

Mechanizing North Dakota Agriculture

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Progress in agricultural mechanization was slow. From 3000 B.C. to the latter part of the 18th Century, technology contributed little to farm mechanization. Numerous patents were issued, but most of these were not practical and were abandoned.

The farmer of the early 1800s produced food and clothing with little more than his bare hands. To prepare the seedbed, he used the spade or a crude plow pulled by an ox or a horse. He sowed his crop seed by hand from a sack tied around his neck and covered the seed with a crude harrow. He harvested with a scythe and cradle, tied the bundles by hand, threshed with a flail, and separated the straw and grain by a winnowing process which took advantage of nature's breezes. The farmer's wife and children often were seen working at his side.

Horace Greeley wrote in the 1850s that the American farmer needed a locomotive that did not weigh more than a ton, could work for a half hour steady without stopping to

refuel, could travel on plowed fields, could be hooked to any machine in a minute--including carts and harrows--and could also be used as a stump puller, thresher, plow, or pump, as well as dig cellars and ditches.²

EARLY ATTEMPTS AT MECHANIZATION

W.J. Jardine, United States Secretary of Agriculture, 1925-1929, in reflecting on this situation, wrote the following:

Had a farmer of the Pharaohs' time been suddenly reincarnated and set down in our grandfather's wheat field, he could have picked up the grain cradle, and could have gone to work with a familiar tool at a familiar job. And then within the space of 20 years, the methods of crop production underwent greater changes than they had in the previous 5,000 years. At one stride, we covered ground where 50 centuries had left almost no mark.



Tractor power was used to fill a silo at the college barns about 1912.

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The space of 20 years that Jardine mentioned is the period from 1830 to 1850 which could well be called "the beginning of a fabulous era in agriculture." Technology was being applied to agricultural production (Table 1).

Table 1. The beginning of a fabulous era in agriculture, 1830-1850.

1831	Birth date of the reaper
1836	Combine built in Michigan
1837	Thresher patented Steel plow industry began
1840	Wooden hand pump — first use of suction to lift water
1840-41	Grain drill feeding mechanism patents
1841	First grain elevator constructed
1846	First wheel cultivator (one horse)
1847	Disk plow patented
1850	Hand dump rake with steel teeth Portable steam engines for farm use

MECHANIZATION IN 1889

When North Dakota became a state, the reaper had become the grain binder. The portable steam engine, which originally was moved from farm to farm with a team of horses, had become a steam traction engine. It could move the thresher from farm to farm on its own power and also do heavy fieldwork such as plowing and disking.

However, horses still were the main source of power. In 1900, farmers used over 18 million draft animals, more horsepower than was used for all manufacturing.² Popular farm machines of that day included the steel plow, disk, harrow, grain drill, binder, thresher, hay mower, and the rake.

A farmer who operated a 160-acre farm in 1908 invested \$924 in the following machinery: grain binder, \$125; mower, \$45; gang plow, \$65; walking plow, \$14; riding one-row cultivator, \$26; walking cultivator, \$16; disc harrow, \$30; two farm wagons, \$150; smoothing harrow, \$17; corn planter, \$42; seeder, \$28; manure spreader, \$130; hay loader, \$65; hay rake, \$26; light road wagon, \$60; and a buggy, \$85.²

CONVERTING TO TRACTORS

The steam traction engine, though still used in the early 1900s, was being replaced by the tractor powered with an internal combustion engine that used kerosene or gasoline for fuel. The gasoline engine, patented in the 1870s, still is used on North Dakota farms but, since the 1930s, has been replaced in farm tractors by the diesel engine, patented in the 1890s.

The bonanza farms of North Dakota still flourished in 1889. Farm machines generally were powered with teams of horses. The bonanza farms used large-scale animal power and newly invented farm machinery. Apart from volume buying and marketing, bonanza managers had little advantage over the family operated farm. The completely diversified and successful farming operation in the Red River Valley seemed to lie somewhere between 240 and 320 acres.²

When North Dakota agriculture was still horse powered, NDAC was known for its fine horses.



NORTH DAKOTA DEVELOPMENTS IN MECHANIZATION

Farmers and farm equipment mechanics often saw the need for a new piece of equipment first. They would refine or "engineer" the innovative ideas into a suitable machine.

Innovative North Dakota farmers built multiple hitches with which they could pull more than one plow, disk, grain drill, or other field machines. The large crawler tractors of the day also could pull several field machines at a time, creating the demand for multiple hitches. As large machines became available, the demand for multiple hitches decreased.

Sometimes a machine developed for one geographical area will not work well in another area. The combine worked well where grain matured uniformly for harvest. Uniform maturity of grain was not common in the Red River Valley where weeds were a problem. This necessitated the use of a swather to put the grain in a windrow to dry before the combine picked it up. E.G. Melroe, Gwinner, developed an excellent pickup attachment for the combine.

The auger type of grain elevator revolutionized many farm grain handling jobs. One of the first manufacturers of auger elevators was Westgo Industries of West Fargo. It also developed the flexible auger intake section, a safety feature which reduced damage to the grain as it was taken into the auger.

Sherman Quanbeck, Aneta, and Ed Reiten, Coopers-town, developed a trip beam plow which permitted individual plow bottoms to pass over rock without damaging the plow. Wil-Rich, Inc., Wahpeton, manufactured Quanbeck's machines.

As farms became larger, a demand for large four-wheel drive tractors developed. Douglas and Maurice Steiger, Red Lake Falls, Minnesota, built their own large four-wheel drive tractor which now is manufactured by Case IH.

North Dakota State University honored the following eight pioneer North Dakota inventors at its 1980 Harvest Bowl:

Cyril and Louis Keller, Gwinner, Melroe Bobcat
John Kirschmann, Bismarck, grain drills and Spra-Coupe
E.G. Melroe, Gwinner, Melroe Manufacturing Company
Sherman Quanbeck, McVile, 20 patents on cultivators
Ed Reiten, Cooperstown, automatic resetting plow
Douglass and Maurice Steiger, Red Lake Falls, Minnesota, four-wheel drive tractor
Herb Tintes, West Fargo, portable grain auger (Westgo, Inc.)
Wayne Tonsfeldt, Comstock, Minnesota, dual disc, hydraulic beet toppler, row guide system, and guide-master cultivator

ELECTRIFICATION OF THE PRAIRIE

*The wind pumped water for cattle; women usually had to pump their own. Waterwheels ground the grain for bread, but women kneaded the dough by hand. Horses pulled plows, but animals couldn't help with kitchen and washhouse chores. The farm woman's life was a narrow one and full of ceaseless burden. The farmer's wife had to wait for electricity to emancipate her.*⁶

In 1930, when radio was only a decade old, 40 percent of North Dakota farm families owned receiving sets, nearly double that of the farm families of the nation.⁵ Electric

power took the farmer's wife out of bondage and, through radio and television, put her whole family in touch with the world.⁶

The first North Dakota farm to receive electricity was the J.A. Johnson farm, three miles west of Minot, in 1910.

Northern States Power, which began operating in 1911 from Minot, bought the Union Light and Power Company in Fargo and the Red River Power Company in Grand Forks in 1937. That year, the first cooperative in North Dakota was organized (Table 2). The Baker Electric Cooperative was located first at Baker and then at Cando. The main problems these early cooperatives had were sleet and lack of power.⁷

Table 2. Cooperatives energized in North Dakota.⁷

Baker Electric Cooperative	1937
Cass County Electric Cooperative	1938
Nodak Electric Cooperative	1939
Tri-County Electric Cooperative	1939
Verendrye Electric Cooperative	1940

By 1978, North Dakota had 20 cooperatives with 68,800 farmer members who shared 57,000 miles of line with an average consumption per farm of 1,400 kwh.⁷

Electric power made it possible to mechanize the farmstead as well as the farm home. Farm chores were simplified and required less labor to do them.

IMPACT OF MECHANIZATION ON AGRICULTURE

The farm tractor probably has had a greater impact on agricultural production than any other single development. Nationwide, each time a farmer purchased a tractor in the 1920s, 4.5 horses were displaced, saving 850 man-hours annually.²

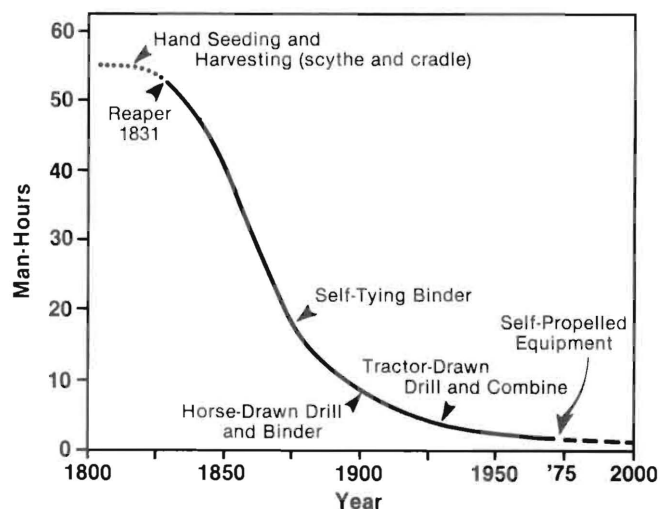


Figure 1. Man-hours to produce an acre of wheat (Great Plains area).

The labor required to produce an acre of wheat in 1830 with all hand labor was about 55 man-hours (Figure 1). By 1880, with seeding machines, the binder and the thresher, the labor was nine man-hours per acre. Rubber-tired tractors helped to reduce the labor to four man-hours per acre in 1935. Today, the modern high-speed plows, drills, and self-propelled combines have reduced the man-hours to one or two per acre of wheat.

The loss of village and farm population resulted from the growing mechanization of farming and the increased use of automobiles. For much of the state, a father-and-son partnership in 1959 could handle from 640 to 1,280 acres in a grain-and-livestock operation and were more profitable because they could make fuller use of expensive agricultural equipment.⁵ By 1959, North Dakota had 2.05 tractors, 0.98 combines, and 1.25 trucks per farm, more than any other state. From 1945 to 1960, the number of automobiles registered in the state increased 90 percent. North Dakota had one car for each 1.8 persons compared to one for each 2.5 persons in the United States.⁵

As the number of tractors on farms increased, the number of people working on farms decreased (Figure 2).

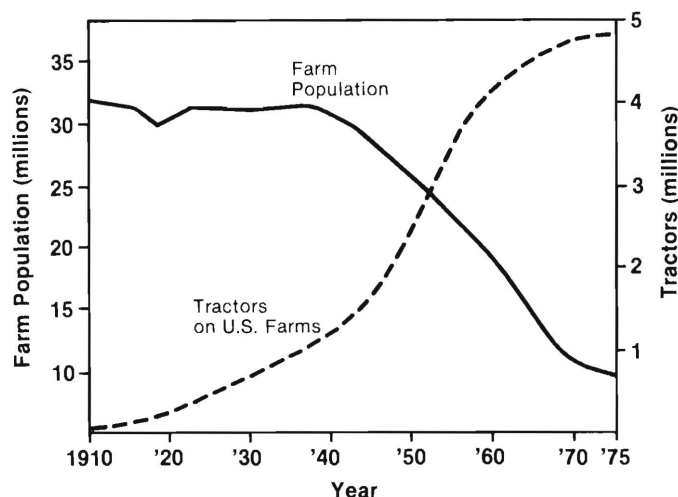


Figure 2. Farm population vs. farm tractors.

THE FUTURE OF MECHANIZATION IN NORTH DAKOTA

J.B. Davidson, one of the founders of the agricultural engineering profession, wrote, "...the producing capacity or earning ability of the farm worker is in direct proportion to the amount of power one is able to control."¹

In 1899, the consuming public already was saving an estimated \$700 million on their food bill because of the farmers' use of machinery. Some agricultural writers were predicting the day when farm machinery would do the work "that will be worth \$1,000,000,000 a year."²

Will mechanization continue? Indications are that it will--for two good reasons:

1. There is a continuing need for food and fiber. Much of the world's population is undernourished.
2. We have the hardware, software, and know-how to continue the mechanization process.

Electronics and computers will play an important part in mechanization to guide machines, calculate chemical formulas and feed rations, plan crop rotations, and beam questions to university and commercial sources for the best management practices. New machines will be developed to handle crops and farm processes not yet fully mechanized.

The farmer of the future will be part economist, part agronomist, part chemist, and part engineer. Farms likely will continue to become larger and more productive and will require fewer workers.

North Dakota's farmers will have an active part in continuing the farm mechanization process because, as Hiram Drache stated in 1976, they are achievers and they are motivated.

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