

Row Crops: An Intensification of the North Dakota Agricultural Industry

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Six row crops are produced commercially in North Dakota. Sunflower, corn, soybeans¹, dry edible beans, sugarbeets, and potatoes account for one-sixth of total acres harvested in the state but contribute 28 percent of total crop value produced.² These crops provide risk-reducing diversification to a cropping system dominated by wheat. Because of their high value per acre and often local processing, row crops add intensity to the agricultural industry of the state.

Corn production in North Dakota traces back to the Mandan Indians who grew and bartered it with other tribes. Potatoes have been produced since settlement of the state in the 1800s. Other row crops have been introduced more recently. Unlike small grains, production of row crops is concentrated in particular areas of the state.

Corn production is associated with development of the state's livestock industry. Prior to the mid-1970s, a majority of the corn was used for fodder and silage. Currently, two-thirds of the corn acreage is harvested for grain. Although some corn is planted in every county, corn for grain production is concentrated in the extreme southeastern part of the state, particularly Richland County. Corn is the most important irrigated crop, with 10 percent of the state's acreage under irrigation.

Commercial potato production in the Red River Valley dates back to the early 1900s (Lana). By 1910 more than 50,000 acres were harvested. Potatoes are produced for processing into chips and french fries and grown for table stock and seed. Production is concentrated in the northern Red River Valley counties of Walsh, Pembina, and Grand Forks with some in Traill County.

Sugarbeets have been grown commercially in the Red River Valley since the early 1920s. Sugarbeets were shipped to Chaska, Minnesota for processing until 1926 when the first processing factory was opened in East Grand Forks, Minnesota (Gilcreast). The industry has grown to six factories located at an average of 45-mile intervals throughout the Red River Valley. These factories processed about 160,000 acres of beets in 1988. In addition to dryland production in the Red River Valley, about 12,000 irrigated acres are produced annually in McKenzie and Williams Counties and processed in Sidney, Montana.

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¹Originally planted in rows, a large portion of production is now solid seeded.

²Including wheat and feed grain deficiency payments.

The first substantial production of soybeans occurred around 1950 in Richland and Cass Counties. Production has increased and expanded into the central Red River Valley. Limited production has begun in the northern Valley and east central areas of the state. However, the two southern Red River Valley counties, Richland and Cass, still account for three-fourths of the state's production.

Sunflowers were first grown in the Red River Valley for confectionery uses beginning in the 1960s. Acreage of oil-type sunflowers increased rapidly in the early 1970s and now accounts for the major portion of sunflower production. Plants at West Fargo, Enderlin, and Velva process the seeds into sunflower oil and meal. Production has moved out of the Red River Valley into central North Dakota. Sunflowers are now produced throughout the state although very limited production is found in the extreme western counties.

Dry edible beans also were introduced into the Red River Valley in the early 1960s. Pinto beans were the type first produced and remain dominant. Navy beans are another type produced in large quantities. Production is concentrated in central and northern Red River Valley areas, with Grand Forks County being the leading producer. About 30,000 acres are also harvested annually in Steele County.

CHANGES 1967-1987

Land Use

Land use over the past 20 years is depicted in Figure 1 (North Dakota Agricultural Statistics). The "other crops" category (solid seeded crops) comprises wheat, barley, oats, rye, flax, millet, and mustard. The major land use change over the period has been an increase in row crops and a reduction in summer fallow.

Acreage harvested of the principal row crops produced statewide, corn and sunflowers, are shown in Figure 2. Sunflower acreage increased rapidly starting in 1977 and declined in 1985 and 1986. Although corn acreage has increased some in the 1980s, a more significant change has been the increase in the proportion harvested for grain rather than silage. The percentage harvested for grain increased from 36 percent in 1968 to 68 percent in 1987. Acreage harvested of row crops produced primarily in the Red River Valley are shown in Figure 3. Sugarbeet acreage increased in 1974 because of the opening of two new processing plants. The increase in soybean and dry edible bean acreage in the 1980s is the most notable trend in Figure 3.

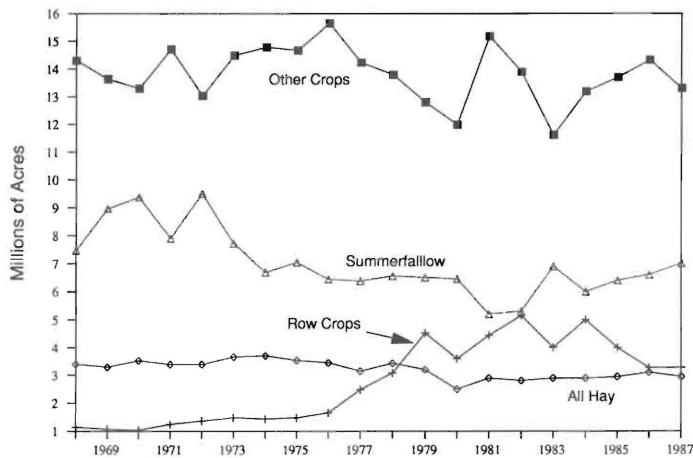


Figure 1. Harvested Acres in Row Crops, All Hay, Other Crops, and Acres Summerfallowed, North Dakota, 1968-1987.

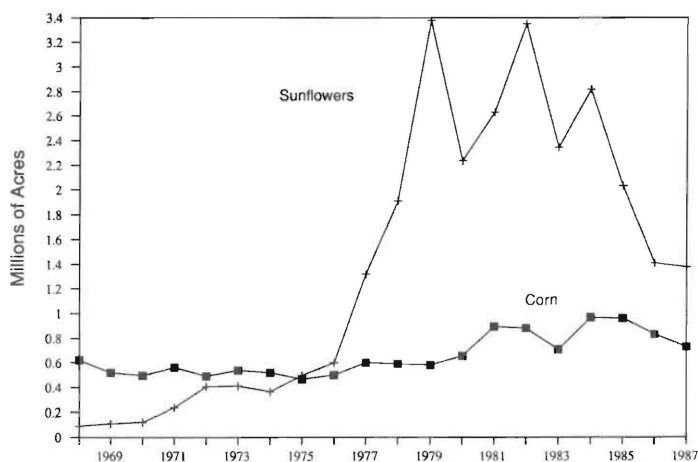


Figure 2. Harvested Acres of Corn and Sunflower, North Dakota, 1968-1987.

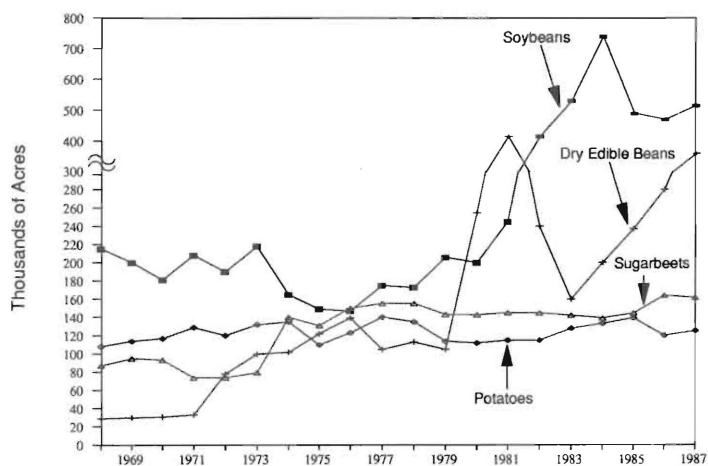


Figure 3. Harvested Acres of Soybeans, Dry Edible Beans, Potatoes, and Sugarbeets, North Dakota, 1968-1987.

Productivity

Improved production practices and new varieties have increased row crop yields. State average annual yield increases for row crops, wheat and barley are summarized in Table 1. These yield increases are not adjusted for changes in location of production, use of summer fallow, or irrigation. Yield increases at any one location could differ substantially from the numbers presented here.

State average soybean yields have improved at the same time that acreage has expanded into areas requiring earlier maturing varieties. The shift to narrower row spacing and/or solid seeding has been a major contributor to yield increases.

Yield improvements in corn for grain are partly due to an increase in acres produced under irrigation. Yield comparisons between old and new hybrids indicate that about half the yield increase is due to better hybrids.

Improvements in sugarbeet yields are in large part the result of more timely planting, higher plant population, improved control of nitrogen levels, and higher yielding varieties.

Table 1. Average Yields and Average Annual Yield Increases, Row Crops, Wheat, and Barley, North Dakota, 1968-1987.

Crop	Unit	1968-1987 Avg. Yield Per Acre	Average Annual Increase ^a	
			Units Per Acre	Percent of 1968 ^b
Sunflower	lbs.	1105.00	17.00	1.8
Corn grain	bu.	65.20	1.80	3.7
Soybeans	bu.	21.90	.80	5.7
Dry edible beans	lbs.	1125.00	14.00	1.4
Sugarbeets	tons	15.71	.28	2.2
Potatoes	cwt.	158.20	1.40	1.0
Wheat	bu.	27.80	.20	1.0
Barley	bu.	43.00	.80	2.3

Source: North Dakota Agricultural Statistics 1967-1987

^aAverage annual yield increase determined by linear regression analysis

^bAverage annual yield increase divided by 1968 predicted yield x 100

Increases in sunflower yields have occurred in spite of a shift in production out of the Red River Valley into more arid areas to the west. The introduction and improvement of hybrids has been the major yield increasing factor.

Yield increases for dry edible beans and potatoes have been modest relative to those of other row crops.

Wheat and barley yield changes over the 20-year period are presented to give some perspective to the row crop data. Wheat yields have improved less than barley yields, partly because a larger portion of the wheat is produced in western North Dakota where moisture is more limiting.

Value Produced

The increasing importance of row crops to the state's agricultural economy is portrayed by the data in Figure 4. In

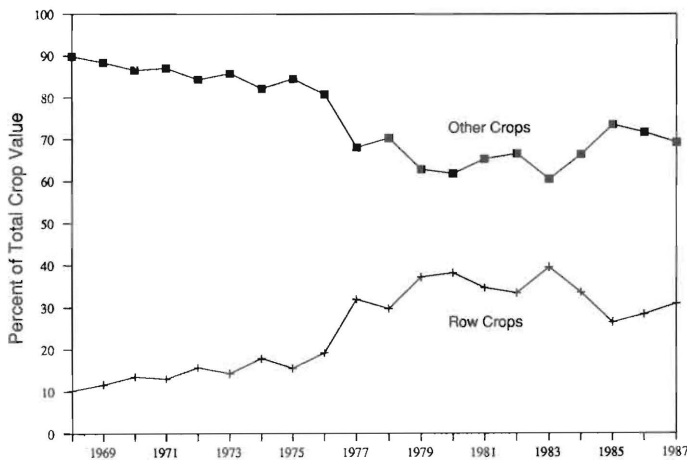


Figure 4. Percent of Total Crop Value (Excluding Hay) of Row Crops and Other Crops, North Dakota, 1968-1987.

the late 1960s row crops accounted for about 10 percent of the total value of crop production (including wheat and feed grain deficiency payments). By the late 1970s, row crops accounted for over 30 percent of crop value produced, and this has remained true in the 1980s.

Initially, the increasing economic importance of row crops was due to the large increase in sunflower acreage in the late 1970s and early 1980s. In the later 1980s, increased values of soybean, dry edible bean, corn and sugarbeet production have compensated for the decline in value produced by sunflowers.

ECONOMIC CONTRIBUTION

The total value of North Dakota crop production from 1984-87 averaged \$2.64 billion per year, including wheat and feed grain deficiency payments (North Dakota Agricultural Statistics).

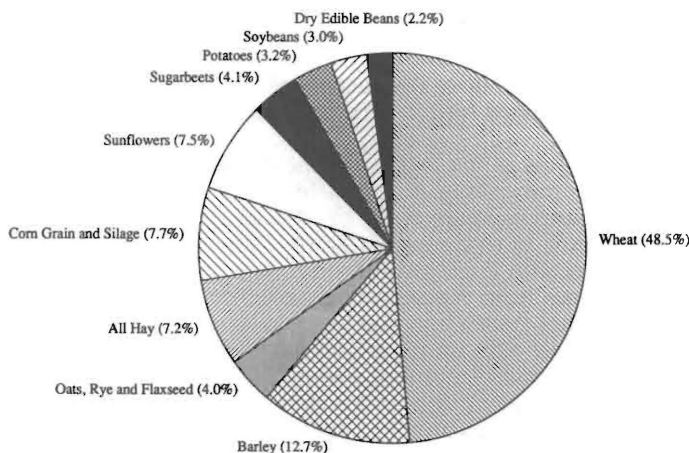


Figure 5. Four-Year Average Percent Share of Total Crop Value (Including Deficiency Payments) by Principal Crops, North Dakota, 1984-1987.

The division of this value among crops is presented in Figure 5. Row crops together account for 28 percent of the total value. Except for corn silage and sunflower, row crop production tends to be concentrated in the Red River Valley. Because of the high value per acre, the economic contribution of row crops is greater than would be indicated by their acreage.

Intensity of crop production can be measured by the value produced per acre. To put the value produced per acre on a comparable basis, the state has been divided into three areas, Red River Valley, East Central, and West (Figure 6). Value produced for each of the row crops, wheat and barley is presented by area in Table 2. Wheat and feed grain deficiency payments are included in the value produced and required acreage reductions have been added to planted acres for wheat, barley, and corn.

Sugarbeets and potatoes are by far the highest value per acre crops produced in the state. Dry edible beans and corn grain averaged more gross value per acre than wheat. Soybeans, sunflower, and corn silage tend to be similar to wheat in production intensity.

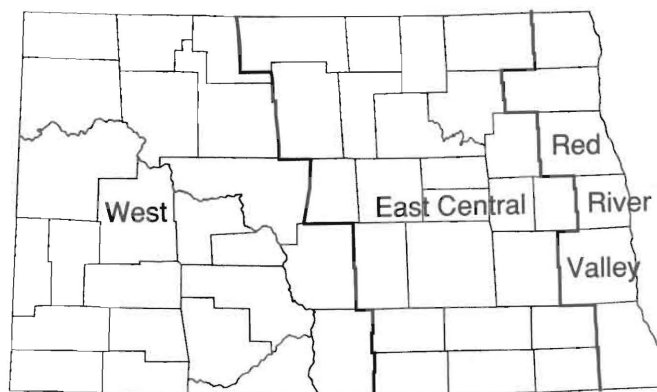


Figure 6. Farming Areas in North Dakota.

Table 2. Gross Value Produced Per Planted Acre For Selected Crops by Area of North Dakota 1984-1987 Average.

Crop	Area of the State		
	Red River Valley	East Central	West
	----- dollars per acre -----		
Sugarbeets	697	—	788
Potatoes	556	—	—
Dry edible beans	199	178	—
Corn grain ^a	175	147	127
Soybeans	147	111	—
Wheat ^a	138	102	83
Sunflower	115	103	85
Corn silage	114	100	86
Barley ^a	118	91	67

Source: North Dakota Agricultural Statistics 1984-1987.

^aGross value produced includes deficiency payments and required acreage diversion has been added to planted acres.

The total economic contribution of a crop is greater than its farm value because expenditures are also made in marketing and processing the product. Also, farm and marketing expenditures are re-spent in the local economy. Each dollar spent in crop production is estimated to generate another \$2.86 in business activity for a total multiple of \$3.86 (Coon et al., 1985).

Recent studies have been completed on the economic contribution of the potato and sugarbeet industries in the Red River Valley (Coon et al., 1986 and 1988). The potato industry in 1985 provided \$238 million of business activity in North Dakota and Minnesota, or about \$1,117 per crop acre planted. The sugarbeet industry in 1987 generated \$986 million in business activity in the two states, or about \$2,191 per acre planted. Although not as intense as these two crops, other row crops also are making large contributions to the North Dakota economy.

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acreage was planted to confectionery type sunflowers. In 1974, higher yielding hybrid sunflowers, mostly oil type, became available and sunflower acreage increased several-fold in the next five years. Nearly all of the first hybrids resulted from use of inbred lines developed by USDA-ARS breeders and geneticists located at NDSU. Recent competition from other domestic and foreign sources of vegetable oils has resulted in closing of some sunflower processing plants and a reduction in acreage and production.

The advent of hybrids in corn occurred much earlier than in sunflower, and there was a rapid shift from production of open pollinated to hybrid corn. There has been a gradual shift from production of corn for silage to corn for grain. The availability of high-yielding early-maturing hybrids (the state's average yield of corn for grain has tripled in the past 40 years) and a reduction in the number of livestock farms are reasons for this change. Many early-maturing corn hybrids sold in North Dakota have at least one inbred parent that was developed by the NDSU breeding program.

The dry bean and soybean breeding programs at NDSU were expanded greatly through the cooperation and funding supplied by their commodity groups. Acreage planted to these crops expanded about 1980, and North Dakota has become one of the leading states in production of dry edible beans. Markets for North Dakota-produced dry edible beans gradually have been developed and are continuing to expand. NDSU expects to release higher yielding, good quality varieties of these two crops in the next several years.

Sugarbeet production began in North Dakota in the early 1920s, and the first beet processing plant was constructed in 1926. Several more processing plants have been built since. Acreage of this crop is controlled by the local farmer-owned cooperatives and production has remained rather static in

recent years. NDSU and the University of Minnesota cooperate in providing information on production and weed control practices to growers. USDA-ARS scientists located at NDSU develop germplasm with improved storage characteristics and resistance to pests that is released to commercial breeders.

North Dakota-produced potatoes are used for seed, processing, and table stock. Nearly all of the varieties currently grown in North Dakota were developed by the NDSU breeding program. Several of these varieties show wide adaptation and are grown in other potato producing states. Total acreage of potatoes has remained at about 100,000 acres for at least 20 years.

NDSU scientists are evaluating the potential of several other row crops for North Dakota, including amaranth, crambe, rape, and canola. The success of these "new" crops will depend, as does the success of any crop, on development of markets for the produce.

Regardless of the length of time a specific crop has been grown commercially in the state, the trends in harvested acreage and yield are at the heart of explaining the growing importance of row crops in North Dakota. Many variables help to explain those production trends. Important contributions come from research conducted at NDSU and other Land Grant institutions that leads to new varieties, alternative cultural and management practices, more profitable marketing practices and opportunities, and the feasibility of processing agricultural commodities to create value-added products. That research has been extremely important from the standpoint of enhancing the income of producers as well as the income of other firms and individuals (most of us in the state) whose livelihood depends on agriculture.