sectors that are most affected are the financial and real estate sector along with overall construction and trade.

Figure 5. Employment in Minnesota and Kandiyohi, Nobles, and Jackson Counties, 2014






Jackson County Employment, 8,603
Government, 8.4%
Agriculture, 16.1%
Mining, 0.1%
Construction, 3.7%
Manufacturing, 20.1%
TIPU, 5.4%
Trade, 9.5%
Service, 36.6%

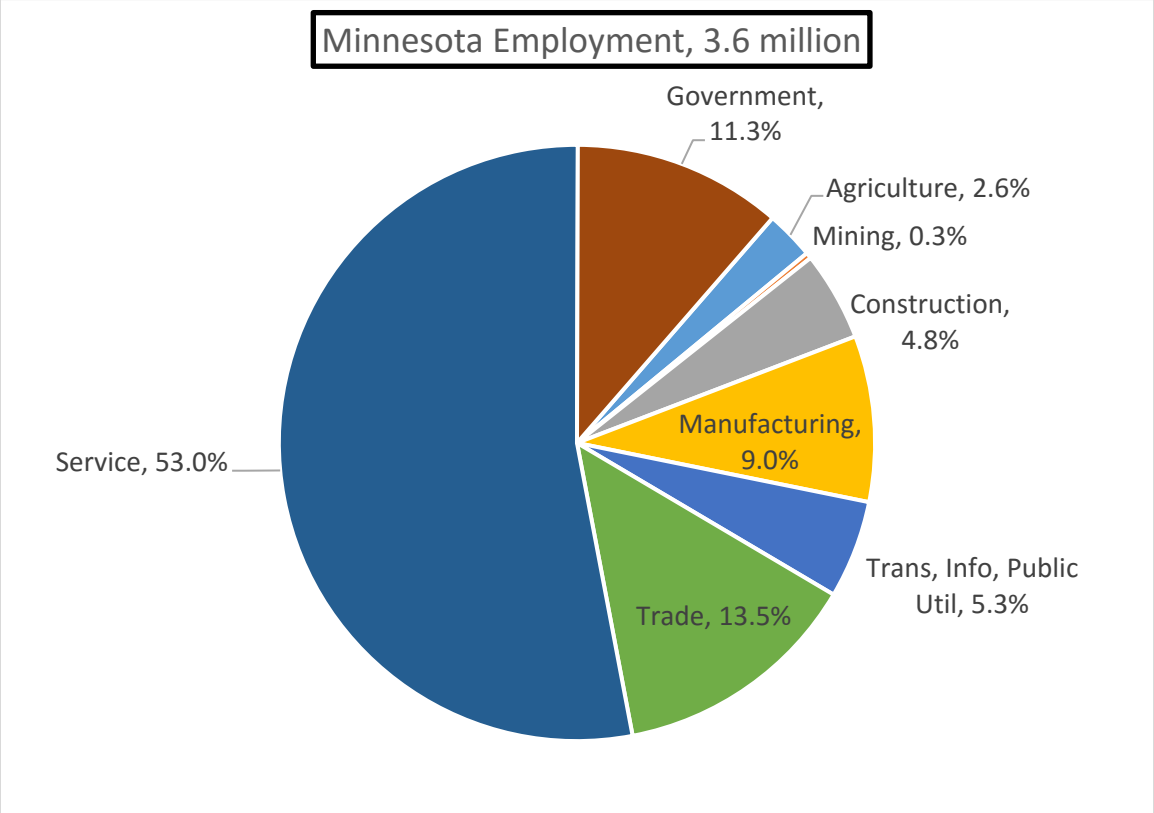
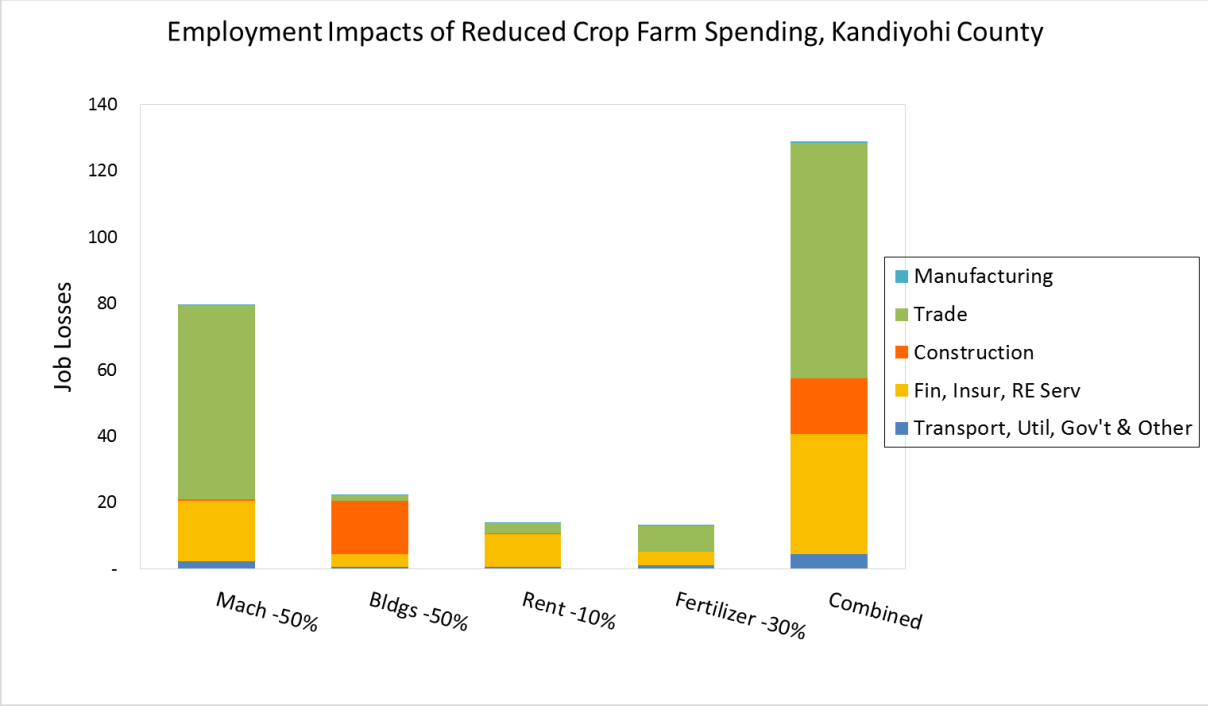
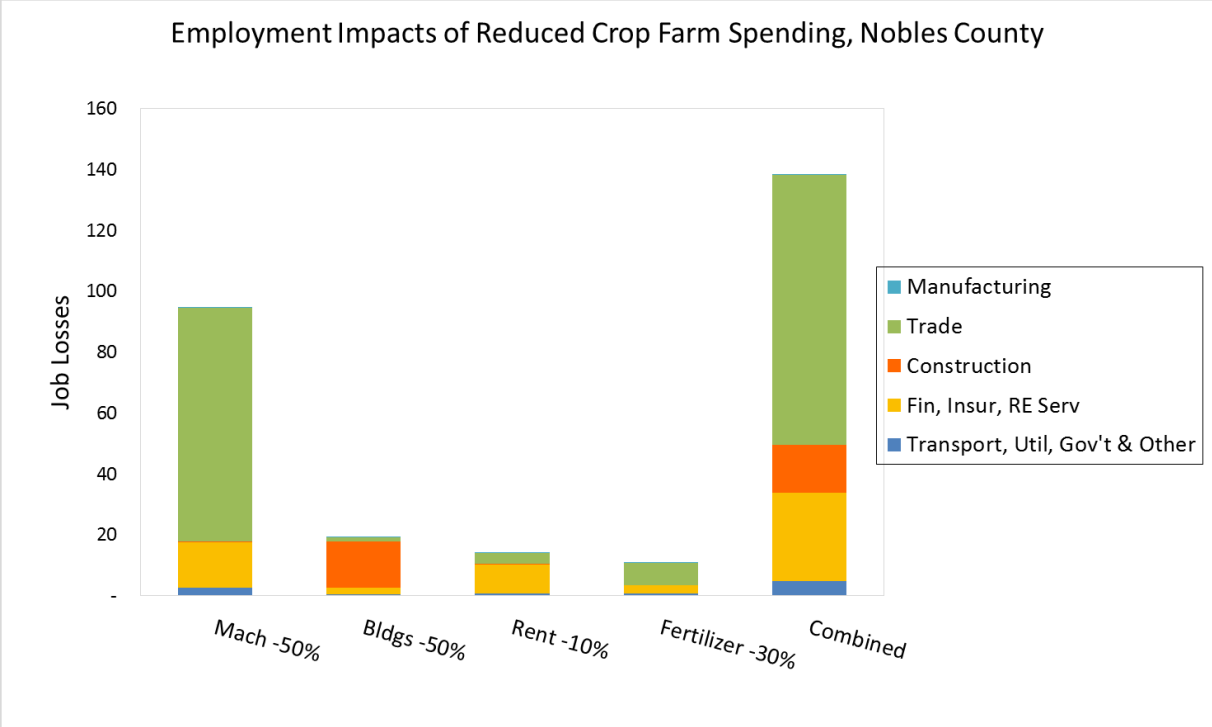
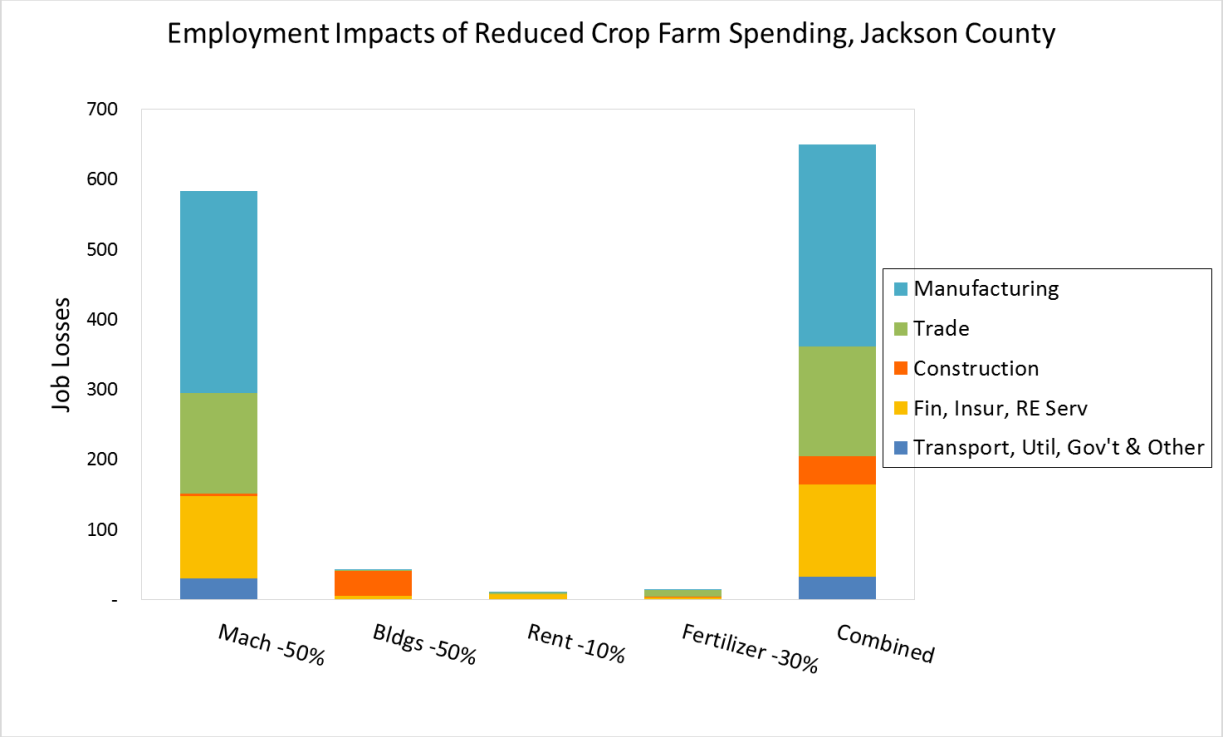

Minnesota Employment, 3.6 million
Government, 11.3%
Agriculture, 2.6%
Mining, 0.3%
Construction, 4.8%
Manufacturing, 9.0%
Trans, Info, Public Util, 5.3%
Trade, 13.5%
Service, 53.0%

Figure 6.


Employment Impacts of Reduced Crop Farm Spending, Kandiyohi County
Job Losses
140
120
100
80
60
40
20
-
Mach -50%
Bldgs -50%
Rent -10%
Fertilizer -30%
Combined
Manufacturing
Trade
Construction
Fin, Insur, RE Serv
Transport, Util, Gov't & Other


Employment Impacts of Reduced Crop Farm Spending, Nobles County
Job Losses
160
140
120
100
80
60
40
20
-
Mach -50%
Bldgs -50%
Rent -10%
Fertilizer -30%
Combined
Manufacturing
Trade
Construction
Fin, Insur, RE Serv
Transport, Util, Gov't & Other



Note: The Jackson County estimates assume that reduced farm spending nationally results in a 25% cutback in a large farm machinery manufacturer located in the county but selling nationally, as well as the reduced spending of crop producers in Jackson County itself.

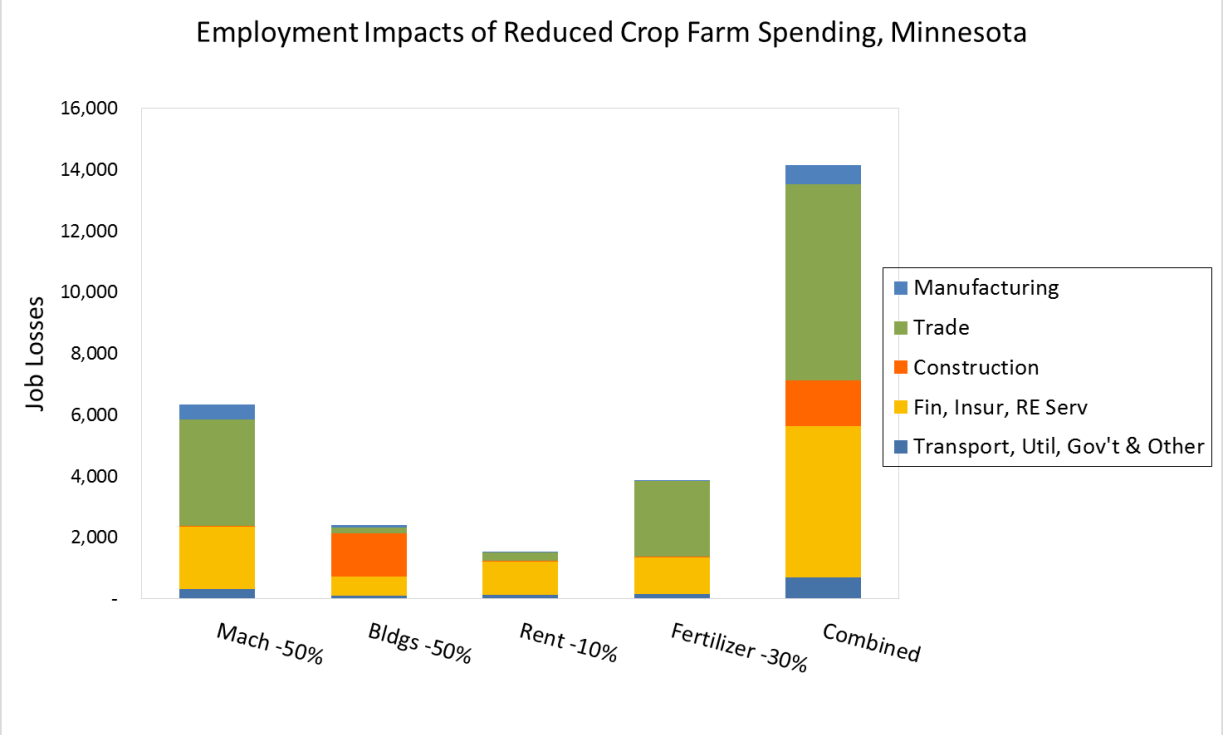


Table 3. Direct, secondary, and total impacts of the reductions in machinery purchases, farm building construction, and land rental payments, for Kandiyohi, Nobles, and Jackson Counties and Minnesota statewide

	Employment	Labor Income
Kandiyohi County, population 42,285		
Direct Impact - machinery ($million)	-53	-$4,851,298
-construction	-16	-$780,391
-fertilizer	-7	-$614,213
Total	-76	-$6,245,902
Secondary impact	-53	-$1,891,439
Total impact ($million)	-129	-$8,137,342
Percent of county economy	-0.4%	-0.6%
Per capita change in labor income		-$192
Nobles County, population 21,487		
Direct Impact - machinery ($million)	-71	-$4,904,896
-construction	-15	-$592,885
-fertilizer	-7	-$447,004
Total	-93	-$5,944,785
Secondary impact	-45	-$1,539,953
Total impact ($million)	-138	-$7,484,738
Percent of county economy	-1.0%	-1.2%
Per capita change in labor income		-$348
Jackson County, population 10,269		
Direct Impact - machinery ($million)	-358	-$22,689,785
-construction	-35	-$1,442,784
-fertilizer	-9	-$468,286
Total	-403	-$24,600,855
Secondary impact	-247	-$8,554,587
Total impact ($million)	-650	-$33,155,442
Percent of county economy	-7.5%	-9.1%
Per capita change in labor income		-$3,229
Minnesota, population 5,457,000		
Direct Impact - machinery ($million)	-3,294	-$301,622,552
-construction	-1,390	-$80,313,838
-fertilizer	-2,202	-$209,481,651
Total	-6,886	-$591,418,041
Secondary impact	-7,254	-$376,650,939
Total impact ($million)	-14,140	-$968,068,980
Percent of state economy	-0.4%	-0.5%
Per capita change in labor income		-$177

Table 4. Industry breakdown of the direct, secondary, and total impacts of the reductions in machinery purchases, farm building construction, and land rental payments, Kandiyohi, Nobles, and Jackson Counties and for Minnesota statewide

	Output	Employment	Labor Income
Kandiyohi County			
Ag &Forestry	0.1%	0.1%	0.1%
Construction	16.8%	12.9%	10.0%
Manufacturing	1.1%	0.3%	0.3%
Transport & Util	4.2%	2.5%	1.7%
Trade	33.7%	55.2%	72.5%
Fin, Insur, RE Serv	27.2%	28.1%	14.5%
Government	1.2%	0.9%	0.9%
Private Households	15.7%	0.1%	0.0%
Nobles County			
Ag &Forestry	0.1%	0.1%	0.1%
Construction	14.6%	11.3%	8.3%
Manufacturing	0.5%	0.2%	0.2%
Transport & Util	4.2%	2.6%	1.8%
Trade	35.8%	64.0%	76.5%
Fin, Insur, RE Serv	24.3%	21.1%	12.6%
Government	0.7%	0.5%	0.5%
Private Households	19.7%	0.2%	0.0%
Jackson County			
Ag &Forestry	0.0%	0.0%	0.0%
Construction	2.4%	6.1%	4.9%
Manufacturing	81.1%	44.4%	58.0%
Transport & Util	2.4%	4.3%	4.2%
Trade	6.6%	24.1%	22.2%
Fin, Insur, RE Serv	6.0%	20.2%	9.9%
Government	0.2%	0.5%	0.7%
Private Households	1.3%	0.2%	0.0%

Minnesota			
Ag &Forestry	0.3%	0.2%	0.2%
Construction	11.9%	10.4%	8.8%
Manufacturing	17.3%	4.5%	4.4%
Transport & Util	7.3%	3.3%	3.3%
Trade	18.8%	45.2%	56.8%
Fin, Insur, RE Serv	34.3%	35.1%	25.5%
Government	1.1%	0.8%	0.8%
Private Households	9.0%	0.5%	0.1%

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APPENDIX 1: METHODOLOGY

Special models, called input-output models, exist to conduct economic impact analysis. There are several input-output models available. IMPLAN (IMpact Analysis for PLANning, MIG) is one such model. Many economists use IMPLAN for economic contribution analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available to economists for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations will help ensure the best results from the model.

One of the most critical aspects of understanding economic impact analysis is the distinction between the "local" and "non-local" economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this study, the study area is the entire state of Minnesota.

A few definitions are essential in order to properly read the results of an IMPLAN analysis. The terms and their definitions are provided below.

Output

Output is measured in dollars and is equivalent to total sales. The output measure can include significant "double counting." Think of corn, for example. The value of the corn is counted when it is sold to the mill, again when it is sold to the dairy farmer, again as part of the price of fluid milk, and yet again when it is sold as cheese. The value of the corn is built into the price of each of these items and then the sales of each of these items are added up to get total sales (or output).

Employment

Employment includes full- and part-time workers and is measured in annual average jobs, not full-time equivalents (FTE's). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

Labor Income

Labor income measures the value added to the product by the labor component. So, in the corn example when the corn is sold to the mill, a certain percentage of the sale goes to the farmer for his/her labor. Then when the mill sells the corn as feed to the dairy farmer, it includes some markup for its labor costs in the price. When the dairy farmer sells the milk to the cheese manufacturer, he/she includes a value for his/her labor. These individual value increments for labor can be measured, which amounts to labor income. Labor income does *not* include double counting.

Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is the expenditures of businesses receiving federal funding via the SBIR and STTR programs.

Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to spending for inputs (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase in output by the plant. As the plant increases output, it must also purchase more inputs, such as electricity, steel, and equipment. As the plant increases purchases of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts. In this study, indirect impacts are those associated with spending by small businesses to purchase inputs.

Induced Impact

The induced impact is the summation of changes in the local economy that occur due to spending by labor, that is spending by employees in the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to spend to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. This can be quantified and is called the induced impact. Primarily, in this study, the induced impacts are those economic changes related to spending by employees of small businesses receiving federal funding.

Total Impact

The total impact is the summation of the direct, indirect, and induced impacts.

Appendix 2.

Table A2-1. Corn and soybean acres and all cropland acres compared to jobs at farm and garden machinery and equipment merchant dealers, and jobs in commercial and institutional building construction, by Minnesota County, 2014.

County	Corn & soy planted acres	All cropland, 2012	Jobs at machinery dealers	Jobs in commercial construction
AITKIN	not reported	61,792	0	0-19
ANOKA	not reported	32,950	174	340
BECKER	147,000	309,942	0-19	0-19
BELTRAMI	Not reported	88,216	0-19	20-99
BENTON	90,000	139,942	20-99	106
BIG STONE	212,500	215,735	20-99	20-99
BLUE EARTH	363,500	338,830	100-249	140
BROWN	296,000	296,379	100-249	28
CARLTON	Not reported	42,431	0-19	0-19
CARVER	79,700	131,550	20-99	100-249
CASS	Not reported	61,267	0	0
CHIPPEWA	258,000	310,612	73	100-249
CHISAGO	40,700	76,150	20-99	0-19
CLAY	317,000	555,239	100-249	0-19
CLEARWATER	Not reported	76,181	0	0
COOK	Not reported	185	0	0
COTTONWOOD	343,500	336,445	20-99	20-99
CROW WING	Not reported	44,788	0-19	100-249
DAKOTA	138,600	192,659	100-249	430
DODGE	217,400	202,525	20-99	20-99
DOUGLAS	125,700	197,806	20-99	83
FARIBAULT	385,500	370,187	47	29
FILLMORE	280,800	316,843	107	26
FREEBORN	347,500	356,653	95	0-19
GOODHUE	250,200	329,994	100-249	20
GRANT	219,000	279,634	100-249	20-99
HENNEPIN	19,800	54,284	500-999	4476
HOUSTON	89,400	129,356	44	20-99
HUBBARD	Not reported	68,940	0	0-19
ISANTI	45,000	98,929	0	51
ITASCA	Not reported	40,139	0	20-99
JACKSON	361,500	329,974	105	0
KANABEC	17,300	65,870	0-19	0-19
KANDIYOHI	270,000	354,055	118	169

KITTSON	Not reported	391,057	20-99	0-19
KOOCHICHING	Not reported	24,674	0	0-19
LAC QUI PARLE	355,500	407,869	20-99	0
LAKE	Not reported	1,508	0	0
LAKE OF THE WOODS	Not reported	56,199	0	0
LE SUEUR	183,200	207,466	22	11
LINCOLN	229,500	256,638	20-99	0-19
LYON	355,500	379,676	116	51
MAHNOMEN	110,400	178,461	0-19	0-19
MARSHALL	276,300	740,407	20-99	0
MARTIN	391,000	405,588	20-99	20-99
MCLEOD	159,000	236,951	256	100-249
MEEKER	209,400	259,935	153	20-99
MILLE LACS	23,500	78,935	20-99	0-19
MORRISON	122,100	256,103	20-99	20-99
MOWER	366,500	422,921	20-99	43
MURRAY	358,000	374,929	20-99	0-19
NICOLLET	201,600	249,992	92	0-19
NOBLES	402,000	350,983	20-99	20
NORMAN	280,700	492,474	55	0-19
OLMSTED	201,900	209,399	20-99	298
OTTER TAIL	322,000	623,346	156	122
PENNINGTON	Not reported	225,497	20-99	10
PINE	22,000	103,782	0-19	20-99
PIPESTONE	208,000	206,004	20-99	0-19
POLK	359,700	991,405	156	100-249
POPE	196,800	267,478	88	0-19
RAMSEY	Not reported	399	20-99	1047
RED LAKE	Not reported	167,739	0-19	0-19
REDWOOD	451,000	489,626	117	20-99
RENVILLE	480,000	589,089	55	20-99
RICE	156,400	197,330	43	188
ROCK	258,000	252,671	20-99	0-19
ROSEAU	136,200	445,387	20-99	0
SCOTT	63,300	111,627	20-99	189
SHERBURNE	not reported	88,663	0-19	66
SIBLEY	264,000	318,627	0-19	20-99
ST. LOUIS	Not reported	60,400	100-249	194
STEARNS	295,900	582,796	346	414
STEELE	194,500	217,923	20-99	38
STEVENS	258,500	297,309	0-19	0-19
SWIFT	320,500	326,631	0-19	0-19

TODD	101,400	248,050	0-19	0-19
TRAVERSE	285,500	334,992	20-99	0
WABASHA	136,800	177,784	20-99	0-19
WADENA	not reported	83,490	0-19	0
WASECA	203,000	213,590	20-99	23
WASHINGTON	33,800	58,485	0-19	178
WATONWAN	235,800	223,268	20-99	20-99
WILKIN	273,000	428,789	20-99	0
WINONA	111,400	180,009	109	0-19
WRIGHT	121,100	231,832	20-99	86
YELLOW MEDICINE	376,000	364,471	0-19	0-19
Maximum	480,000	991,405	346	4,476
Average	223,975	248,243	79	216
Median	219,000	225,497	64	38
Counties with exact numbers reported		87	32	41
Counties reported as ranges		0	55	46
Total counties reported		87	87	87

Sources: USDA-NASS and U.S. Census Bureau's County Business Patterns

Note: County Business Patterns includes farm building construction in category 236220 "Commercial and Institutional Building Construction". Kandiyohi County is reported as having 169 jobs in this category while Nobles County has only 20, compared to an average of 98 per county not including Hennepin County's 4,476 jobs.