■ FARM SHOPS

- Important for repairing equipment, storing tools, and maintaining the farmstead
- A well-equipped shop could save operating expenses
- The size of the shop depended on the size of farm implements

Most farmers were constantly repairing, maintaining, and upgrading the equipment needed to operate the farm. In addition to implements for fieldwork, farmers had chore motors, cream separators, milking machines, and cars and trucks to repair. All farms had systems for water, sewage, heating, and power that had to be maintained, and many farmers built or expanded their own houses, barns, and other outbuildings. Many were excellent mechanics and most were well-versed in carpentry, plumbing, electrical work, concrete work, small-engine repair, auto mechanics, and blacksmithing (and its successor, welding).

Barn historian Eric Sloane describes a "forge barn" as a small building or work shop with a forge, which was sometimes found on farms east of the Midwest (Sloane 1967: 83). In the late 19th century, the *Minnesota Farmers' Institutes Annual* was pointing out the advantages of having a dedicated farm shop in which to store tools and provide space for the construction, maintenance, and repair of farm equipment (Gregg 1898: 370).

In the mid-20th century, experts were still explaining that, in addition to providing essential work space, a shop could "prevent costly loss of time . . . reduce annual depreciation . . . [provide] emergency storage of farm products . . . [and serve as an] emergency animal shelter." They felt a shop would "more than pay its own way if properly managed" (Neubauer and Walker 1961: 246).

One of the farm's most important seasonal chores, maintaining machinery, occurred in the farm shop. This was no small job, as a 1937 Minnesota Extension Service Bulletin entitled "The Farm Shop" explained:

> A complete overhauling [of a piece of machinery] includes the cleaning of all parts; the application of heavy oil or grease to the bright parts so that they will not rust; the changing of oil and grease in all bearings; the tightening of nuts; straightening of bent rods; the replacing of broken or worn parts; the sharpening of sickles, discs, cultivator shovels, colters, and plow shares; and the repainting of both wooden and metal parts (Christopherson et al 1937: 3).

DESIGN CONSIDERATIONS

In 1940, *Successful Farming* magazine listed four goals for a complete farm shop: to "provide convenient storage for all shop tools and supplies . . . to provide a well-lighted, comfortable place to work . . . to provide sufficient space so almost any machine can be taken in for repairs or servicing . . . [and to accommodate] the need for power equipment" (Fox 1940: 60).

See also
Implement or Machine Sheds
Garages
Combination Buildings
Appendix: Focus on Mechan Techno

Labor efficiency, drainage concerns, the location of windbreaks, possible drifting snow, and planning for future additions needed to be considered when siting a shop building. Because shops typically housed a combustible mix of oil, wood shavings, heating stoves, and flames from the forge, the risk of fire was real and the possibility of flames spreading to other buildings was also a concern (Christopherson et al 1937: 5).

While a farm shop was often an independent building, it was equally common to combine the shop with the implement shed and/or the garage. A shared structure saved construction costs and reduced travel time between buildings. (See also "Implement or Machine Sheds" and "Garages", two individual farm elements sections.)

If the shop was combined with the garage, the building was usually located near the back door of the house. It was recommended that there be a fireproof wall between the shop and the garage.

If the shop was combined with the implement shed – also a typical combination – the building was sited with easy access to the fields. Some farmers placed the shop at one end of the implement shed – often the end nearest the house – while others placed the shop in the center of the building for easy access to machines at both ends.

Farm shops varied in size. A building measuring 12′ x 16′ or 12′ x 20′ was considered the smallest adequate size to provide both tool storage and work space. In a combination building, the shop's share of the space could be modest (e.g., 12′ x 18′ or 12′ x 24′) or quite large. And as farm equipment grew in size, so did the shop.

The farm shop was most often made of wood but fireproof materials such as brick, clay tile, concrete block, and metal were also employed.

Farmers were often advised to use poured concrete for shop floors and approach ramps. One 1920 manual disagreed with this advice, arguing that tools dropped on the floor would be dulled by the concrete and that wood or dirt made a better floor (Moore et al 1920: 594). One source wrote that if concrete was not affordable, "black-top, soil-cement, pumice, gravel, sand, and clay" could suffice (Neubauer and Walker 1961: 246).

Roofs were usually gabled, hipped, or shed, and covered with standard roofing materials. Beginning in the 1940s trussed rafters were used to maximize floor space without interior posts (Neubauer and Walker 1961: 246; Christopherson et al 1937: 8; Iowa State 1969: 425).

Doors could be hinged, sliding, or roll-up style, with the size of the opening determined by the size of the implements. In the 1930s, for example, double doors 8′ high and 8′ wide could be sufficient, but eventually openings 16′ wide and 9′ to 12′ high were necessary. A service or pedestrian door was usually located on the side of the building closest to the house (Christopherson et al 1937: 8; Iowa State 1969: 425).

It was important that a farm shop have several windows to provide light and cross ventilation. Windows were especially important before electric lights and ventilating fans were affordable.

Shops were frequently insulated and heated because farmers usually had more time for repairs and improvements during the winter. Shops were sometimes insulated with tar paper and materials found on the farm such as straw or sawdust. Shops were heated with wood stoves and later coal, gas, oil, and electric heaters. Many also had forges, and it was recommended that the chimney have a double flue to separately serve the forge and heater. An exhaust fan to remove smoke and gases was also recommended (Christopherson et al 1937: 7-8; Neubauer and Walker 1961: 249; Iowa State 1969: 425).

With the introduction of electricity, shops often needed to be rearranged to make the best use of electric power and tools. As electric "chore" motors came into use, additional wiring and well-placed switches and outlets were needed. One of the biggest concerns of agricultural engineers was designing structures that allowed safe use of electric power tools, especially by farmers working alone (White 1936: 19).

Because of their simple design, shops, like implement sheds, were good candidates for the new types of construction that emerged in the 1940s. Pre-built trusses, pole frames, and prefabricated panels were all useful options. For example, Stran-Steel's easy-assemble Quonset-brand buildings were popular for use as farm shops and combined shop-implement sheds (Stran-Steel 1948; Stran-Steel 1957; Flintkote 1946).

Common shop equipment included a forge and anvil, drill press, bench grinder, vise, and a full array of hand tools for carpentry and motor repair. One 1920 farming manual noted, "[the] better equipment a farmer has on his own farm the less he has to pay to the machinist, blacksmith, and carpenter. It pays for the farmer to turn machinist during the winter months" (Moore et al 1920: 594). Most shops had workbenches along the walls. Tool cases, bins, lockers or cabinets, and sufficient shelves for supplies were common (White 1921: 147; Wooley 1946: 263). By the 1950s, some farms were expanding their shop into "a management center" with an office complete with desk, manuals, catalogs, reference books, ledgers, and a telephone (Iowa State 1969: 425).

PREVALENCE

Provision for the repair of equipment and the storage of tools was found on virtually all Minnesota farms. It is not known how many farms had a separate, dedicated farm shop, but they were not uncommon. It is likely that well-preserved examples are still standing, especially those built after the 1920s when tractors and tractor-drawn implements became widespread.

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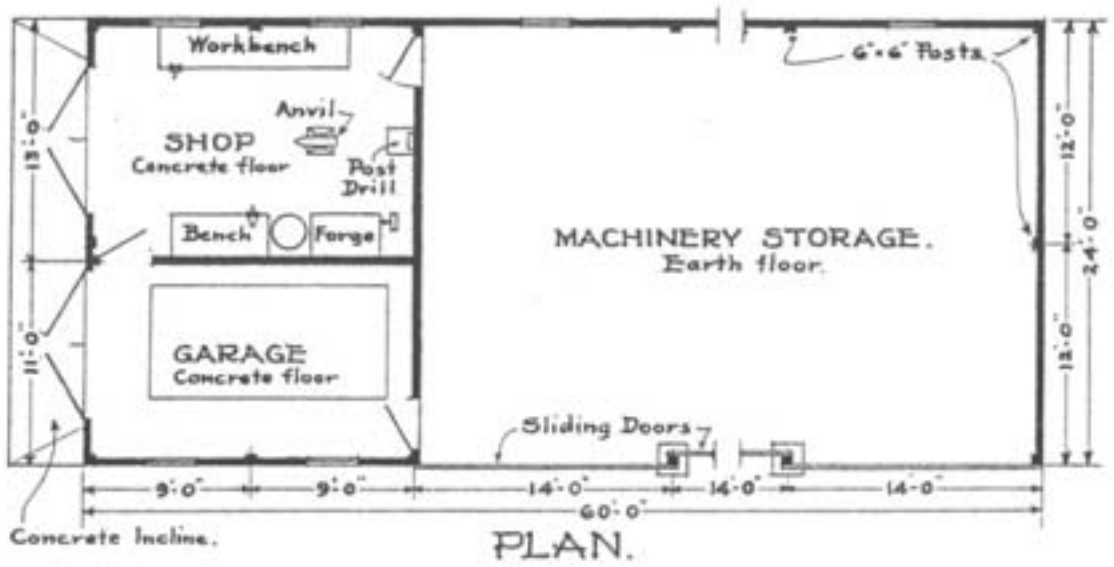

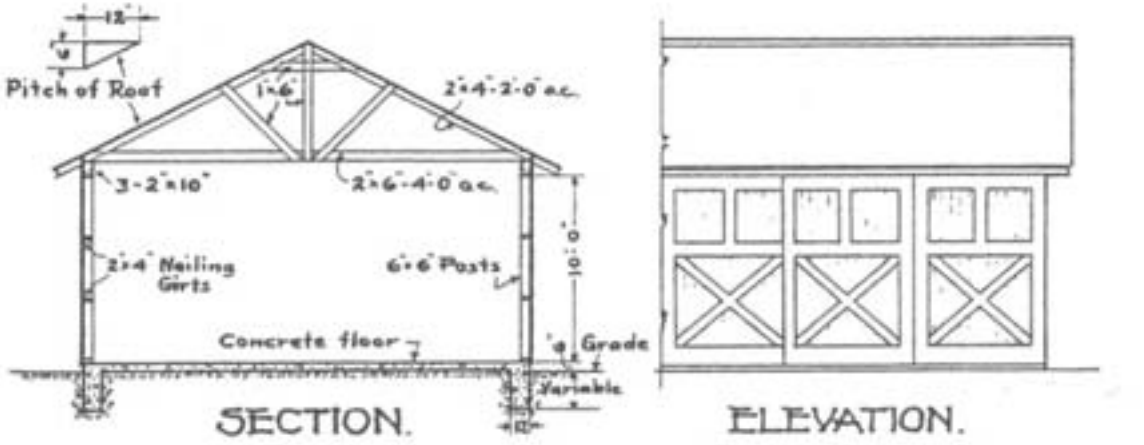

Combining a farm shop, implement shed, and garage into a single structure saved capital costs and could be very efficient since repairing and maintaining farm machinery was a constant task. Most farmers were also blacksmiths, draftsmen, carpenters, concrete-layers, electricians, plumbers, auto mechanics, and small-engine repairmen, and much of this work was supported by the shop. From "The Farm Shop," a 1937 Minnesota Extension Service bulletin.

■ FARMHOUSES

- Farmhouses were often by necessity modest buildings that were expanded as needed
- Farmhouses were vital work centers for the farm, but competed with barns, livestock, and machinery for farm resources
- In the early 20th century there was new interest in improving the comfort and functionality of farmhouses
- After 1900 some farmhouses were built with design details that distinguished them from many urban houses of the same period
- Farmhouses in both Minnesota and nationwide were substandard compared to their urban counterparts in 1940

Farmhouses in Minnesota and the Midwest have been the subject of considerable study. That information is not summarized here. The reader is referred to sources such as Jarchow (1949), Folwell (1956/rpt. 1921), and Hudson (1975) on settlement-era farmhouses, and Marilyn Brinkman and Bill Morgan (1982) on settlement-era farmhouses still standing in central Minnesota in the early 1980s. Studies of balloon frame farmhouses include those by Fred Peterson (1992; see also others by Peterson). The many studies of ethnic influences in farmhouse design include those on Germans (e.g., Peterson 1998, Martens 1988, Martens 1990, essays collected in Glasrud 1981, and Tishler 1986), Germans from Russia (e.g., Goertz 1976, Sluss 1983, and Koop and Ludwig 1984), Finns (e.g., Koop 1988 and Gudmundson with Winckler 1991), Norwegians (e.g., Peterson 1989 and others by Peterson), and Swedes (e.g., Ostergren 1979 and A:son-Palmquist 1983). A nationwide look at farmhouses in the 19th century is Sally McMurry's *Families and Farmhouses in 19th Century America* (1988).

In most ways Minnesota farmhouses were similar to the houses found in any city or small town in the state. But in some significant ways, both conceptual and physical, farmhouses were unique. Those unique characteristics are the focus of the discussion below.

ALLOCATION OF RESOURCES

Despite the fact that the farmhouse was usually one of the two most important buildings on a farm (the other being the principal barn), many Minnesota farmhouses were modest structures, especially before 1945. Farmhouses often received a different allocation of total family resources than did comparable houses in the city. At the same time that the farm family needed a house, they also needed to make constant investments in land, seed, equipment, livestock, fencing, and numerous other farm structures.

According to Fred Peterson, a student of Minnesota farmhouses, "Many pioneer families (and their heirs even today) never built the substantial houses they could well afford, either because of moral misgivings or because they preferred to plow their profits into land, animals, and machinery."

See also

Cisterns
Cesspools and Septic Tanks
Acetylene or Carbide Gas Structures
Summer Kitchens
Saunas
Hired Workers' Housing

Peterson also wrote, "The simple adage, 'The house doesn't pay for the barn,' communicates a belief that frames architectural ambition in the proper context of the farm as a working enterprise where one ought to accomplish 'first things first'" (Peterson "The Intuitive" 1983: 30; Peterson 1992: 80).

Agricultural engineers Neubauer and Walker wrote in 1961, "Very often an ambitious and hard-working farmer will spend most of his time and money on his crops, livestock, and service buildings, to the neglect of his residential comforts, but ultimately, when success is developing or assured, he will invest in a high-grade home on the farm, one which will last for several generations (Neubauer and Walker 1961: 97).

Frugality and necessity led many farmers to construct their houses in increments, building only what was needed at the time. As a result, many farmhouses grew piece-meal from frontier log cabin or frame and tar paper cores to larger houses with two or sometimes three additions. In 1914 a University of Minnesota author described one such situation: "For many years a dark, miserable, two-room shack, size 10' x 16', lighted by but two windows, was their home. The only attention it ever received was the addition of a couple of more rooms, and that addition was in harmony with the ideas of the pioneer homebuilders. However, if at any time more shelter was needed for the livestock or improved machinery in the farm operations, it was purchased, even though on borrowed money" (Wilson 1914: 35).

When farm families did elect to build a new house, the old house was often put to good use as a summer kitchen, workers' housing, barn, shed, or granary. By 1960, if the remnants of an early dugout or log cabin happen to survive, some farms contained evidence of three generations of housing standing on a single property, often built by a single extended family.

ISOLATED LOCATION AND LACK OF CONVENIENCES

Many of the state's first farmhouses were built of indigenous materials found on the farm, in part because they were constructed far from railroads and lumberyards – and sometimes predated them. This physical isolation also prevented farmhouses from getting electricity until the 1930s, 1940s, or 1950s, decades after urban houses received it. Because of their isolation, farms had to supply their own water and sanitary sewer systems, and farmhouses were far less likely than city houses to get indoor running water and bathrooms before 1950. Farmers also typically had cash incomes that were lower than urban residents, making manufactured goods harder to buy. Many farmers created their own, and often ingenious, utility systems with windmills, hydraulic rams, elevated water towers, acetylene plants, and basement generators.

In 1957, Wallace Ashby, a USDA agricultural engineer, described farmhouses of the early 20th century:

> The typical farmhouse was adequate in size, but poorly planned and lacking in facilities we now consider important. Many had 'grown' by addition of rooms without proper planning, so that a person had to pass through one bedroom to get to another. There were few clothes closets and those were small. Most houses were heated by stoves or fireplaces and in cold winter weather the entire family might move into two or three rooms. Very few houses had piped water supplies or plumbing. Since cooking was on a coal or wood range, the kitchen was the best-heated room in the house, and the most used by the

> family. However, it was not a satisfactory work center because of traffic paths and lack of sink, running water, refrigerator, or built-in cupboards. The man of the house coming in to meals was likely to hang his rather smelly coat by the kitchen door, dip water from the water bucket or the reservoir at the side of the range, and wash at the kitchen table, or on the back porch (Ashby 1957: 427).

Ashby also described his parents' farmhouse in Iowa, built around 1900, which was considered quite modern at the time:

> It was 30 ft. square, two story with 8 rooms and bath, full basement with attached storm cave for tornado protection and vegetable storage, and an attic and front and back porches. The walls were sheathed and weatherboarded and plastered inside. The attic was floored, but there was no insulation. Heating was by piped warm air furnace, cooking on a coal range. There was an ice refrigerator on the back porch, supplied with ice hauled from the river three miles away and stored under sawdust in our own icehouse. Water supply was from a storage tank in the attic, filled by hand pumping. Plumbing fixtures included sink, with piped cold water in the kitchen, tub and toilet in the bathroom. House sewage drained into a cesspool. To save pumping water, an outdoor privy was generally used in good weather. Kerosene lamps furnished light at night; later in the principal rooms we had mantle lamps burning gasoline stored in an outside tank and supplied through a hollow wire (Ashby 1957: 427).

A 1951 survey of farm women in the Upper Midwest found that only about 45 percent of farmhouses had basements, while about 95 percent of farm women expressed a desire for a basement – basements having nearly the same desirability as central heating (Schroeder and Otis 1951: 8).

THE FARMHOUSE WORK CENTER

In 1920 A. D. Wilson wrote in the *Minnesota Farmers' Institutes Annual*:

> A farm is not only an industry operated for the purpose of making profit but it is also a place where people have their homes and must live. No one in this country has developed a successful system of operating a farm except through having people live immediately on the farm, and since this is so, the development of the farm is not alone a matter of making the farm a profitable industry but it must include considerations for making the farm home a desirable place in which to live (Wilson 1920).

As Wilson suggested, a farmhouse's primary function was domestic. However, one of the significant differences between a farmhouse and its urban counterpart was the role each played in economic-family life, especially before 1960 (Neth 1995: 17).

Most farmhouses functioned not only as domestic refuges, but as work centers where essential and labor-intensive chores were performed every day. Preparing and preserving food, feeding family and work crews, washing cream separators, drying seed corn, hatching chicks, and feeding bottle lambs were just a few of the numerous farm tasks that took place in the house. In 1914 William Etherton of the USDA explained that not only are all members of the family "farmers and workers," but "the house is a part of their industrial equipment. It is the workshop for the women from dawn until dusk

and the kitchen is the center of their activities. . . . The relative importance of living and service rooms is, therefore, reversed in city and country [homes]" (Etherton 1914: 123).

In 1939 Minnesota farmer William Benitt wrote, "The farm home and the farm buildings are a unit. The farm factory comes up to the kitchen door. Yes, we can even say it spills over into the kitchen, and a times envelops the entire home, merging the home and factory into one, and both become just a factory" (Benitt 1939: 303).

In 1941 farm experts Carter and Foster called the farmhouse "the business center of the farm." In 1947 the University of Minnesota's Vernon Davis explained that, on average, farmhouses needed to house several more people than city houses including extended families and hired help. And in 1951 the University of Minnesota's Andrew Boss and George Pond wrote, "In no other industry is the home so much a part of the business as in farming" (Carter and Foster 1941: 301; Davies 1947: 6; Boss and Pond 1951: 275).

The farmhouse's role in the industrial enterprise even held true for wealthier farmers. In 1914 the USDA's William Etherton explained that upper-middle-class urban men usually left their house to be at work all day. And upper-middle-class urban women often spent much time in the parlor, or away from the house at social activities. In contrast:

> The [well-to-do] family on the farm is seldom away from home and the men are in and out of doors during the day. All members of the family and the farm help must have their 'three square meals' a day, two of them in many instances while the sun is below the horizon. During harvest time, when the well-to-do city family may be in the mountains or at the beach, and little or no kitchen work is done at their home, the farm family is busiest and the kitchen and dining room are taxed to their greatest capacity (Etherton 1914: 123).

In her study of early 20th century farmers in nine Midwestern states, Mary Neth quoted a farm woman who wrote in 1923:

> You don't think of your home on a farm . . . as just a space inside four walls. The feeling of home spreads out all around, into the garden, the orchards, the henhouses, the barn, the springhouse, because you are all the time helping to produce live things in those places and they, or their products, are all the time coming back into your kitchen from garden, orchard, barn or henhouse, as a part of the things you handle to prepare for meals or market everyday (Neth 1995: 17).

POST-1900 FARMHOUSE IMPROVEMENT

Until 1900, most builders' journals and plan books made little distinction between designs for farmhouses and houses in the city. But around 1900, farmers, farm experts, and designers began to express the idea that farmers were not well served by either farmhouses that evolved from frontier cabins, or farmhouses built from plans designed for the city. A major criticism of houses designed for the city, for example, was that attention was focused on the front of the house near the street. These houses often worked poorly on a farm where the rear or side of the house – the elevation facing the farmyard – was usually the center of activity.

A nationwide effort to improve farmhouse design developed in association with the new academic field of home economics, and with the Country Life Movement of 1900-1920. The Country Life Movement was a series of Progressive Era reforms sought to improve the lives of rural families economically and socially, and reverse an exodus of young people from rural areas. One strategy was to provide farmers with the same basic services that urban families enjoyed including running water, central heating, and electricity. Reformers also worked for improving rural roads, mail service, education, technical support, and social networks.

Reconsidering farmhouse design was also aligned with reformers' efforts to improve conditions for rural women (which might in turn increase farm productivity). The Country Life Commission's final report of 1909 stated, "Whatever general hardships, such as poverty, isolation, lack of labor-saving devices, may exist on any given farm, the burden of these hardships falls more heavily on the farmer's wife than on the farmer himself. In general her life is more monotonous and more isolated, no matter what the wealth or poverty of the family may be" (quoted in Ashby 1957: 429).

In 1913 Secretary of Agriculture David Houston wrote:

> According to the testimony of many who are thoroughly familiar with conditions, the needs of the farm women have been largely overlooked by existing agricultural agencies. Endeavor has been largely focused on inducing the field workers to methods of crop production. The fact that the woman's work and time have a real monetary value and that her strength is not unlimited have not been given the consideration they deserve. As a result, on farms where there is always money enough to buy the latest agricultural appliances there is seldom surplus to provide the woman in her productive work with power machinery that will lighten her physical labor, running water that will relieve her of the burden of carrying from the pump all water used in the household, or kitchen equipment and household devices that will save her time, increase her efficiency, and enable her to make important monetary saving. The department [USDA] believes that intelligent help to women in matters of home management will contribute directly to the agricultural successes of the farm (quoted in Etherton 1914: 135).

The message of farmhouse improvement was carried by farm experts, the farm press, government agencies, and University researchers. For example, the nation's force of "nearly 2,500" county extension agents "made more than half a million presentations on farmhouse improvements to rural groups by 1930" (Beecher 1999: 255). Beginning around 1900 – and especially after 1910 – building plans for both new construction and farmhouse remodeling contained features designed to facilitate the role that farmhouses played in farm operations, as well as increase its comfort for the family (Beecher 1999: 256-257). In 1945 University of Minnesota staff indicated that demands for "better working conditions in the farmhouse" had been "strengthened" by "the important part farm women have played in food production during the war years" (Schwantes and White 1945: 14).

Plans for farmhouse improvements were disseminated by land-grant colleges, by publications like *Successful Farming* magazine, by building materials trade groups, and by a host of other interests.

In 1913 Minnesota became "the first state in the union to institute a model farmhouse competition" when a state agency called the Minnesota State Arts Society sponsored a model farmhouse design contest (Flagg 1914: 2). The house was to cost $3,500 ($64,700 in 2003 dollars), and meet a set of requirements developed by experts and ordinary farm families. The Minneapolis firm of Hewitt

and Brown won the competition with a Craftsman style design. Plans for all entries – the work of more than two dozen architects – were made available to farmers by the State Arts Society and the University of Minnesota (see the designs in Flagg 1914).

The Farmer's Wife, a popular national magazine published in St. Paul from 1906-1939, hosted its own model farm home contest in the spring of 1926. The winning entry, designed by Minneapolis' Small House Service Bureau, was published in April 1927. In 1930 the magazine also established a farmhouse plan service that offered designs for both new farmhouses and remodeling (Dean 1994). Improvements in farmhouse design were also spurred by a President's Conference on Home Building and Home Ownership, established by President Hoover in 1930. The group convened in 1931 and published findings in 1932 and 1933.

While the American Foursquare or "corn belt cube" is often linked by modern scholars with the farmhouse design movement of the early 20th century, "improved" farmhouse designs employed a wide range of styles including Craftsman, Colonial Revival, Cape Cod, Cottage Revival, Moderne, and simple vernacular forms (Neubauer and Walker 1961: 99).

FARMHOUSE FEATURES

Described below are some of the major features that designers, farmers, and farm experts identified as being important for good farmhouse design. Some later became standard for many American homes.

Grade Door and Landing. This improvement redesigned the rear (or side) entrance to a farmhouse, which was its most often used entrance. The exterior door was situated a few feet above ground level. Just inside the door was a landing with two sets of steps: about four steps that descended to the first floor rooms, and a longer set that led down into the basement. This arrangement allowed farm workers to walk directly into the basement to remove snowy coats and muddy barn clothes before entering the rest of the house. It also gave good access to the basement for removing ashes from the furnace, servicing the basement electrical plant, and hauling canning supplies from the basement to the summer kitchen. In some plans, a special door at the landing gave direct access to the kitchen wood box (White and Neubauer 1936: 3-8).

Central Rear Hall. Most 19th century houses – whether on a farm or in a city – had rear doors that opened directly into the kitchen. But as Foster and Ward wrote circa 1934, "Too many farm kitchens are passageways through which practically all traffic enters and leaves the house" (Foster and Ward ca. 1934: 5). The central rear hall guided traffic into the kitchen, as well as into the washroom, stairway, and farm office. It was one of the three design changes that *Successful Farming* magazine in 1940 believed would most improve farmhouses. The magazine's editors explained: "'The central rear hall gets rid of the pre-dinner confusion', one woman told us. 'Just about the time when Mother is busiest in the kitchen, the men come in from the field and take over the room'" (Fox 1940: 9). A central rear hall was also one of the "Big Three in Farmhouse Design" cited by experts in 1951 and 1961 (Neubauer and Walker 1961: 105, 122n; Foster and Ward ca. 1934: 3; Carter and Foster 1941: 305; Kaiser 1953: 35).

Washroom. The washroom, located near the rear entrance, was a place where farmers and help could wash up before coming into the rest of the house. Based on farm women's recommendations, a washroom was required in the Minnesota State Arts Society's model farmhouse of 1913. In many

pre-1940 plans, which probably presumed that farm workers would use an outdoor privy, the washroom contained just a sink, but in later plans it sometimes had a toilet. Most washrooms also had hooks or lockers for coats, as well as places for boots (Midwest Farm 1933; Midwest Farm 1937; Flagg 1914; Foster and Ward ca. 1934: 2; Carter and Foster 1941: 305, 310; Kaiser 1953: 35; Dean 1994; Beecher 1999: 258).

Large Well-Placed Kitchen. In 1914 a University of Minnesota author wrote, "practically the housewife's entire lifetime is spent in and around the kitchen," and advised that the kitchen should be planned first and the other rooms designed around it (Wilson 1914: 36). The kitchen needed to be separated from traffic and needed to be big enough to support intensive activities, including preparing and serving large dinners for work crews during harvest and on other occasions. Some plans included kitchens that were 10' x 16', 12' x 18', or 15' x 15'. The need for a large kitchen was sometimes reduced when labor-saving devices were purchased, or when heating, plumbing, and cooking were modernized so that firewood, water pails, and similar items didn't have to be stored in the kitchen.

Workroom. The workroom was a supplement to the kitchen and provided a second work space for heavy chores like canning, meat cutting, other food processing, and laundry, as well as complex chores like sewing. If the farm lacked a milk house, the cream separator, milk pails, and cream cans could be used and stored in the workroom. In some plans, the workroom was explicitly combined with the kitchen to form one large room (Carter and Foster 1941: 305, 310). Some experts recommended that the workroom could contain the shelves necessary to store the farm's large amount of canned fruits and vegetables. The workroom, central rear hall, and public side entrance were the improvements with the greatest potential to transform farmhouses, according to *Successful Farming* magazine in 1940, and other experts in 1951 and 1961 (Fox 1940: 7-9; Neubauer and Walker 1961: 105, 122n). A 1945 University of Minnesota source indicated that, after World War II's intensive years of food production, "Many homemakers now want a workroom . . . . The workroom is generally on the main floor but it may be in the basement if well lighted, heated, and equipped with running water and adequate kitchen facilities (Schwantes and White 1945: 14). A 1951 survey of farm women in the Upper Midwest found that nearly 70 percent expressed a desire for a first floor work room. Just over 40 percent of women characterized a first floor work room as a feature that "should be included by all means" in a farmhouse (Schroeder and Otis 1951: 8-9). Some experts recommended that an enclosed rear service porch or vestibule could serve this function and be used for laundry, canning, butchering, food storage, etc., as long the porch was easy to clean, had a water-resistant floor, and could stand up to hard use (Neubauer and Walker 1961:107).

Stairs to the Second Floor Located at the Rear. Foster and Ward wrote during the 1930s, "In town the stairway [to the second floor] is commonly situated close to the front door, or perhaps near the center of the house. Since members of the farm family naturally approach the house most often from the rear, the stairs will be most convenient if easily reached from the rear entrance." It was advised that the stairs be accessed from the central rear hall so that people could go upstairs without passing through other rooms in the house (Foster and Ward ca. 1934: 5; Kaiser 1953: 35).

Public Side Entrance. According to a 1951 University of Minnesota article, 65 percent of Upper Midwest farms reported that most callers came to the back door (Schroeder and Otis 1951: 9). Farmhouses were often set deeply back from the public road, rather than being close to the street and sidewalk as on a typical urban lot. This made the front door of the farmhouse virtually unused

and often inaccessible from the driveway. Because of this, "almost every guest comes to the back door because that is the easiest way, and often enough, there is not even a walk leading from the driveway around to the front entrance" (Fox 1940: 7). Callers coming to the kitchen door was sometimes inconvenient and interfered with work in progress. Remodeling the house so that the main entrance was on the side, facing the driveway, improved the situation greatly. Guests could easily find the entrance, and the entrance was convenient to the kitchen where someone was likely working, yet segregated from it. The public side entrance, the workroom, and the central rear were the leading three farmhouse improvements named in 1940 by *Successful Farming* (Fox 1940: 7-9). The same features were called the "Big Three in Farmhouse Design" by experts in 1951 and 1961 most important improvements in farm house design (Neubauer and Walker 1961: 105, 122n; Foster and Ward ca. 1934: 4).

Sleeping Rooms for Hired Hands. Segregated bedrooms for hired workers – ideally (but rarely) accessed by their own back stairs – were included in some farmhouse plans, including those drawn for the State of Minnesota's model farmhouse competition of 1913. The desire for segregated sleeping rooms arose in part from social discomfort expressed by some farm families over the need to house unrelated men or "strangers" within the family quarters, especially around women, girls, and young children (Lundquist 1923: 4-5). Despite recommendations for segregated rooms, they were not common, and on most Minnesota farms the workers slept in a regular farmhouse bedroom or in a barn loft, summer kitchen, or separate bunkhouse structure (Scharf 2004).

Farm Office. A farm office was included in many recommended farm house plans, and coincided with the advice of experts who urged farmers to apply modern farm management principals and record-keeping to their operations (Carter and Foster 1941: 305; Kaiser 1953: 35). In 1914, however, the USDA's William Etherton suggested that the farm office's "practical importance to the average farmer has probably been overestimated" and that farmers should carefully evaluate the need for an office before going to the expense of building one (Etherton 1914: 122). In a 1951 survey of farm women in the Upper Midwest, only about 15 percent expressed a desire for a separate office in the farmhouse, compared, for example, to 85 percent who expressed a desire for a spare bedroom (Schroeder and Otis 1951: 8). It is not known how many offices were built in Minnesota farmhouses, but they are believed to have been less common than workrooms and washrooms (Scharf 2004).

CHARACTERISTICS OF FARMHOUSES IN 1940

Data from the 1940 census revealed that, nationwide, only about ten percent of farmhouses had central heating, only about 18 percent had "piped cold water," only 28 percent had kitchen sinks, less than 12 percent had "minimum bathroom facilities," and more than one-third needed "major structural repairs." Farmhouses were worst in the South and in the "Great Plains area of the West" (Barre and Sammet 1950: 342-343).

In 1940 the average farmhouse in the U.S. was "less than 1200 square feet." Nationwide, the average size of farmhouses declined between 1920 and 1950 (Neubauer and Walker 1961: 101).

In 1947 Vernon Davies of the University of Minnesota summarized 1940 census data on the 218,580 farmhouses then standing in Minnesota. He reported, for example, that about 30 percent of the state's farmhouses predated 1900, about 40 percent had been built between 1900 and 1919,

and about 27 percent had been built between 1920 and 1940 (the age of 3 percent was unreported) (Davies 1947: 4).

The average number of people living in Minnesota farmhouses had decreased from 4.97 people in 1920 to 4.33 people in 1940. These occupants included hired workers, lodgers, and extended family members.

In 1940 more than 17 percent of Minnesota farmhouses had three or fewer rooms. About 26.6 percent of the farmhouses were classified as needing major repairs (Davies 1947: 6-9, 12).

In 1920 Minnesota ranked 26th among states in the number of farmhouses with electricity. In 1940 Minnesota had dropped to 27th among states.

Davies wrote in 1947, "Minnesota does not make a favorable showing in comparison with other states with respect to water and bathroom facilities and mechanical refrigeration. There was a higher proportion of flush toilets in farm homes in 32 other states, running water and private baths in 33 other states, and mechanical refrigeration in 37 other states according to 1940 census data. Only North Dakota, South Dakota, and Missouri in the Midwest show a lower ranking" (Davies 1947: 10). In 1940 about 92 percent of Minnesota's urban houses had running water, while only 12 percent of farmhouses did. About 98 percent of urban houses had electricity in 1940, while only about 30 percent of farmhouses were electrified. In 1940, 75 percent of Minnesota's urban houses had central heating, while 19 percent of farmhouses did (Davies 1947: 6-11).

Davies also reported an increase in vacant farmhouses that was occurring in the 1940s as farms consolidated, and as farms in the northern cutover counties were being abandoned. He expected a brief increase in the farm population immediately after World War II, but then expected the trend toward farm depopulation to resume (Davies 1947: 5, 19).

PREVALENCE

In 1940 there were 218,580 farmhouses standing in Minnesota according to the federal census. Today, it is expected that Minnesota farmhouses display a wide variation in age, style, size, and degree of integrity. In many cases, their design significance can be judged in comparison to urban houses within the state. Farms with two generations of houses are not uncommon, and a few may retain evidence of three generations. Farmhouses that display ethnic influences in design may be increasingly rare. It is not known how many Minnesota farmhouses have features directly linked to early 20th century reforms in farmhouse design.

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A settlement-era farmhouse in wooded Wright County, with a second-generation house nearby. Westphal Farm, Buffalo Township, circa 1973. (MHS photo)

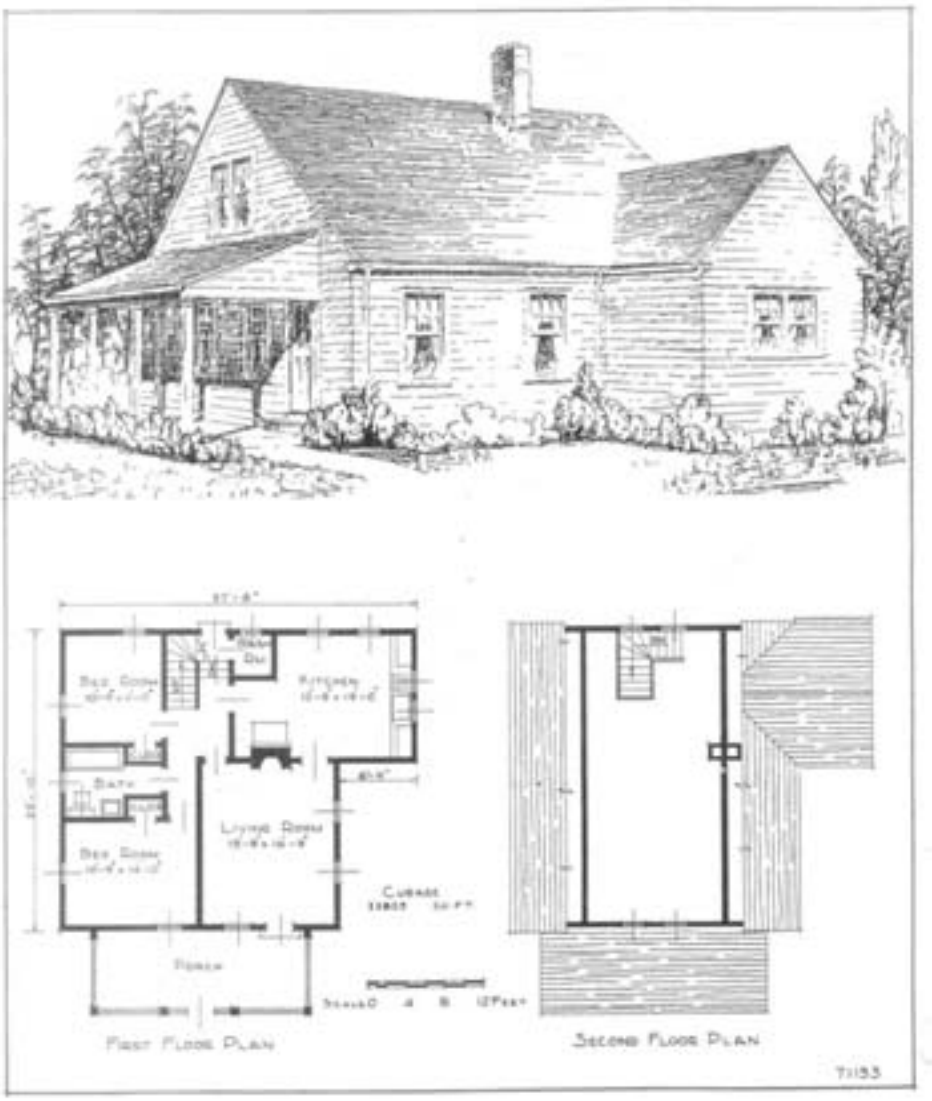
A windmill and orchard are sited on the slope behind this large farmhouse. Swanson Farm near Welch, Dakota County, ca. 1915. (MHS photo)

A woodframe farmhouse of moderate size. Location unknown, possibly near Glencoe, circa 1900. (MHS photo by Joseph Jay Brechet)

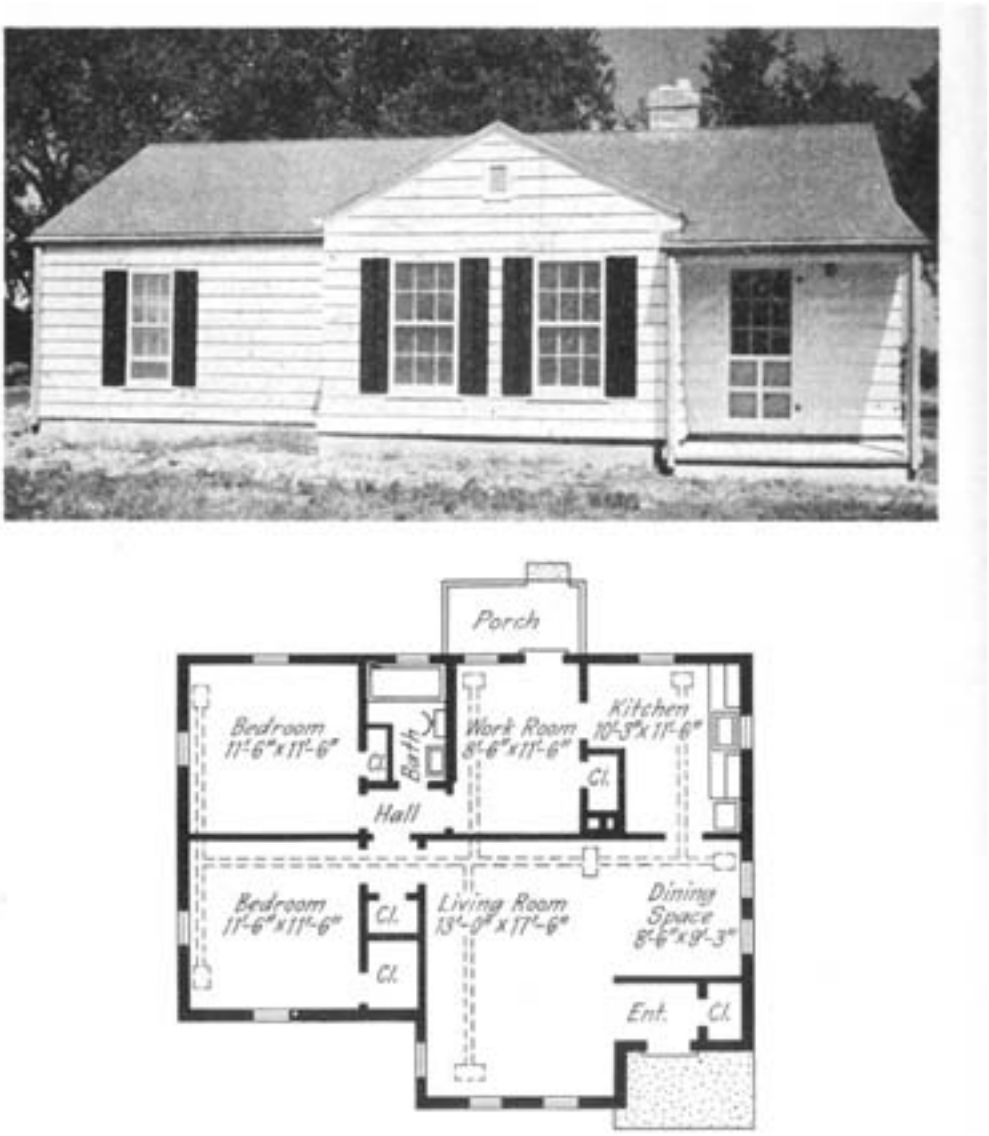
After a larger farmhouse was built, the earlier, smaller house was commonly reused as a summer kitchen, bunkhouse, granary, shop, or shed. In this photo, the earlier house stands behind its replacement. Crow Wing County, circa 1910. (MHS photo by Harry Darius Ayer)

This brick farmhouse was large and elaborate compared with many in the state. Photo taken near Princeton in Mille Lacs County, circa 1919. (MHS photo)

Many early 20th century farmhouses were built in the Craftsman style. E. E. Price farmhouse, near Onamia, Mille Lacs County, circa 1919. (MHS photo)



This Midwest Plan Service design illustrates several of the special features recommended for farmhouses. At the back door was a grade door and landing designed to allow easy access to both the first floor and the basement. A washroom for workers (with a sink but no toilet) was located inside the back door. A central rear hall kept the traffic out of the kitchen where intensive cooking or big, messy chores were often in progress. And the stairway to the second floor was at the rear of the house – the place where family members invariably entered – rather than in the front like in many urban homes (Midwest Farm Building Plan Service 1937).



This "low cost farmhouse" had a workroom measuring 8'6" x 11'6" located directly inside the back door. From Wooley's *Farm Buildings* (1946).

McDougall Farmstead, Dover Township, Olmsted County, 1979. (MHS photo)

■ FARMS

- Minnesota farm numbers peaked around 1935 and have been declining ever since
- From 1925 onward farms have grown in size
- Minnesota farms averaged 145 acres in 1880, 160 acres in 1925, and 235 acres in 1964

For the purposes of this context study, a farm is a parcel of land comprised of a headquarters complex (the farmstead) and surrounding acreage, usually owned and operated by a single entity such as a family.

Each farm is comprised of a collection of built structures and landscape features (or characteristics) including:

- topography and natural features
- spatial organization
- circulation networks
- boundary demarcations
- vegetation
- buildings, structures, and permanent objects
- sites
- a setting

This context study found that, based on use, most features fall into one or more of the four categories listed below:

- crop husbandry elements
- animal husbandry elements
- domestic elements
- service and utility elements

Most Minnesota farms historically contained elements from all four categories.

For a good discussion of farm landscape elements and their evaluation, see McClelland et al, *Guidelines for Evaluating and Documenting Rural Historic Landscapes [National Register Bulletin 30]* (1990).

For planning and management purposes, farms were generally divided into untillable and tillable land. Untillable land was comprised of areas too steep, rocky, wet, or wooded to till, including woodlots and wetlands. Many untillable areas were used as permanent pasture. Tillable land included land that could be worked with machinery and planted. Tillable land was usually planted with crops to be harvested annually, or planted with forage crops to create rotational pasture areas.

See also

Farmsteads
Fields and Pastures
Woodlots
Wetlands
Drainage Structures
Boundary Markers
Appendix: Focus on Gov Land Programs
Snapshot of Farming Regions

In 1900, 82 percent of Minnesota farms were operated by the owner, while 17 percent were operated by tenants.

NUMBER AND SIZE OF MINNESOTA FARMS

The boundary lines of Minnesota farms tended to be straight and aligned with cardinal points – following the orientation of the Public Land Survey – except where rivers, lakes, railroads, or other major geographic features were followed or bypassed. (See also "Boundary Markers," an individual farm elements section.)

In the early-to-mid 20th century, many Minnesota farms were 160 acres, which was the parcel size used by important federal land allocation programs including the Preemption Act of 1841, the Homestead Act of 1862, various military warrants, and the Timber Culture Act of 1873. A parcel of 160 acres "was thought to be the maximum amount of land a family could realistically farm," given mid-to-late late 19th century technology, according to the National Park Service which operates Homestead National Monument in Nebraska (National Park 2005). (See also "Focus on Government Land Programs" in this study's appendices.)

Number and Size of Minnesota Farms

	1880	1890	1900	1910	1920	1925	1930	1935
Number of farms in Minnesota	92,386	116,851	154,659	156,137	178,478	188,231	185,255	203,302
Average size of Minnesota farms (in acres)	145.1	159.7	169.7	177.3	169.3	159.7	166.9	161.4
Average size of farms nationwide (in acres)	134	137	147	138	147	143	151	155
Total number of farm acres in Minnesota (in millions)	13.4	18.7	26.2	27.7	30.2	30.1	30.9	32.8
Percent of total Minnesota land area in farms	25.9	36.2	50.7	53.5	58.4	58.1	59.7	63.4

	1940	1945	1950	1954	1959	1964	1975
Number of farms in Minnesota	197,351	188,952	179,000	165,225	146,000	131,163	104,000
Average size of Minnesota farms (in acres)	165.2	175.4	183.6	195.4	211	235	291
Average size of farms nationwide (in acres)	167	191	213	251	288	333	388
Total number of farm acres in Minnesota (in millions)	32.6	33.1	32.9	32.3	30.8	30.8	30
Percent of total Minnesota land area in farms	63.1	64.1	59.6	59.6	59.6	59.6	58.0

Source: *Statistical Abstracts*, various years.

As railroads were built, as population increased, and as technology improved, the number of farms in Minnesota grew from about 92,000 in 1880 to about 154,600 in 1900. The number increased by only about one percent between 1900 and 1910. Between 1910 and 1920, the number of farms in Minnesota increased by about 14 percent.

The number of farms in Minnesota peaked around 1935 and then began to decline. The introduction of electricity, gasoline-powered implements, and other new technology helped reduce the number of workers needed to run a farm, increase the number of acres a farm family could operate, and shrink the total number of farms. These changes eventually compelled farmers to specialize to remain profitable, and helped increase the amount of capital and machinery necessary to farm, thereby causing farmers to buy or rent more acres.

In 1945, there were approximately the same number of farms in Minnesota as there were in 1925. The state's total number of farms fell from nearly 189,000 in 1945 to about 165,000 in 1954. In 1964 the number of farms in Minnesota was 85 percent the 1900 level, or about 131,000 farms. (In 1997 there were 73,367 farms in the state.) Nationwide, U.S. farm numbers also peaked around 1935 at about 6.8 million and then began to decline. In 1964 there were 3.4 million farms nationwide.

While total farm numbers were rising in the late 19th and early 20th centuries, the number of "improved" acres within each farm was also increasing as farmers cleared land of trees, broke prairie sod, and drained wet areas. About 54 percent of total Minnesota farmland was improved by 1880. The percent of farmland improved rose to 59 percent in 1890, 70 percent in 1900, and 71 percent in 1910 and 1920.

Minnesota farms averaged about 145 acres in 1880. In both 1890 and 1925, the average Minnesota farm was about 160 acres. After 1925 farms began to steadily grow in size. As mechanization accelerated around World War II, average Minnesota farm size jumped 11 percent, rising from 165 acres in 1940 to 184 acres in 1950. By 1964, average Minnesota farm size had jumped another 28 percent, to 235 acres. It was 354 acres in 1997.

Historically there was considerable regional variation in farm size. In 1910, for example, farms ranged from an average of 57 acres in Ramsey County to an average of 305 acres in Wilkin County in the Red River Valley, while the overall state average was 177 acres. In 1935 farms in western Minnesota were larger than the state average of 161 acres, but in northern Minnesota they were only 103 acres, with less than 36 of those acres cleared. In some cutover counties in 1935, the average number of improved acres was as low as 16.5 (Schwantes and Thompson 1940). (See "Snapshot of Farming Regions in 1940" for some additional information on farm size.)

In 1939 average Minnesota farm size was 165 acres with the following variations seen throughout the state:

- Farms in the Red River Valley, averaging 246 acres, were the largest in the state and well above the 1939 state average.
- Farms surrounding the Twin Cities, averaging 57 acres, were the smallest in the state and considerably smaller than the 1939 state average.
- Farms in southeastern Minnesota were about the same as the state average at 161 acres.

- Farms in west central Minnesota, southwestern Minnesota, and northwestern Minnesota were larger than the state average with averages of 233 acres, 204 acres, and 199 acres, respectively.
- Farms in south central Minnesota, east central Minnesota, and the northern cutover counties were smaller than the state average with averages of 143 acres, 130 acres, and 103 acres, respectively (Engene and Pond 1944).

Farm size also differed by the type of farm, with truck farms tending to be very small and livestock and cash grain farms being much larger.

In 1930 dairy farms (defined by the University of Minnesota as those receiving at least 40 percent of income from dairying) averaged 92 acres near the Twin Cities, 131 acres north of the Twin Cities, 134 acres in the northern Minnesota cutover, and 239 acres in the Red River Valley (Engene and Pond 1940).

In 1925, about 53 percent of Minnesota farms were between 100 and 259 acres. In 1954, about 57 percent of farms were in that size range.

Minnesota Farms by Size in 1925 and 1954

Farm Size	1925 number of MN farms	1925 percent of MN farms	1954 number of MN farms	1954 percent of MN farms
less than 50	26,880	14.3	17,742	10.7
50-99 acres	35,167	18.7	21,488	13.0
100-179 acres*	67,949	36.1	55,675	33.7
180-259 acres*	31,396	16.7	38,669	23.4
260-499 acres	24,064	12.8	30,842	18.7
500-999 acres	2,577	1.4	5,084	3.1
more than 999	198	0.1	725	0.4

*In the 1925 data, farm size divisions are 100-174 acres and 175-259 acres; in the 1954 data the divisions are 100-179 acres and 180-259 acres.

Source: *Statistical Abstracts*, various years.

In 1957 the University of Minnesota's Engene and Nodland recommended that farmers seeking an annual income of $5,000 gross or $2,000 net (which translates to a gross of $35,000 and a net of $14,000 in 2004 dollars), "have a very slim chance of meeting this goal if they have less than 100 acres of cropland. This is equivalent to a farm with 120 to 160 acres of total land. With 100 to 199 acres of cropland, the prospects for a $2,000 net income are much higher" (Engene and Nodland 1957: 6).

Regarding small farm size in the mid-century, Engene and Nodland reported, "In 1945 [Minnesota] had 104,000 farmers with less than 100 acres of cropland harvested; by 1954 this had fallen to

71,000. This is a decrease of 33,000 or about one-third. These farmers had acreages so small that prospects for satisfactory earnings were very slight." The authors predicted that farms under 100 acres would become part-time or residential-only unless their owners bought or rented more acres or supplemented their family income with off-farm employment (Engene and Nodland 1957: 7, 19).

Farms accounted for about 50 percent of the state's total land area in 1900. By 1920 the total land in farms had reached 30 million, or about 60 percent of the state's total land area. The total amount of land in farms was approximately the same in 1965 as it was in 1920.

PREVALENCE

Farms are located throughout Minnesota, with the fewest number in northeastern Minnesota's forested cutover. Through time, farms have grown larger in size and fewer in number. The average Minnesota farm was 145 acres in 1880 and 235 acres in 1964. The number of farms in the state has been declining since about 1935.

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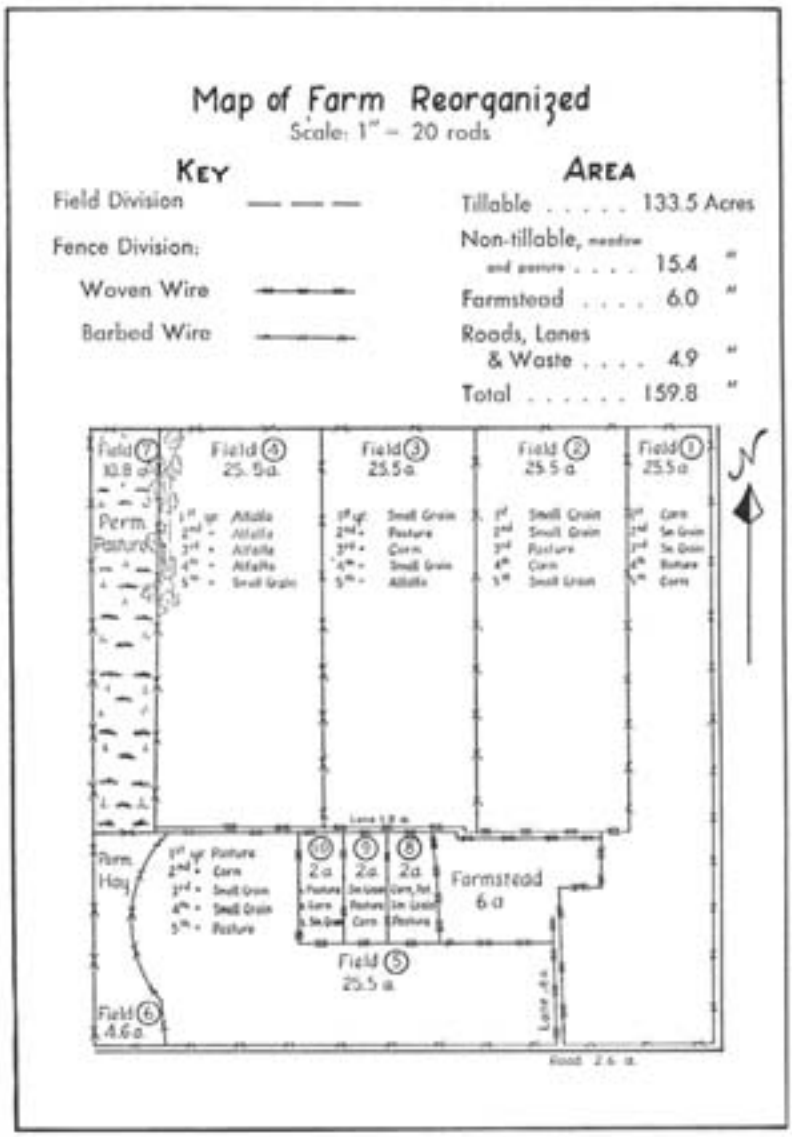
Farms in Nicollet County in 1916. The farms depicted on this atlas range in size from about 80 to 240 acres (Hixson 1916). Judging by the surnames of land owners, extended family members (perhaps siblings) were farming adjacent land.

Layout of a "southeastern Minnesota dairy farm" circa 1950. The farm's 134 acres are comprised of tillable land, nontillable land, a six-acre farmstead, and roads and lanes. From Boss and Pond's *Modern Farm Management* (1951).



Recommendations for reorganization of the circa 1950 southeastern Minnesota dairy farm depicted in the previous illustration. Fields are divided into larger and more even parcel sizes for more effective crop rotation and use of larger machinery. From Boss and Pond's *Modern Farm Management* (1951).

Cows (and one sheep) grazing in a clover field. The fences are made with simple poles, there are young ornamental plantings along the driveway, and there is a big stack of what looks like firewood in the yard. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

▪ FARMSTEADS

- Farm buildings and work areas were usually protected by a windbreak or woodlot
- Farm buildings were usually grouped around a farmyard accessed via the main driveway
- Livestock buildings were usually sited away from the house, often to the southeast
- In the most efficient farmstead layouts, buildings were grouped according to function
- South-facing farmsteads were preferred

"The farm headquarters serves as a home for the family, a business center, and an industrial establishment for the production and handling of crops and livestock," wrote University of Illinois faculty Carter and Foster in 1941 (Carter and Foster 1941: 158).

Two years before in 1939, Minnesota farmer William Benitt had called the farmstead "a virtual miniature city" of structures to house livestock, store forage crops and grain, shelter machinery, etc. (Benitt 1939). And in 1951 Minnesota's Boss and Pond wrote:

> The farmstead is the center of farm operations. It includes the home, the farm buildings, and the yards, paddocks, garden, orchard, windbreak, and other service areas. Its location and arrangement are important factors from both a personal and a business standpoint. An attractive farmstead adds much to the enjoyment of farm life. A well-located and arranged farmstead may help greatly in using labor most advantageously (Boss and Pond 1951: 160).

Minnesota farmsteads exhibited a wide variety of spatial and building arrangements. In general, however, the buildings were sheltered by a windbreak or woodlot, and clustered around a farmyard or work area that was accessible via the main driveway. Usually most farm structures are located within the farmstead. (Exceptions may include an occasional hay barn, stock tank, set of hog cots, straw cattle shed, etc., that might be located in pastures or at the edge of fields.) In rolling or hilly areas, topography often dictated the arrangement of elements, while arrangements in flat areas tended to be orthogonal.

Most farms developed with a fairly tight clustering of buildings and structures that were spaced far enough apart to prevent the spread of fire, but close enough to reduce travel time when moving between them. In Minnesota's extreme climate, siting buildings close together was advantageous for doing work in sub-zero weather and during blizzards. A tight grouping was also useful to deter animals like wolves that might prey on pigs, sheep, and chickens, or raid the hen house for eggs.

Noble and Wilhelm indicated in 1995 that the spatial arrangement of Midwestern farmsteads had not been extensively studied. In their brief discussion they named five factors influencing farmstead arrangement: topography, weather (including snow accumulation), convenience or labor efficiency, the land survey system, and "tradition" (Noble and Wilhelm 1995: 9).

See also

Farms
Farmyards
Roads, Lanes, Tracks, Sidewalks
Landscaping and Ornamental Plantings
Windbreaks
Woodlots
Appendix: Focus on Farm Electrification

The authors attributed the orthogonal arrangement of many Midwestern farmsteads to geometry and the cardinal alignment of the Public Land Survey. They wrote, "Barns and other farm buildings often line up in rigid conformity with survey lines, and the farmstead has an order imposed by the land division system" (Noble and Wilhelm 1995: 9). They cited a study from the mid-1980s that found that Midwestern farms in flat areas "obeyed just two general rules: They were square to the road (e.g., the survey lines), and, because of the prevailing westerly winds, hogs were housed to the east of the [rest of the] farmstead" (Noble and Wilhelm 1995: 9). Noble and Wilhelm also explained that traditional influences – for example, an ethnic German "courtyard plan" – were sometimes seen in the Midwest, but such phenomena had not been well studied (Noble and Wilhelm 1995: 9-10).

Noble and Wilhelm also wrote:

> Midwestern farmers usually laid out their farmsteads in one of three patterns. Most common are the farmsteads where all buildings have exactly the same orientation, usually to compass directions. A second pattern can be termed the courtyard arrangement. In these cases, the house and barn form two sides of an open square. Smaller outbuildings define the remaining two sides. The third pattern is a more free-form arrangement, in which buildings vary in alignment, but generally follow the contour of a slope. Further study may reveal additional farmstead patterns (Noble and Wilhelm 1995: 9-10).

Brinkman and Morgan, in their study of settlement-era farms in central Minnesota, described the layout of one farmstead as "circular, allowing for relatively simple access to the garden, pump, and outbuildings. To the east are Anna's garden, a small storage shed, and the privy. Running clockwise from the house in a north-to-south direction are the barn, storage shed, woodshed, garage, and granary-tractor shed. The major avenues of use are mainly for water and wood. The pump is located in the middle of the farmyard" (Brinkman and Morgan 1982: 95).

Many farmers grouped their buildings according to function to reduce labor – placing the corncrib by the hog barn, for example. Brinkman and Morgan reported that the Gogala farmstead, which had a group of log buildings built beginning in the 1860s, was arranged with triangular groupings consisting of a farmhouse, blacksmith shop, horse barn cluster; a horse barn, hog barn, corncrib cluster; a farmhouse, pump, smokehouse cluster; and a storage shed, pump, temporary corncrib cluster (Brinkman and Morgan 1982: 78).

ADVICE TO FARMERS

By the late 19th century, the farm press, university experts, extension agents, and others were trying to improve farm conditions and profitability by providing advice and plans for farmstead layout. Smart farmstead layout could save farmers significant time and labor, making them more productive. Because many farmers inherited an existing farmstead layout rather than building anew, farm specialists encouraged farmers to devise 5-year, 10-year, or even 20-year plans for improving their arrangement, including relocating buildings if necessary (Hays 1894; Hamilton 1908; Wilson 1914; White 1932: 217-218; Howe 1940: 20; Schwantes and White 1945: 8).

Farmstead Size. The size of the farmstead varied according to the total farm acreage, the type of farming, and anticipated expansion. In general small farms had small farmsteads, larger farms had bigger farmsteads. A common guideline for a suitable farmstead size was about five percent of the

farm. According to that standard, a 160-acre crop and livestock farm (a quarter section) required a farmstead of about eight acres (Wilson 1914: 58; White 1932: 217). A 1951 source suggested that a livestock farm required a larger farmstead than a cash crop farm: a four- to six-acre farmstead for a 160-acre livestock farm, compared to a six- to ten-acre farmstead for a 240- to 320-acre cash grain farm (Boss and Pond 1951: 160-161).

Farmstead Location. Elevation and good drainage were among the most important factors in farmstead location, and farmers often built on the highest available ground. Farmstead location was also influenced by the location of timber and water, and by soil type, field access, location of roads, and proximity to neighbors and village services (Hamilton 1908: 95; Wilson 1914: 57; White 1932: 217; Howe 1940: 2, 14).

In deciding where to build, farmers also had to consider economic and social factors. Placing the farmstead near the center of the farm had operational advantages: the fields were closer to the farm buildings and stockyards, and all four sides of the farmstead were adjacent to fields. This was especially important when relatively slow draft horses were used to make multiple trips to fields each day. However, a central location, far from the public road, increased the farm family's isolation, especially before automobiles became common. Building the farmstead at the end of a long driveway also made it less convenient for children to get to school, placed the farm farther from markets and country grain elevators, and made it hard to get to town when snow blocked the driveway (Wilson 1909: 24-25; Wilson 1914: 56; Howe 1940: 3).

In 1914 the University of Minnesota's Andrew Boss favored placing the farmstead close to the public road. He explained,

> The objection to a central location is that it results in the isolation of the farmer's family, which is a serious phase of farm life. Families of farmers enjoy seeing passing teams and should be near enough to the road to encourage social calls from their neighbors. Convenience in getting to school and to market should also receive due consideration. The economic advantage of being near the center of the farm is . . . [apparent], but it is doubtful whether this advantage is sufficient to outweigh the social advantages of living near the main road in the center of one side of the farm (Boss 1914: 65-66).

Boss's advice of 1914 is consistent with the recommendations of the Country Life Movement, a series of Progressive Era reforms (circa 1900-1920) that sought to improve the harsh physical, social, and economic conditions facing American farm families. The movement's recommendations included improving rural roads, increasing rural mail delivery, bringing electricity to farms, improving the status of farm women, improving rural education, and establishing an agricultural extension service.

Nearly 40 years later Andrew Boss had not changed his recommendations regarding farmstead placement. He and colleague George Pond counseled in 1951:

> A location on the highway in the center of one side of the farm is generally the most satisfactory compromise. This avoids the necessity of maintaining an all-weather road [driveway] from the public road to the farmstead. In northern climates it may require considerable effort to keep a long lane free from snow in winter. In the days of horse travel this was not so important [because sleighs were used] but with practically all road

> travel motorized it is important to keep a road open and passable at all times. The extra time spent in reaching the fields from the farmstead is not so serious a handicap under present conditions. Modern tractors travel more rapidly than horses, and labor-saving machinery coupled with larger power units reduces the number of hours required to produce an acre of crops (Boss and Pond 1951: 161).

Boss and Pond also pointed out that "passing travel will create interest and break the monotony of daily routine in the household" and that telephone and electrical lines are more accessible if the farmstead is sited near the highway or public road (Boss and Pond 1951: 161).

Orientation. The orientation of farm buildings depended on which direction the farmstead and house faced. The south or southeast-facing farmstead was probably the most common, with a good windbreak on the north and west sides. The main barn and hog house could be placed to the east of the house so that the prevailing winds blew odors and grain dust away (Hamilton 1908: 95; White et al 1936: 6; *Farm Building Plans* 1953).

A north-facing farmstead was least preferred because the house was exposed to the prevailing wind and the windbreak had to go across the front yard, disrupting the view between the house and the road. However, the rest of the farm buildings were easily sited in a north-facing farmstead. The livestock yards could be placed south and east of the barns, where they were protected from the wind and got full sun (White et al 1936: 5-6; *Farm Building Plans* 1953).

A west-facing farm was also exposed to the wind, making the front yard likely to drift in the winter and forcing the windbreak to pass in front of the house. Some farmers solved this problem by facing the house south. A west-facing farmstead made it easy to place the barns and livestock yards to the east of the house and left plenty of room to enlarge them (White et al 1936: 5-6; *Farm Building Plans* 1953).

The east-facing farmstead was the most difficult to arrange well. The barns and stockyards had to be placed to the north and west, next to the shelterbelt, and were generally farther from the house because the prevailing winds carried granary dust and livestock odors to the living area (White et al 1936: 5-6; *Farm Building Plans* 1953).

Principles of Good Farmstead Arrangement. The test of efficient arrangement of farm buildings, University experts explained, "is the accomplishment of their specific purposes under sanitary conditions with a minimum of time and effort" (Hamilton 1908: 98). For example, because most farm animals had to be fed 500 to 1,000 times a year, "the stables, granaries, yards, lanes and well should be so arranged as to economize labor in caring for the livestock" (Wilson 1909: 24). According to agricultural engineers Barre and Sammet, in 1943 farmers spent about one-third of their labor hours in and around the farm buildings. This suggested that the arrangement of entire farmsteads and individual buildings could have a real effect on worker fatigue and safety, power requirements, equipment wear and tear, and total labor hours (Barre and Sammet 1950: 414; Schwantes and White 1945: 8).

To help farmers evaluate and improve their farmstead layouts, farm experts from 1894 to 1951 outlined a consistent set of basic principles for good farmstead arrangement (see Sources below):

House

- House located near one side or corner of the farmstead (this recommendation varied), set back 80′ to 200′ from the public road to avoid dust and traffic, and separated from the other farm buildings
- House sited with view of the service area or fields from the kitchen windows
- Garden, orchard, and hen house close to the farmhouse so chores could be done and eggs and produce gathered without extra steps

Service and Utility Infrastructure

- Convenient access to public roads and fields
- Convenient driveways
- Plenty of space for yard, garden, orchard, lanes, buildings, and stockyards within the windbreak
- Well and windmill built on ground that was higher than the barn and farm buildings, and at least 150′ to 200′ from privies, cesspools, manure piles, and other sources of contamination
- Low spots in the yard filled
- Open, level runways or tile to carry away surface water and reduce mud, preventing yards and roads from becoming impassable from rain and spring thaws
- Windbreaks on the north and west

Outbuildings

- Principal farm buildings grouped around a farmyard or work area accessible from the main driveway
- Buildings placed on high, well-drained ground
- Outbuildings far enough from the house to minimize odors, flies, noise, and fire danger, yet not so far that chore routes are needlessly long; outbuildings at least 150′ to 200′ from the house recommended
- Machinery buildings, shop, and fuel storage situated for good fire safety and easy access

Livestock

- Barns and stockyards located east of the house
- No livestock barns or yards southwest of the house
- Feedlots and stockyards south or east of the barns for wind protection and maximum sun
- No animal yards in front of the house or between the house and the barns
- Cattle yards adjoin main fields and hog yards adjoin smaller fields so livestock can be conveniently turned into fields
- Open-front barns facing south or east
- Facilities grouped according to function
- Horse barns near implement sheds
- Dairy barn, silo, hay and feed storage, and milk house grouped together
- Beef cattle barns, stockyards, and feed storage grouped together
- Corncribs near hog houses
- Hog houses located farthest from the house to reduce odors

The distance between buildings varied with the type of farm. A 1932 survey of Minnesota farms, for example, showed that dairy farmsteads tended to be more compact than cattle farmsteads (White 1932: 217-218).

The number of buildings also varied. One group of farm experts recommended in 1936, ". . . the fewer structures there are, the more economical the labor and the lower the shelter cost" (White et al 1936: 8).

In 1941 manufacturers of fireproof brick and tile promoted a "closed court" arrangement of farmstead buildings, in which related functions were grouped into a few long buildings with common walls. The structures were set in a tight ring around a central courtyard, which was entered from the main driveway or the service lanes (Structural Clay 1941). However, few Minnesota farms followed this plan (White et al1936: 8). More common in Minnesota was an "open court" arrangement in which the main farm buildings were loosely grouped around a central farmyard and the buildings did not share common walls (Structural Clay 1941).

Farmstead arrangements changed as tractors replaced horses in the 1920s and 1930s. A 1929 article in *Agricultural Engineering* illustrated how the coming mechanization would affect the entire farm setup and suggested that shifting a large farm to "power farming" with tractors might require alterations in field divisions and pastures, fences, grain storage buildings, stockyards, and housing for farm laborers (Doane 1929: 27-30).

It is interesting to note that, by the early 1950s, planners were advising that the farmhouse, "while part of the farmstead group, should be distinctly [and more fully] separated from other buildings." This suggestion reflected, in part, the success of technology in reducing some of the most intensive labor of farming and allowing farm families to begin to consider their home more like a domestic refuge (an ideal more common to urban culture) and less like an industrial work center. Early 1950s recommendations also show the influence of modernism in architectural design. A 1951 ideal, for example, shows an almost factory-like collection of matching, low rise structures with "buildings having some uniformity in color, roof coverings, rooflines, and foundation" (National Plan Service 1951).

PREVALENCE

Elements on Minnesota farmsteads changed through time as particular farming practices were adopted, later to be succeeded by others. While large buildings are likely to retain their historic locations, smaller buildings and structures may have been moved around as farm technology, methods, and products changed. Spatial arrangement is likely to be the most intact on farmsteads where the largest number of historic elements remain. As small buildings, windmills, fences, orchards, and other elements are increasingly removed, the integrity of farmstead spatial arrangements is also being lost.

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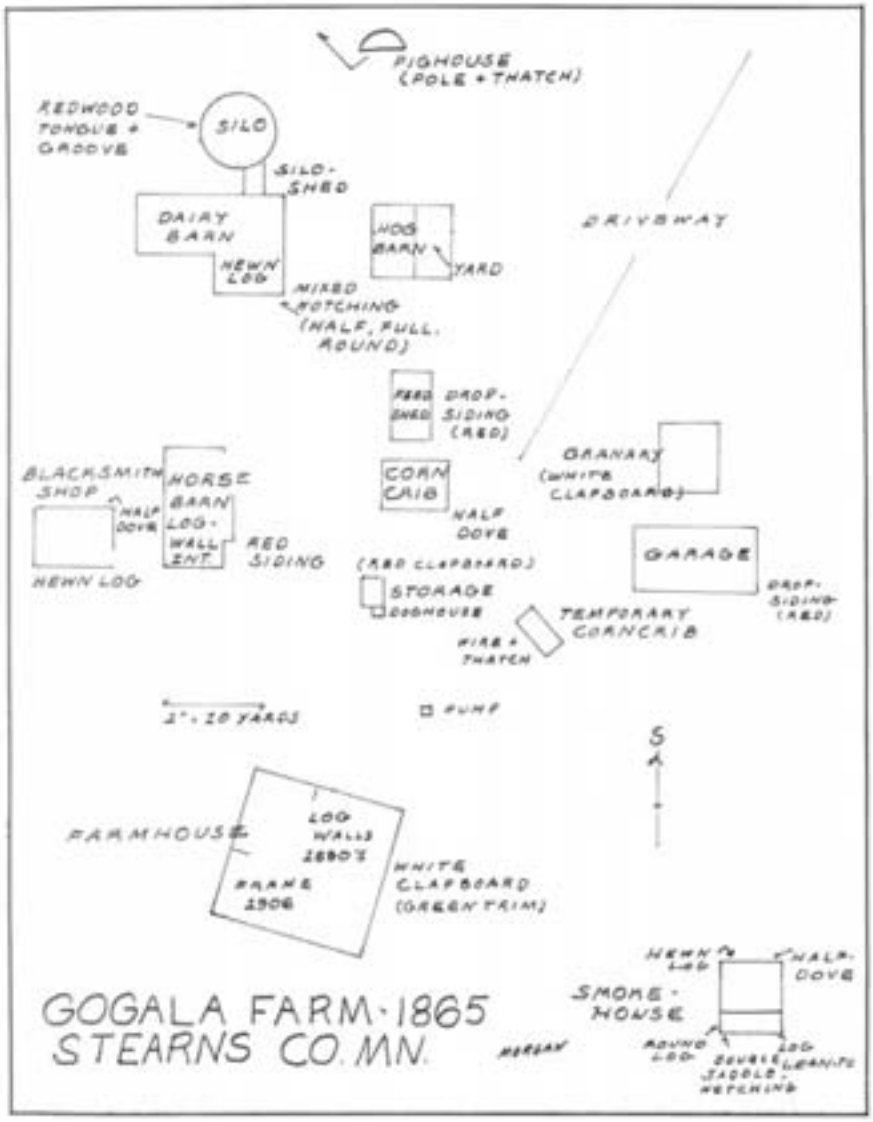
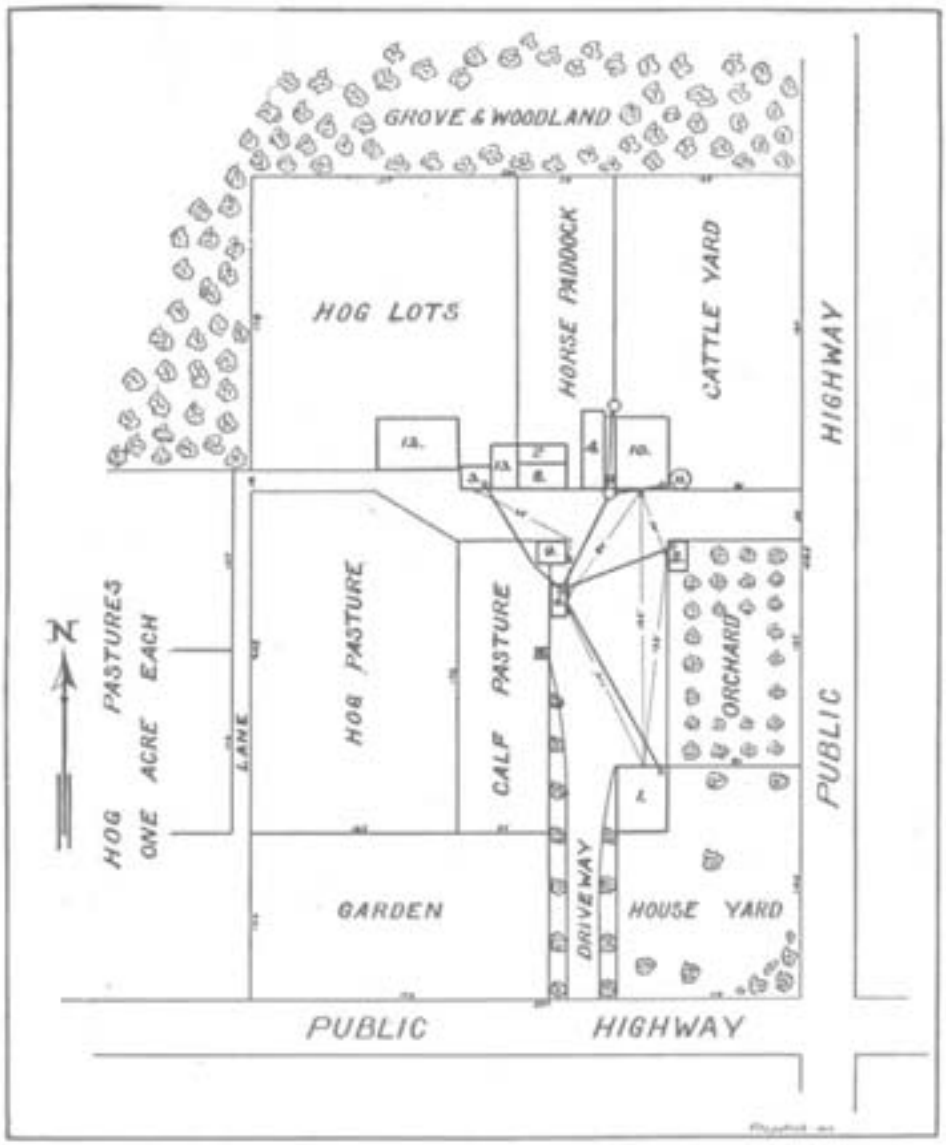
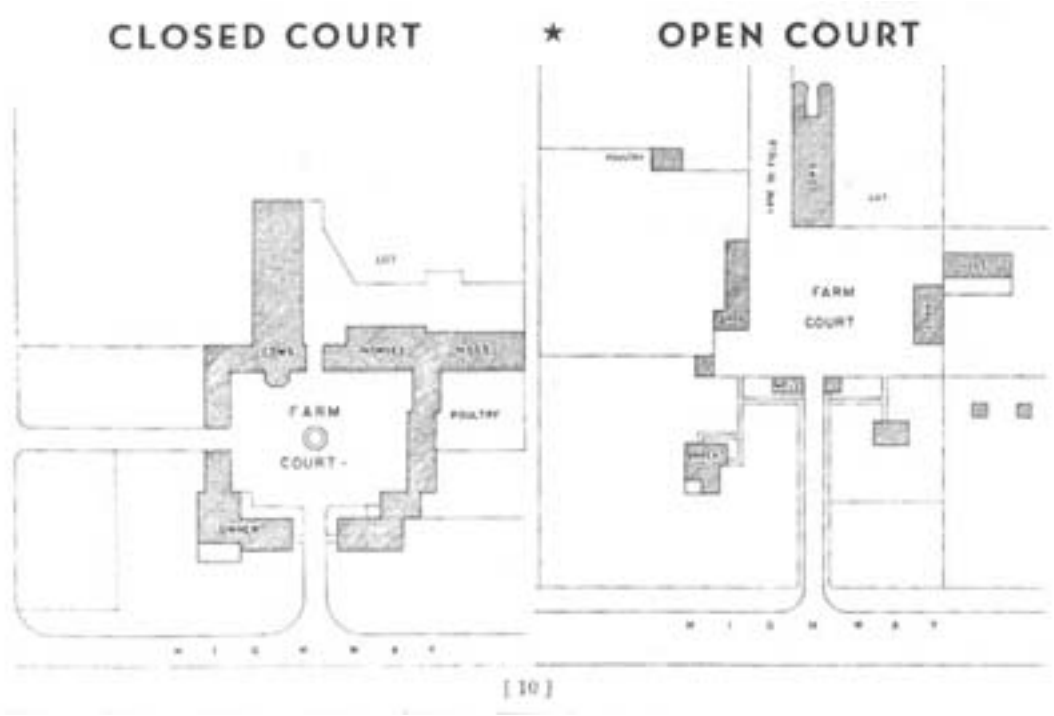


In their 1982 study of settlement-era farmsteads in central Minnesota, Marilyn Brinkman and Bill Morgan studied the Anton Gogala farmstead, established in the 1860s, which had tight clusters of buildings. From Brinkman and Morgan (1982).

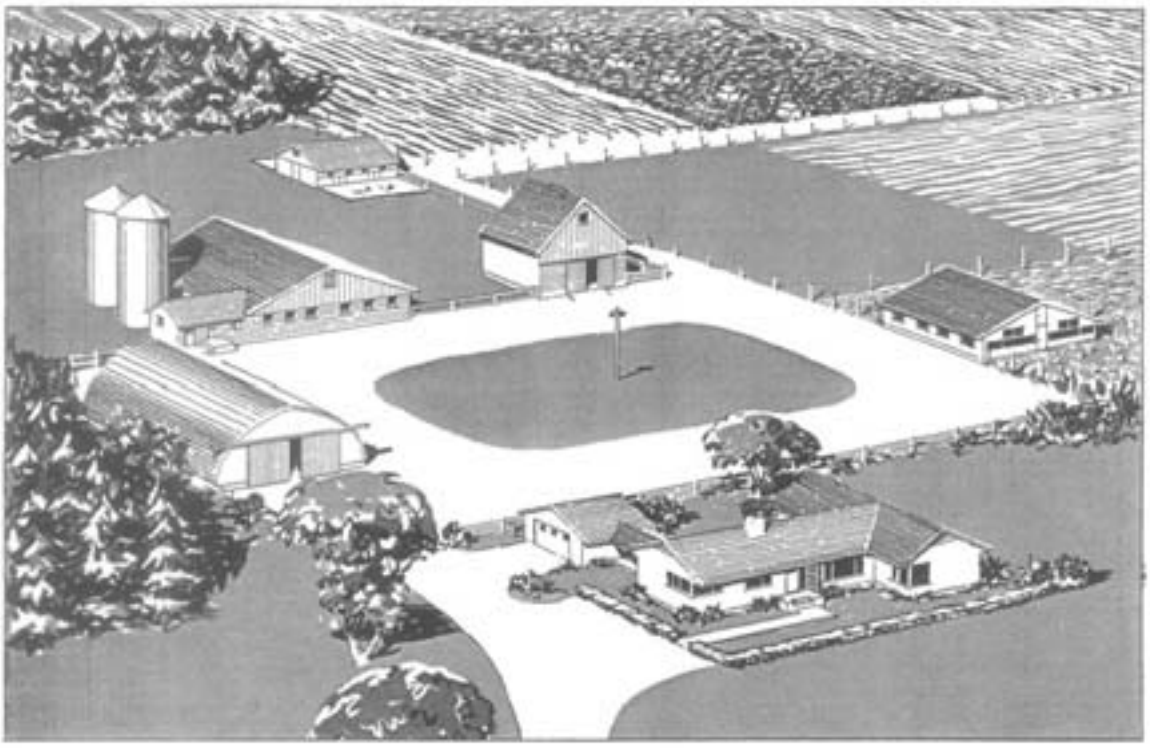


This illustration from *Farm Management* (1914) by the University of Minnesota's Andrew Boss shows buildings well-located, considering the farmer will need to travel three times per day between the corncrib and the hog barn, between the well and the hog barn, and between the farmhouse and the poultry house, according to Boss.



Closed court and open court plans from a 1941 publication, *Brick and Tile on the Farm*, published by the Structural Clay Products Institute. This trade group advocated the closed court, which was predicated on their fireproof building materials.

This University of Minnesota photo illustrates "A well-developed farmstead. The farmstead is the center from which a farm is operated. One that is well-proportioned, with buildings conveniently placed and arranged, contributes much to the economy of operation." The caption for a similar photo in the book indicates that "A well-established and orderly farm unit should be the objective of every farm operator." From Boss and Pond's *Modern Farm Management* (1951: plates 1 and 17).



This illustration of good farmstead planning appeared in a 1951 National Plan Service catalog called *Practical Structures for the Farm*. Among the recommendations accompanying this drawing was that the buildings have "some degree of uniformity in color, roof coverings, rooflines, and foundations."

■ FARMYARDS

- The central common area enclosed by barns, implement sheds, and farmhouse
- Often the site of the windmill, electrical distribution pole, and fuel tanks
- The area near the back door of the house was often an intensive outdoor work area

The farmyard (sometimes called the court or barnyard) was a central common area into which the main driveway usually led. The yard was usually surfaced with dirt or gravel and patches of grass. The ornamental lawns of the farmhouse were nearby but generally not part of the "farmyard," which was typically a work area.

Buildings for crop storage, animal husbandry, and implement storage were generally grouped on one side of the farmyard, with the domestic service area and farmhouse located on the opposite side. The windmill, electrical distribution pole, and elevated fuel tanks were often located at the edges of the yard, and the vegetable garden, orchard, and poultry house were often nearby. Brinkman and Morgan describe the yard of the Gogala farmstead as a "hub around which the wheel of farm activity moves" (Brinkman and Morgan 1982: 74). Farmhouses, farmyards, and dairy barns were usually the first areas of a farmstead to be electrified.

Part of the farmyard – the domestic service area – usually extended outward from the back entrance of the house. In all but the coldest weather, this was an outdoor work center for innumerable chores like beating rugs, filling lamps, washing clothes, churning butter, and cutting meat. This was the area where threshing crews washed for dinner at outdoor plank "tables", where youngest children played, and through which family members made constant trips carrying water, firewood, ashes, eggs, and garden produce. The area contained the clothesline, which was placed in full sun, and often the water pump, trash burner, woodpile, and other utilitarian objects. The service area also needed to be large enough to allow a delivery wagon or truck to enter (Hunt 1937: 6-8; Snyder 1950: 4; Scharf 2004).

In 1961 agricultural engineers Neubauer and Walker wrote, "The kitchen is the farm woman's workshop, and should have access to the back yard, laundry, supplies, and equipment. It should overlook the farm court [farmyard], yards, and service buildings, as well as the children's play area. It may also view the farm driveway and road, when possible (Neubauer and Walker 1961: 104).

PREVALENCE

Farmyards were found on virtually all Minnesota farms. If the surrounding buildings remain, the spatial organization of the yard may be intact. Typical post-1960 alterations include removing windmills and other elements, paving portions of the farmyard with bituminous, removing historic circulation routes (such as gravel lanes) and converting them to lawn, and adding new structures.

See also

Farmsteads
Power Houses
Utility Poles and Equipment
Stockyards
Propane Gas Structures

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The farmyard was a convenient work area around which buildings were arranged. It was often surfaced with dirt and patchy grass. The windmill, electrical distribution pole, clothesline, trash burner, fuel tanks, hand water pump, and other pieces of equipment were often placed near the edges. The stacks of hay or unthreshed grain in this photo are covered with lightweight tarps to shed water. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

The service area near the back door was an outdoor workroom for washing clothes, filling lamps, churning butter, and countless other chores. To reduce the amount of water hauled, clothes were washed in reverse order of need, with the barn clothes washed last. Peterson Farm, Hamlin Township, Lac qui Parle County, circa 1910. (MHS photo)

■ FENCES

- Farms used fences to contain livestock; the type of fence depended on the type of livestock
- In the early settlement era, fences were made with materials available on the farm; later, farmers installed barbed wire and woven wire fences
- Barbed wire became common in the 1880s, woven wire in the 1890s, steel posts in the 1920s, and electric fences in the 1940s

Fences in Minnesota are especially linked to the diversification of agriculture in the late 19th century when farms replaced a wheat-only cropping system with a more sustainable mix of livestock and crops.

Fences were a major capital investment that could create new economic opportunity, just like a barn or other outbuilding. As early as the 1890s farmers were urged to see fences not as an expense, but rather as a means of increasing profits (Story 1897: 307).

Farmers put up fences to mark the boundaries of their property and subdivide their land, but especially to manage livestock by keeping them out of gardens and cultivated fields, off railroad tracks, within stockyards, and within pastures and harvested fields where they could forage.

Livestock were allowed to run at large in rural Minnesota until the 1870s. If farmers wanted to protect their crops, they needed to erect fences to keep animals out. Eventually in 1878 Minnesota law gave farmers damages for crop losses from livestock depredations, whether the field was fenced or not, making it expensive for stockmen to let livestock roam. Fencing-in of livestock then became standard (Jarchow 1949: 206).

Because crops were fenced, cattle farmers could drive their cattle along public roads to market. According to one historian, "This was possible as all roadsides were fenced. Someone, often on horseback, went ahead to see that all gates to fields were closed and to guide the cattle at crossroads" (Wayne 1977: 19).

In 1917 Minnesota law specified four types of legal wire fences for enclosing livestock. The law also recognized fences of "rails, timbers, wires, boards, stone walls or any combination thereof, or of streams, lakes, ditches, or hedges" (Jarchow 1949: 7, 205-206; Hart 1998: 170-171; "Legal Fence" 1918: 246-247).

TYPES OF FENCING

Stump and Brush Fences. In the early settlement period, pioneers made fences from materials at hand such as brush and trees cleared from their land. These were sometimes called brush, stump, or deadwood fences. In cutover regions settlers pulled up pine stumps that had wide, shallow roots,

See also
Fields and Pastures
Stockyards
Cattle Guards
Farmsteads

dragged them to the edge of the field, "tipped them over onto their sides, and lined them up to make fences that were quite effective" (Hart 1998: 166-171, 182; Noble 1984: 118-119).

Stone Fences. In areas where field stones were plentiful, farmers piled rocks along the edges of fields to get them out of the way of the plow, forming stone-pile fences that grew over the years. They were most often built in glaciated New England, New York, Ontario, Michigan, Wisconsin, and Minnesota (Noble 1984: 119). A few farmers built more elaborate stone walls, either laid dry or with mortar. Because wood was plentiful in much of Minnesota, however, stone was an uncommon fence material (Hart 1998: 182, 185-186).

Zigzag or Worm Fences. In newly-cleared areas frontier settlers often built zigzag fences (also called worm or rail fences) from wood the farmer chopped himself or obtained from a sawmill. Tree trunks were split into 10' rails and interleaved at angles to form a zigzag or "worm." The fences were often six or eight rails high. Zigzag fences consumed a considerable amount of wood and land, required hours of labor to build, and were subject to falling over (Jarchow 1949: 7).

Post-and-rail Fences. Post-and-rail fences – that is, fences with rails mortised into posts – used less wood and land than zigzag fences but required more labor to build. In the 1870s in Minnesota, a fence needed to have at least three rails and be 4' high to qualify as a legal fence (Jarchow 1949: 206; Noble 1984: 122-123).

Board Fences. Wooden fences made with three or four horizontal boards nailed to (rather than inserted into) wooden posts were also common on Minnesota farms, particularly after dimensional lumber became widely available. Sometimes a flat board was nailed across the top to protect the lower boards from the weather. A board fence made a secure livestock pen and it could be painted to give a neat appearance. Board fences, however, were not used in large quantity because they required many posts, were expensive to build and repair, and, according to one author, "the excessive winds of the Western [Minnesota] country [could] soon prove too much" (Story 1897: 310; Jarchow 1949: 98; Noble 1984: 124-125).

Hedgerows. On the treeless prairie some farmers experimented with living hedge fences. Hedgerows could both confine livestock and protect the animals from wind and driven snow. In 1894 one Minnesota writer praised the value of white willow for fences: "There ought to be a half-mile of white willow growing on every quarter section, for it will furnish a farmer with all his fuel, besides making a good fence and windbreak" (Ludlow 1894: 279). Another popular hedge fence planted in the Midwest, including southern Minnesota, was made of Osage orange trees. Osage orange enjoyed a decade-long boom that began in 1845 and lasted until the severe winters of 1856 and 1857 when many hedgerows died. Hart wrote in 1998, "Some prairie areas still have a few long derelict strips of overgrown Osage orange hedgerow that begin nowhere and end nowhere, but most of the old hedgerows have been grubbed out or bulldozed" (Hart 1998: 172; Noble 1984: 126).

Barbed Wire Fences. Before barbed wire became available in the 1870s, farmers made fences from 8-gauge round or oval wire, or flat wire with serrated edges. This kind of wire fence was easily broken, however, because it could not stand the pressure of cattle leaning against it. Expansion and contraction of the wire in temperature extremes also caused it to break (Schueler 1956: 675).

Although somewhat slow to catch on, barbed wire was mass produced in a wide variety of styles. It was made from two twisted strands of galvanized steel with about five twists per foot, a design that permitted contraction and expansion of the cable. Barbs were placed at intervals of 4"-5" and were diagonally cut in order to provide sharp points (Schueler 1956: 675; Story 1897: 310).

Barbed wire fences were cheap, effective, took up little room, did not harbor invasive weeds or damaging rodents, did not shade crops, and were easy to build (Noble 1984: 128). Barbed wire worked well for keeping cattle and horses fenced, but these valuable animals could be badly cut on the barbs. Barbed wire would not hold hogs, sheep, or goats, all of which required woven wire fencing (Hart 1998: 174).

In 1918 legal barbed wire fences in Minnesota needed posts not more than one rod (16.5' apart). The top wire could not be more than 48" high and the bottom wire had to be 12"-16" from the ground ("Legal Fence" 1918: 246-247).

Woven Wire Fences. Woven wire, also called hog wire, was first developed in the 1850s, but the early version was made of ungalvanized wire that rusted and broke in the cold. Woven wire fencing became practical in the late 1890s following advances in steel manufacturing and improvements in looms (Horton 1915: 135). It was expensive, but effective, and by 1907 experts were urging Minnesota farmers to replace their barbed wire fences with woven wire as soon as they could afford it:

> Most of us are glad that the barbed wire fence has had its day. To be sure, it served its purpose, and in most cases, paid for itself, but it must go and none too soon. The woven fence is far its superior in every way. It makes feasible upon the farm many features that otherwise would not be possible, such as the keeping of sheep or the 'hogging off' of corn. Still more than that, it makes desirable the use of permanent fences about the larger fields and the farm, whereby stock of all kinds can be turned out to glean the fields of grain and to gather weeds before going to seed (Olson 1907: 56).

Woven wire fence consisted of horizontal wires called line wires, and vertical wires called stay wires. Many variations were produced, and the fences generally stood 20" to 58" high. The vertical and horizontal wires were held together at each intersection by joints (called ties or knots) or by welds or twists. The wire was usually galvanized (coated with zinc), although lead, aluminum, enamel, and plastic coating was also used (Schueler 1956: 674). To prevent the stock from being electrocuted if the fence were struck by lightning, wire fences had to be grounded (Horton 1915: 136-148; Schueler 1956: 674-675).

Fences for hogs or sheep usually had rectangular mesh, which also kept out preying wolves and dogs. When topped with a strand or two of barbed wire, an all-purpose fence was created that could enclose hogs, sheep, cattle, and horses. Poultry fences, which also kept out predators, generally had woven diamond or hexagonal mesh. They were first made about 1865 (Horton 1915: 146-156; Schueler 1956: 674; Noble 1984: 131).

Wood Fence Posts. Posts were usually wood or steel; some fences used both. Minnesota's first farmers often cut wood posts from their own trees. They were cheaper than steel but didn't last as long and had to be set in hand-dug holes. The best were oak or cedar posts, which resisted rotting and could last 20 years or more. Posts of cottonwood, willow, jack pine, and tamarack were

usually good for only a few years unless they were "barked" and treated against decay by smoking, charring, tarring, water seasoning, painting, or by applying a chemical preservative (Hart 1998: 177; Bassett 1918: 248; Aune 1908: 234; Horton 1915: 157).

The size of wood posts varied depending on the height, weight, and expected life of the fence. Temporary fence posts were generally 4" wide or less and simply driven a short distance into the ground. Permanent wood posts were usually 5" or 6" wide and set about 3' into the ground and about 16' apart. End and corner posts, which bore most of the weight of the fence, were usually about 8" wide and were installed in pairs set 10' to 12' apart They were usually anchored or braced with timber or wire (Wilson 1912: 322; Bassett 1918: 248-249).

Wire fencing was attached to wood posts with 1-1/2" fencing staples. The staples were driven loosely into the wood, allowing the wire to play freely through the staples as the wire fence expanded and contracted and as cattle pushed on the fence (Bassett 1918: 251).

Sometimes field rocks were used to support fence posts. For example, wooden posts could be held in place by rocks contained within cylinders of woven wire fencing, wooden cribs, stacked tires, or other devices.

Steel Fence Posts. Used as early as the 1910s and common by the 1930s, steel fence posts were more expensive than wood but lasted longer and could be driven into the ground rather than being set into pre-dug holes. Steel posts were manufactured in many styles including flats, angles, channels, tees, trusses, and tubes. They were protected from rusting by painting or galvanizing.

By the early 20th century, steel posts fostered the use of temporary and portable farm fences and made it possible for one man to erect "80 rods of good fence in less than a day's time." Portable fences were especially useful for "hogging down corn, fencing small grain fields to utilize sweet clover after threshing, the fencing of temporary pastures, pasture rotation, and livestock sanitation methods [that required moving animals to fresh ground]" (Lyman 1930: 332). The University of Minnesota recommended a combination of permanent and temporary fences that allowed a farmer to quickly divide long fields into smaller sections. Permanent fencing mounted on anchored posts was installed on the long sides of the field, and then temporary posts and wire were stretched across the short side of the field "to make lots of any size desired" (Aune 1908: 232).

Concrete Fence Posts. In some parts of the Midwest farmers built permanent concrete fence posts. However, "there have been many cases of failure when using the cement post," said one agricultural engineer. This was primarily due, he believed, "to the lack of skill on the part of the maker of the post" (Horton 1915: 157).

Electric Fences. Electric fences became available in the early 1930s and were widely adopted after World War II, especially for rotational grazing. They were made of lightweight steel wire attached to plastic or porcelain insulators mounted on thin wood or steel posts. Fence posts were spaced at intervals ranging from 20' to 80'. A fence charger or controller generated an intermittent electrical pulse that gave animals a painful but harmless shock when they touched the wire. Livestock quickly learned to respect the fence and remain within the enclosure (Kable 1936: 471; Hart 1998: 174). According to geographers Noble and Cleek, "Highly visible white porcelain insulators mark older fences" (Noble and Cleek 1995: 177).

Electric fences were cheap and easy to install and move, making them ideal for temporary fences. Farmers also found electric fences useful for protecting ditches from livestock, surrounding the hay stack to keep the stock out, pasture rotation, hogging down corn, confining the obstreperous farm bull, and dividing fields (Kable 1936: 471).

Electric fences did not work well for sheep, whose thick wool insulated them from electric shocks. Farmers trained the animals, however, by hanging shiny tin can lids from the charged wires. The curious sheep would put their unprotected noses against the can lids, receiving a shock that soon taught them to stay away (Hanke 2004).

Electric fences could be unreliable. Power failure was possible, and deer and other animals could disrupt the electric charge, permitting livestock to stray onto the road or into another farmer's field. For that reason, farmers often avoided using electric fencing along their property lines or next to a public highway (Hanke 2004).

Snow Fences. Snow fencing (also called crib or combination fencing) was made of wooden pickets or slats wired loosely together. It was commercially available by at least 1894 and was used by farmers to build low-cost corncribs and silos (Woodburn 1894: 347). Farmers also erected snow fences to force wind-driven snow to drift behind the fence instead of blocking roads or stockyards. Until the mid-1970s snow fences of this material were used frequently along Minnesota roads.

Ornamental Fences. Ornamental or lawn fences were used to enclose the farmhouse lawn or garden, accent landscaping features, or separate the domestic and work areas of the farmstead. They were usually made of wood, stone, iron, or wire. Ornamental wire lawn fences were not in widespread use until after 1920 (Schueler 1956: 675; Snyder 1950: 2-9; Hunt 1937: 2-12).

Gates. Farmers used a variety of structures to get in and out of fenced fields and pastures and, in planning fields, they had to consider the number of gates that had to be repeatedly opened and closed. Common methods to access fields included gaps, stiles, gates, and cattle guards. Gaps were made by attaching the fence strands to a loose, upright pole and slipping the pole into wire loops at the top and bottom of the next post. A stile was a set of steps or a ladder that allowed people to climb over the fence without damaging it. Gates came in all sizes, shapes, and materials. A Y-shaped "kissing" gate, for example, let people through but blocked animals (Hart 1998: 179-180).

PREVALENCE

Fences were found on virtually all Minnesota farmsteads before 1960. During the last 20 years, fences along fields have been steadily removed as farm machinery and fields have grown larger and as livestock farmers have moved to confinement operations and no longer put animals in pastures. Within farmsteads, fencing is also being removed as animal enclosures are no longer needed. A farm or farmstead with intact or extensive historic fencing is likely to be rare.

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A barbed wire fence with a braced corner post and a simple gate consisting of two removable log rails. Farmers tried to plan their fields so they didn't have to open and close too many gates as they moved machines or livestock from field to field. Location unknown, circa 1910. (MHS photo)

Two whitewashed wooden gates marked openings in a woven wire fence that had round wooden posts. One gate was the width of a wagon and the other was more narrow. Many farmers preferred woven wire fences because they held sheep and hogs, which barbed wire couldn't contain, and because they didn't have sharp barbs that injured valuable horses and dairy cows. Location unknown, 1914. (MHS photo by Charles J. Hibbard)

A barbed wire fence with homemade wooden posts. Location unknown, circa 1940. (MHS photo)

One of many styles of woven wire fence that were commercially available. This fence had steel posts, which were common on Minnesota farms by the 1930s. Miller Farm, Lac qui Parle County, circa 1950. (MHS photo)

This woven wire fence had wooden posts and a steel gate. Location unknown, 1952. (MHS photo by Norton and Peel)

As farms phased out their livestock and as machinery increased in size, scenes like this became increasingly common as fences were removed. Stevens County, 2004. (Gemini Research photo)

■ FIELD ROCK PILES

- Rocks pushed to the surface by frost heave had to be removed from farm fields to protect equipment
- Farmers usually heaped field stones along the edges of fields
- Rock piles are found on farms in all parts of Minnesota

Nearly all of Minnesota, except for a small area in the southeastern part of the state, was once covered by glaciers. Embedded in the glacial drift that forms Minnesota's soils were stones and rocks that are pushed up to the surface each winter like an unwelcome crop. These frost-heaved stones had to be collected every spring and moved out of the fields so that farm equipment wouldn't be damaged.

Historically, rock picking was a job farm children helped with, and today farmers still hire school-age children to pick rocks. The workers walked alongside a four-wheeled wagon driven slowly through the field picking up rocks and tossing them into the wagon bed. When the load was full, the farmer drove to the rock pile and the rocks were thrown onto the pile one by one. Larger rocks were removed from the fields with crowbars, shovels, and log chains, with horses and later tractors supplying the power.

Eventually machines like front-end tractor-loaders with rock buckets and mechanical rock-pickers made the job somewhat easier, but rock picking was still an annual ritual.

Many farmers simply piled the stones in heaps near the edges of fields or at the base of utility poles.

Sometimes the piles could serve a second purpose. For example, rocks were often piled along the edges of lanes or streams to serve as riprapping to prevent erosion. Less common was to form rough boundary walls by stacking rocks along the edges of fields, pastures, or lawns. Field rocks were also used to support fence posts. The posts – usually wooden – were held in place by rocks contained within cylinders of woven wire fencing, wooden cribs, stacked tires, or other devices.

Rocks could also serve an ornamental purpose when placed along the edges of a driveway, sidewalk, or garden. Some farmers built elaborate lawn art, statuary, rock gardens, gate posts, or walls with field rock, usually mortared. Field rock was also used as a construction material for foundations or entire buildings.

PREVALENCE

Simple field rock piles are expected to be found on nearly all farms throughout Minnesota. More innovative or complex uses for field stones are expected to be more rare. Rock piles are likely to be more prevalent in areas where soils are particularly stony.

See also
Fields and Pastures

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Each spring, a new crop of frost-heaved rocks had to be picked from the fields. Some farmers built dry-laid boundary walls with the stones, but more often they were left in simple piles at the edges of fields or at the base of utility poles. On this farm the rocks are corralled in woven wire fencing. Buh Township, Morrison County, 2004. (Gemini Research photo)

It was common to pile field rocks at the edges of roads or streams to serve as riprapping. Retzlaff Farm, Framnas Township, Stevens County, 2004. (Gemini Research photo)

■ FIELDS AND PASTURES

- Field sizes and shapes were influenced by factors like topography, drainage, soil type, and farming methods
- Untillable land often served as permanent pasture
- Historically nearly all fields and pastures were fenced for livestock
- Field divisions changed considerably beginning in the 1950s when farmers shifted from mixed crop and livestock farming to cash crop operations

Farms were not divided into perfect sets of square fields. On the contrary, field divisions on most farms were complex, with sizes and shapes dependent on several factors. Factors influencing the size and location of fields and pastures included pre-existing conditions such as topography, soil type, and location of native streams and woodlots, and man-made and operational factors such as accessibility to the farmstead and to roads, the type of crops planted and livestock raised, drainage structures installed, and machinery use.

See also individual farm elements sections such as "Farms," "Farmsteads," "Drainage Structures," "Erosion Control Structures," "Fences," and "Irrigation Structures."

Field patterns were apparently fairly persistent through time. Geographer John Fraser Hart wrote in 1975, "the layout of fields, as a general rule, is even more conservative, and changes even more slowly, than agricultural practices. The field pattern of an area often reflects past agricultural practices better than it reflects those of today" (Hart 1975: 74; Hart 1998: 153, 278).

The term field generally refers to a plot of land, often (but not always) tilled. The term pasture generally refers to grazed land. Pastures, also called meadows, could either be permanent, which could make good use of untillable land, or impermanent, sometimes called rotational. Impermanent or rotational pastures were planted with grasses, legumes, and other forage crops. Some pasture plants were perennials and some reseeded themselves, so a planted pasture could remain productive for several years, especially if enriched with manure.

Cropland had to be well-drained to be productive, and topography was a major factor in field size and layout. Farmers had to work around hills, ravines, streams, sloughs, timber stands, and roads, and try to use these features to best advantage. An 1898 example of a field layout for an 80-acre Minnesota farm created three, nearly-square, fenced fields arranged around a central permanent pasture that was cut by a deep ravine. The plan allowed a three-crop rotation, made full use of the farm's untillable land, and minimized the distance needed for manure hauling (Gregg 1898: 154-155; Howe 1940: 2-20; Hays et al 1912).

Soil type was another important factor in field and pasture division. Fields of mixed soil type dried out unevenly in the spring which impeded tilling and planting. Experts recommended, "Where the

See also

Farms
Field Rock Piles
Erosion Control Structures
Drainage Structures
Fences
Shelterbelts

soil varies considerably, each type should be segregated into separate fields so that all the land in each field will be ready to work at the same time and will receive the proper fertilizer treatment and cropping sequence" (Howe 1940: 4).

Whenever possible farmers tried to arrange fields that touched the farmstead rather than being located a long distance away. According to one Minnesota expert, in 1912 a 30-acre cornfield could easily require 240 annual trips between farmstead and field just to transport manure, plus 9 trips for harrowing, 8 for disking, 6 for planting, 40 for cultivating, and 60 for husking the standing corn. At a time when most farming was done with horses, the time saved with an efficient arrangement was considerable (Wilson 1912: 116).

Supporting the farm's livestock was an important factor in field and pasture layout. Having fields approximately the same size helped ensure a predictable supply of livestock feed as fields were rotated. Pastures had to be accessible to drinking water for the stock.

After 1900, the number and size of fields and pastures was often dictated by the farm's crop rotation. To work well in rotation, fields (or sets of fields) had to be about the same number of acres. A model plan from the 1910s, for example, divided a 160-acre farm into five fields – about 20 acres each – for the rotation of major crops, plus approximately seven smaller fields closer to the farmstead for the rotation of pasture crops and for supplemental space for the main crops. A plan from 1951 divided a 160-acre farm into six 26-acre fields – four of them long and narrow – for crop rotation (Boss and Pond 1951: 165). By 1940 many Minnesota farmers had settled on a standard rotation of corn, small grains, and a forage crop such as sweet clover or alfalfa, and divided their fields accordingly (Howe 1940: 4; Wilson 1912: 115-117; Boss 1914: 83-85; Boss and Pond 1951: 164-167).

Fields and pastures needed to be fenced to allow livestock to eat crop residue and forage plants. Fields grazed by hogs and sheep were generally small because they needed to be fenced with woven wire which was expensive. Fields grazed by cattle could be larger because they were fenced with barbed wire and, later, electric fencing (Lyman 1930: 330; Hanke 2004).

Field layout had to strike a balance between the expense of fencing and efficient machine operation: longer and narrower fields were more efficient for machinery, but square fields used less fencing. Fields two to three times as long as they were wide were considered a workable compromise. When portable electric fencing became available in the 1930s, the cost of fencing became less of a factor in field dimensions, "thus favoring the narrow field" (Howe 1940: 4).

Fields and pastures were often improved with drainage systems, and less commonly with erosion control structures and irrigation structures. Minnesota farmers began to build ditches and other structures to drain fields as early as 1860. As wet spots were drained, farm fields generally grew and became more regular in shape. Drainage was especially intense in 1900-1915, but continues today. Erosion control structures such as terraces and flumes were built beginning around 1900, but increased considerably in the 1930s. Some isolated fields were irrigated beginning in the 1920s, and irrigation became more widespread beginning in the 1950s.

Field divisions changed with mechanization and with other advances in agricultural technology. Fields were enlarged and lengthened, for example, as draft horses were replaced with tractors and farmers were able to till more land with less labor (Doane 1929: 28).

Beginning in the late 1950s many Minnesota farmers changed from mixed crop and livestock farming into crop-only systems, and began to use larger implements. They removed unneeded fences, enlarged their fields, and lengthened them to reduce the time wasted in turning the larger machinery (Hart 1998: 187; Howe 1940: 18).

After 1960, machines grew still larger, farm size increased, livestock raising became concentrated on fewer farms, livestock were less frequently put out to pasture, and farmers used fertilizer and pesticides instead of rotating crops. All of these factors favor larger fields and fewer field divisions.

Demonstration Plots. Some fields included demonstration plots, which were small areas planted along busy roads and identified with signs so passing farmers could see the results. The plots were used to demonstrate new crop varieties, hybrids, weed control, fertilization methods, drainage, and other new technologies. Railroads and other land developers used demonstration plots effectively in Minnesota in the late 19th century, and the Minnesota Extension Service began using them as a teaching tool around 1920 (McNelly 1960: 84).

PREVALENCE

The earliest field and pasture divisions may remain on farms where topography and other conditions have discouraged farmers from adopting cash grain systems with their very large equipment and expansive fields. Historic field patterns can sometimes be discerned through the location of existing fence lines along which volunteer trees and shrubs may grow, and preserved by the location of farm lanes, woodlots, streams, and other natural landscape elements. Farms with full sets of fields in pre-1960 patterns may be rare.

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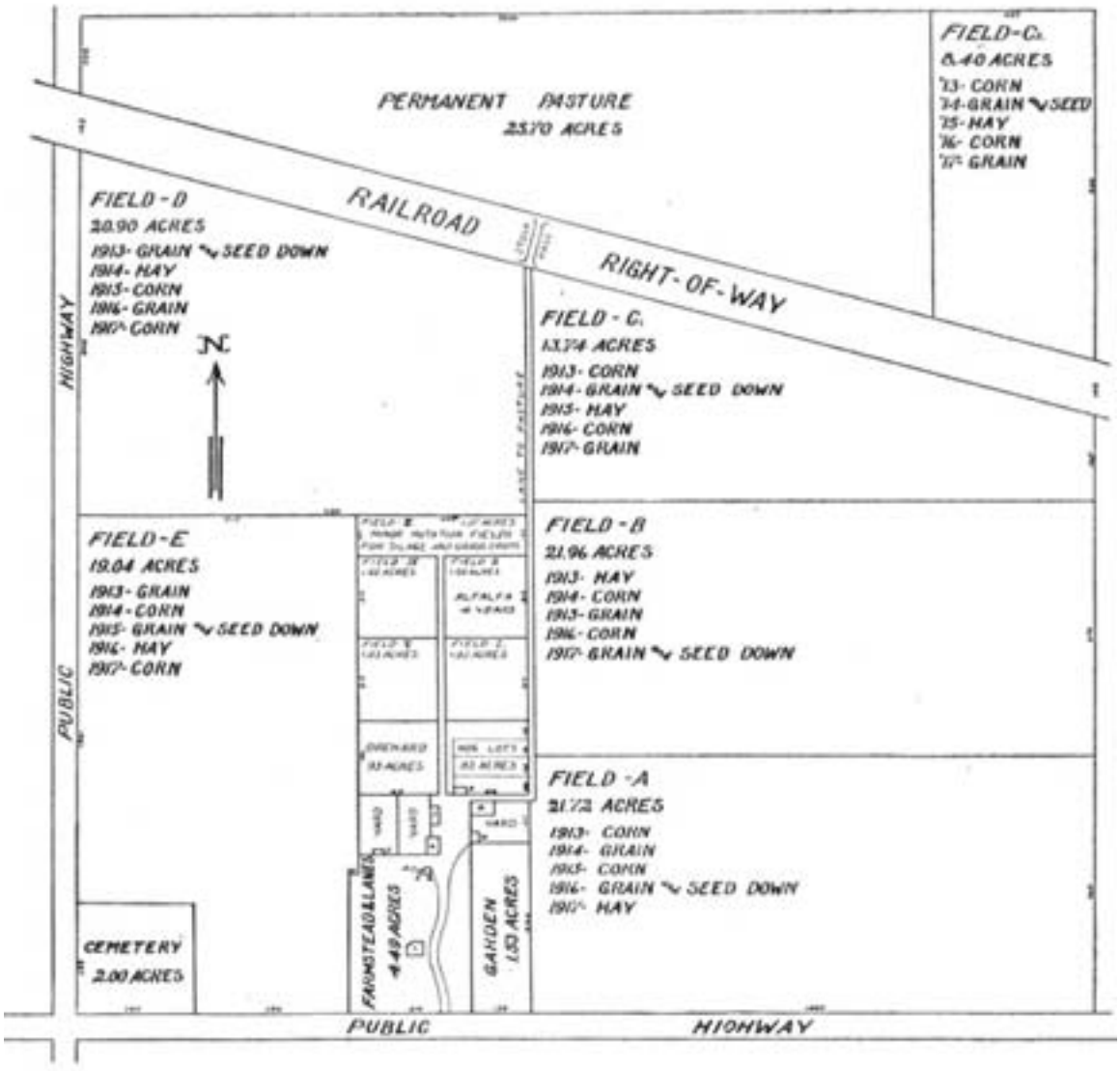

This 160-acre farm from the 1910s had five 20-acre fields for rotating major crops, and several smaller fields for rotating pasture, forage crops, and extra amounts of the major crops. The smaller parcels were located close to the livestock yards. Note the farm lanes and an underpass to move livestock under the railroad to the north pasture (Boss 1914).

A wheat field, location unknown, circa 1920. (MHS photo by Henry A. Briol)

Field divisions are responses to topography, the square divisions of the Public Land Survey, ownership patterns, drainage, and farm operations. By 1938, when this photo was taken, tractor use was increasing and fields were being lengthened to reduce the time wasted in turning machines. A closer look at this high-resolution photo revealed neat rows of grain shocks standing in several of these fields. (ASCS photo, Borchert Map Library, U of M)

A cornfield with shocks. Location unknown, circa 1940. (MHS photo by Kenneth Melvin Wright)

▪ GARAGES

- Farmers were very early buyers of automobiles
- 87 percent of Minnesota farms had an automobile in 1939
- Garages on farms were similar to urban garages, unless combined with a farm shop or implement shed

Minnesota farmers began using automobiles as soon as they could afford them. Automobiles made farm operations easier and reduced farmers' isolation. A trip to town to buy parts or hardware or to deliver eggs might only take a few hours in an auto, rather than all day.

In the 1910s, some farmers used their automobiles not only for transportation, but as a source of farm power. The Ford Motor Company and others sold conversion kits, which turned the family car, in the words of one author, "into a powerful farm tractor" (Barlow 2003: 122). For as little as $195, farmers could turn their Model T loose in the fields, towing a plow. Also available were kits that ran a belt from the Model T's rear wheel to power pumps, churns, feed mills, saws, washing machines, and electric generators (Barlow 2003: 122).

By 1939, 87 percent of Minnesota farms had an automobile, compared with only 18 percent of farms that had a truck. The fewest farms with automobiles in 1939 were located in the low-income northeastern Minnesota counties where only 73 percent of farms had a car that year. Cars were more prevalent in southern Minnesota counties where 93 to 95 percent of farms had cars in 1939 (Engene and Pond 1944: 28).

Most automobile garages on farms were similar to urban garages unless they were combined with an implement shed or farm workshop.

Most garages were woodframe and covered with wood siding, although concrete block, clay tile, and even fieldstone garages were built. Most garages were placed on concrete foundations and had floors of concrete, cinder, or dirt. The first garages had swinging hinged doors although, by the 1930s, garages with vertically-opening doors were common. Windows provided natural light, especially in years before electrification.

The garage could include a small workbench. An elevated fuel tank was sometimes installed outdoors nearby.

PREVALENCE

Garages were built on nearly all Minnesota farms, except where automobiles were stored in another building. It is expected that many well-preserved garages are still standing, with examples from the 1920s and earlier being more rare.

See also
Farm Shops
Implement or Machine Sheds
Roads, Lanes, Tracks, Sidewalks
Appendix: Focus on Mechan Techno

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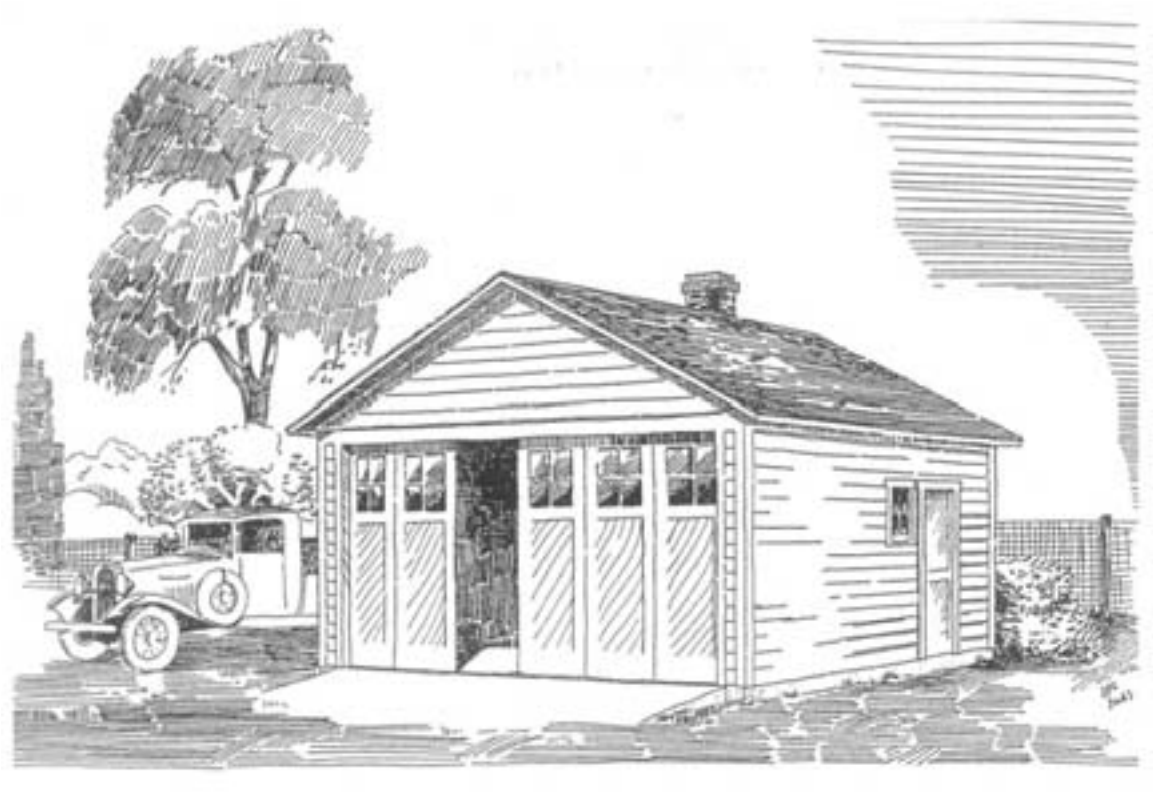

Minnesota farmers could order plans for this 20' x 24' garage with hinged doors and drop siding from the Midwest Plan Service. Note the chimney, which could vent a heating stove or forge near the back wall's workbench. From Midwest Farm Building Plan Service (1933).

■ GARDENS (VEGETABLE)

- A home vegetable garden was considered essential to nearly all farms
- Gardens were usually placed near the house in the shelter of the windbreak
- Poultry were kept near gardens to help control insects

Vegetable gardens and orchards provided essential food for farm families beginning in the early settlement era. Some families derived extra income from their home garden – for example, by selling vegetables and fruits in roadside stands or growing cucumbers to be made into Gedney pickles. (See "Roadside Markets," another individual farm elements section.)

An 1894 publication noted that "no farmer can afford to fail to spend the time to read and learn how to grow vegetables and small fruits, the money for seeds and plants, or the labor of raising all of these that the family wants" (Hays 1894: 278). In a 1921 survey of Minnesota farm women, 60 percent said their gardens were important, and many called them "positively necessary to our very existence" (Lundquist 1923: 14, 24). Reflecting this need, University of Minnesota farmstead plans from the 1890s to the 1950s consistently show a garden and orchard on every farm (Hays 1894: 272-278; Kirkpatrick 1910: 273; *Farm Building Plans* 1953).

Traditionally, the garden, orchard, and poultry care were women's responsibilities. For convenience "the orchard, garden and poultry are placed near the house, because the housekeeper often cares for the poultry and makes many more trips to the garden and poultry house than anyone else" (Wilson 1909: 26). The vegetable garden was usually to the rear or side of the house between the house and the windbreak, with orchards and berry bushes nearby. The hen house was normally placed near the garden to allow the chickens to forage for insects and help control garden pests. The garden was often fenced, however, to keep chickens away from the plants (Lundquist 1923: 14; Wilson 1914: 58; *Farm Building Plans* 1953; Hays 1894: 272-278; Kirkpatrick 1910: 273).

Big gardens were the rule on Minnesota farms. A University of Minnesota publication advised in 1931, "Particular attention should be given to having a farm garden of generous size, not only as a means of saving cash, but plenty of vegetables go a good way toward making certain that the family has a well balanced diet. If the garden is laid out in long rows about three feet apart, much of the work can be done with the horse cultivator" (Cavert and Pond 1931: 15). One 1956 source suggested that a farm garden of 100' x 150' would feed a family of five, but that a spot twice as large should be reserved so that crops could be rotated to preserve soil fertility (Roberts et al 1956: 214).

University of Minnesota building plans from 1953 show sample farmsteads with gardens ranging from 7,500 square feet to 30,000 square feet. Every summer and fall farm women typically raised and preserved an entire year's worth of vegetables and fruits such as strawberries and raspberries for the family table (*Farm Building Plans* 1953; Lundquist 1923: 14). Some Minnesota farmers also

See also

Roadside Markets
Landscaping and Ornamental Plantings
Greenhouses, Hotbeds, Coldframes
Orchards
Root Cellars

planted grapevines for making jelly or wine. The vines were trained on wire trellises strung between posts, which were usually set in rows on hillsides. Some varieties of vines had to be buried in the winter to protect them from freezing.

The necessity for large gardens and orchards on Minnesota farms declined as roads and transportation improved so that farmers could buy more things at stores, and as mechanical refrigeration and increasing amounts of pre-made, prepackaged, and frozen foods became available, particularly after World War II.

PREVALENCE

Vegetable gardens were found on nearly every Minnesota farm. It is expected that farms that retained gardens after the 1960s will have gradually made them smaller, and that large gardens will be uncommon. Like all vegetative features, garden plants, berry bushes, and similar elements are subject to change by natural processes.

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This photo appears in the 1951 book *Modern Farm Management* by the University of Minnesota's Andrew Boss and George Pond. The caption reads, "A good farm garden, suited to the size and needs of the home, will save expense for foods and add to the health and enjoyment of the family" (plate 21).

Big vegetable gardens were the rule on Minnesota farms. They were often fenced to keep out the chickens. Blonigen Farm, near St. Martin, Stearns County, circa 1960. From Marilyn Brinkman's *Bringing Home the Cows* (1988).

▪ GENERAL PURPOSE OR COMBINATION BARNS

- The most common type of barn historically built on Minnesota farms
- Almost always included, at a minimum, housing for dairy cows and horses
- Especially associated with the diversification of Minnesota farms, 1880-1960
- Sizes ranged from very small two-horse, two-cow buildings to large L-shaped barns

The most common type of barn on Minnesota farms was the "general purpose" or "combination" barn. General purpose or combination barns were associated with diversified or "general" farming, the most prevalent farming system in Minnesota between 1880 and about 1950.

Building a single all-purpose barn made economic sense for the general farmer, and most barns during Minnesota's early settlement era were of this type. During the early period, combination barns were often built of indigenous materials such as logs, stone, poles, mud, and straw. Dimensional lumber became the favored material for combination barns after local lumberyards were established and as farm income improved.

General purpose or combination barns shared many characteristics with Minnesota's dairy barns including size and shape, use of hay mows, and provision for ventilation, feeding, milking, and handling manure (Moore et al 1920: 546; Keith 1944).

Farm specialists remained consistent through the decades on the basic requirements of a general purpose barn. These were articulated by Neubauer and Walker in 1961:

Convenience – efficient arrangement of animals, alleys, and doors to minimize labor in feeding, milking, and cleaning the barn;

Sanitation – cleanliness, adequate lighting, drainage, storage, and proper ventilation to protect the health of animals and the quality of milk;

Economy – cost-effective, functional design; adherence to the requirements of dairy inspectors;

Appearance – both for aesthetic reasons and resale value. The authors noted that the barn "should be designed to harmonize with its general environment – adjacent buildings, surrounding vegetation, and countryside" (Neubauer and Walker 1961: 31-32).

Like all barns, combination barns were best sited on well-drained land, preferably southeast of the house. Adjacent manure piles or manure pits needed to be far from drinking water supplies. Many combination barns had a silo attached. Minnesota experts recommended that barns be aligned north and south to allow maximum light to shine into the windows (White et al 1936: 4).

See also

Barn Forms and Terminology
Dairy Barns
Beef Barns
Silos
Stockyards
Diversification & Rise of Dairy, 1875-1900

FORMS

Combination barns were built in a wide variety of shapes and types. See, for example, Dairy Barns and Beef Barns, two other individual farm elements sections, for information on forms and uses. See also this context's "Planning and Building Farm Structures: Barn Forms and Terminology."

SIZE

The typical width of general purpose barns in Minnesota ranged from about 20' to 36'. Many experts considered 34' the maximum desirable width in northern climates where the animals' body heat was needed to provide warmth in the coldest weather. (Hay in the mow and storm windows were also recommended for Minnesota barns.) Barn length was often limited by the size of the herd and by the length of hay carrier equipment. L-shaped barns were used to add capacity without over-extending length, to segregate dairy cows from other animals, and to provide a sheltered stockyard at the intersection of the wings (White et al 1936).

Combination barns could be very small. One plan offered for many years by the University of Minnesota created a 16' x 18' gable-roofed barn for two horses and two dairy cows. It had a small mow and a Dutch door that could double as a window. Slightly larger options were 16' x 32' and 16' x 36' (*Farm Building Plans* 1953).

A moderately-sized combination barn plan was featured in the *Minnesota Farmers' Institutes Annual* in 1903. Labeled a "good cheap barn for the small farmer," the 48' x 48' building was deemed sufficient for all stock, feed, and tools for a 40- to 80-acre farm. The ground floor was devoted 25 percent each to machinery, hay, horses, and other livestock. The hay mow had a hay carrier and hay door ("'This is the Barn'" 1903: 63).

In 1950 the National Plan Service was offering plans for 1 1/2-story general purpose barns in about 10 different widths between 20' and 40' and about 20 different lengths between 20' and 80'. The smallest barn was about 20' x 20' and the largest 40' x 80'. Roofs were gabled, jerkinhead, gambrel, gothic, and rainbow-arched, with or without details like hay hoods, flared eaves, bracketed eaves, dormers, cupolas, and circular metal ventilators (National Plan circa 1950; National Plan 1951).

In 1950 the National Plan Service also offered plans for one-story general purpose barns that were 18', 32', 34', and 36' wide. Their roofs were nearly-flat, gabled, and shed (National Plan circa 1950; National Plan 1951).

Moderately-sized multipurpose barn plans offered by the University of Minnesota in 1953 included footprints of 32' x 56', 34' x 60', and 36' x 76' (*Farm Building Plans* 1953).

In 1961 Neubauer and Walker indicated that most general purpose barns in the U.S. at that time ranged from 30' to 40' wide and 36' to 80' long. They reported that the most common widths were 34' to 36' with the length varying according to the number of animals. Feed alleys were generally 4' to 6' wide when carts were used and 8' to 10' wide for trucks and manure spreaders (Neubauer and Walker 1961: 39-41).

MATERIALS

Dimensional lumber was the most common material, but structural clay tile, concrete block, and brick were also used for combination barns. Dirt and wood were common floor materials. Because it was durable and could be easily washed, poured concrete was eventually favored for floors, although it could be cold and slippery for the animals. The concrete was sometimes overlaid with wood within the stalls (Cleland 1941; Hanke 2004).

As early as 1910 some farmers were re-siding their older combination barns with sheets of low-maintenance corrugated iron or steel. In the 1930s and 1940s changes occurred as innovations such as glued laminated trusses, metal framing, pole frames, and prefabrication were applied to the general purpose barn.

FUNCTION

While combination barns primarily housed dairy cows, calves, and horses, they could also shelter beef cattle, sheep, hogs, chickens, and turkeys, as well as store hay, straw, grain, corn, root crops, and machinery. (For the special requirements of each, see various individual farm elements sections in this context study.) Hogs, beef cattle, sheep, and bulls were kept in pens, and poultry were housed in a special poultry area with nesting boxes. Various animals were sometimes housed in an addition to the general purpose barn, rather than within it (Louden 1923: 95).

Some experts strongly discouraged sheltering dairy cattle with horses, despite the economic advantages of a shared facility. Milk easily absorbed barn odors and was contaminated by debris, and the constant noise, activity, flies, and dust of the horse area was incompatible with contented dairy cows and a sanitary barn. If the barn contained both, it was recommended that horses and dairy be clearly segregated by a wall or in separate wings of an L-shaped footprint. The gradual replacement of horses with tractors alleviated the situation as housing 5 to 10 horses on every farm was no longer necessary (Moore et al 1920: 540; White 1923).

Dairy cow areas generally had milking stalls and pens for maternity, calves, sick animals, young stock, or a bull. Whether the milk cows faced in toward the center or out toward the side walls was generally a matter of personal preference.

Areas for horses and mules usually had large doors for easy access to the outside and storage for harnesses and tools. Horse stalls were larger than those for dairy cows and had a different style of manger. The horse area usually had one or more box stalls for a sick horse, a "prized animal," or a team that was housed together – which was a common practice (Neubauer and Walker 1961: 39).

Some multipurpose barns had feed rooms in which feed was ground, chopped, and mixed. Feed rooms usually contained bins, scales, mixing containers, and a hay chute from the loft. Some basement barns had a trap door in the driveway that opened into a lower-level feed room. Some feed rooms had a root cellar nearby. Feed rooms were less important after commercial, fortified feed mixes became cost-effective and cylindrical bulk feed bins were installed. The latter were common by 1960.

Grain could also be stored in a combination barn. A 1933 plan from Midwest Plan Service described a 32′ x 32′ gambrel-roofed barn for a small farm. It contained four horse stalls, a box stall, two cow stalls, and four grain bins (Midwest Farm 1933).

Hay and straw were frequently stored in a combination barn. If feed and bedding storage wasn't included, the farm needed a separate storage area nearby. Minnesota farmers preferred to store feed and bedding with the animals because it reduced labor during the long indoor season dictated by Minnesota's winter.

When barns were electrified, agricultural engineers recommended that the new wiring include divided circuits, rows of overhead lights with reflectors to shed light for cleaning, double outlets for milking equipment, a heavy-duty 230-volt outlet for silo equipment, wall switches, and a master cut-out switch (White 1936: 19; Stewart et al 1928: 14).

PREVALENCE

General purpose barns were the most common type of barn built in Minnesota and are found throughout the state. Early examples will be less common.

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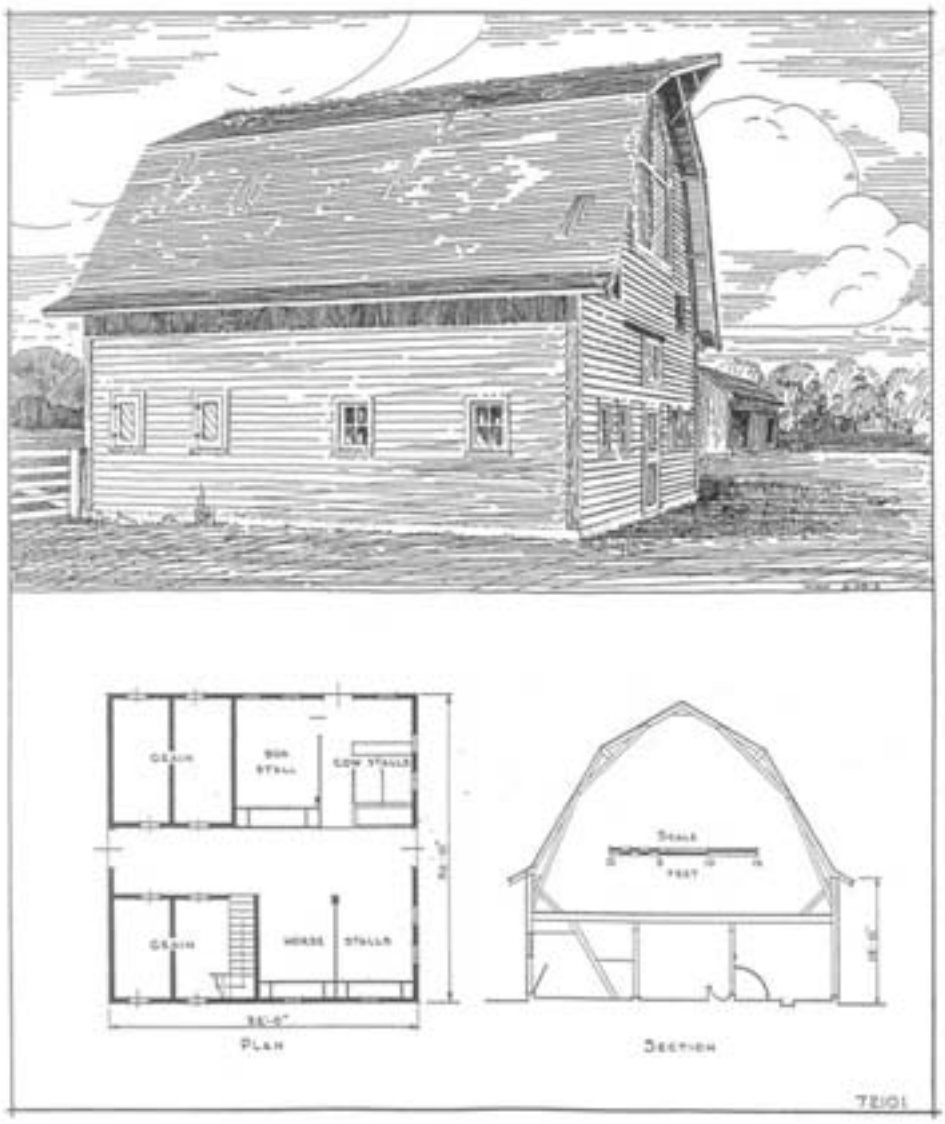
A settlement-era general purpose barn in wooded Douglas County. It was enlarged on one end, and eventually electrified. Note the tool grinder. Such grinders were used on most farms to sharpen mower sickles – twice a day during hay cutting. According to Steven Hoffbeck in *The Haymakers*, the grinder sat in the shade of a tree and children were pressed into service turning the handle while someone more skilled did the sharpening. Alexandria Township, Douglas County, 1983. (MHS photo)

This moderately-sized general purpose barn had vertical siding and three lightening rods on the roof. Location unknown, circa 1900. (MHS photo by John T. Austinson)

A relatively small general purpose or combination barn in Lac qui Parle County. In this photo the barn doors are painted with several names and "Madison, Minnesota 1902." Photo taken circa 1905. (MHS photo)

This barn was covered with corrugated metal panels. There are horses, cows, sheep, and hogs in the adjacent yards. Trygeseth Farm, Yellow Medicine County, circa 1915. (MHS photo by Ole Mattiason Aarseth)



In 1933 the Midwest Plan Service offered a 32′ x 32′ barn for four horses, two dairy cows, mow storage, and a granary with four bins. Storing grain with hay was discouraged by many experts because, if the hay caught fire, all feed would be lost (Midwest Farm 1933).

▪ GRANARIES, ELEVATORS, BINS, DRYERS

- Essential for preserving crops for feeding livestock and timing market sales
- Sited for easy access to fields and stockyards
- Usually built of wood, metal, cement stave, or structural clay tile
- "Elevators" were granaries with built-in mechanical elevating equipment
- Cylindrical metal grain bins first became popular circa 1910-1914
- Portable elevating equipment was used by average farmers beginning in the 1920s
- Grain dryers were used in the 1940s and became more common in the 1950s
- Shelled corn was stored in granaries beginning in the 1950s

A granary was a structure built specifically for the storage of field crops – usually small grains, shelled corn, or soybeans. Metal grain bins and grain-drying structures are also included in this discussion. (See also "Corncribs," another individual farm elements section.)

Granaries allowed farmers to store crops outside of the barn. In addition to providing more ideal storage conditions, granaries separate from the barn reduced the danger that the entire crop would be lost if the barn caught fire, which was a common occurrence.

Granaries were used to store crops before they were fed to livestock or taken to market. Being able to store grain without spoilage and sell it when market prices were favorable freed farmers from being tied to immediate market prices.

In general, a farm's need for storage grew with improved seed varieties, crop rotation, fertilizer use, and mechanization, all of which increased production. New Deal farm programs and wartime output also increased storage needs. According to H. M. Bainer, an agricultural engineer writing in 1930:

> The 'combine' [first used in Minnesota in the 1920s] has revolutionized wheat harvesting and is compelling the farmer to make radical changes in his storage and marketing methods. The present plan, that of delivering a large part of the crop direct from the field to the market, results in a mad rush for space to unload and makes it impossible for local elevators and railroads to get the grain out of the way fast enough. As a result the farmer who does not have storage space is forced to dump at least part of his wheat on the ground. This rush plan has the temporary effect of overloading the market (Bainer 1930: 249).

One source explained that by the mid-20th century, "Nearly all grains produced on farms are stored before they are finally processed or consumed. The storage period may consist of a few weeks' holding on the farm or in transit or may extend to a year or more. Inadequate storage and conditioning facilities, or their complete absence, contribute to an enormous annual loss in the

See also

Corncribs
Threshing Barns
Scale Houses
Develop of Wheat Mono, 1860-1885
Appendix: Focus on Minnesota Crops

United States in the income from grains and to a loss of quality for consumption or processing" (Barre and Sammet (1950: 312).

DEPRESSION AND WARTIME

During the Depression there was an increase in grain storage structures in response to the Ever-Normal Granary, a New Deal farm program that began in 1938 and was administered by the USDA's Commodity Credit Corporation. Developed by agriculture secretary Henry A. Wallace of Iowa, the Ever-Normal program sought to protect farmers' incomes and consumer prices from market fluctuations. A secondary goal was to insure a national crop reserve against drought or other unforeseen conditions. Farmers were given loans on grain placed in storage with the idea that they could market the grain during years when supplies were down and prices high. One source wrote in 1938, "The federal government isn't interested in buying or taking delivery on any corn [or other grain]. It is interested, leaders say, in providing the means to enable the individual farmer to store his grain on the farm, and by so doing to establish orderly marketing to support the price and carry over a reserve from years of good crop production to years of less favorable yields" (Bridgman 1938; Tweton 1988: 121-123).

The Ever-Normal program "spawned a great wave of farm construction as farmers erected grain bins and other storage facilities on their farms" (Minnesota Institute 1939: 17). Participating farmers needed to store their grain in a substantial and permanent structure that would be weatherproof and protect against loss of crop quality, theft, rodents, birds, insects, and fire. Because participating granaries were sealed to discourage fraud, the granary also needed to "require forcible breaking in order to be entered when sealed" (Wooley 1946: 269).

As part of the subsidy program, the Commodity Credit Corporation purchased tens of thousands of prefabricated bins to sell to farmers and to install in large "bin sites" in locations where sufficient commercial and private storage was unavailable. In 1939, for example, the Butler Manufacturing Company won a contract to supply the Corporation with more than 30,000 steel grain bins. A recent history of the Butler company noted, "This order was one and a half times more bins than had been produced the previous year by the entire [steel grain bin] industry" (Butler 2004).

In 1942, after the U.S. had entered World War II, the Commodity Credit Corporation purchased another large group of prefabricated grain bins – this time wooden bins. Farmers were being urged to increase production during the war but storage space was lacking. One author explained that the prefabricated bins were needed in part because "There was not enough lumber and nails in local lumberyards to provide even an appreciable part of the storage needed in many of the localities" (Barre 1943: 290). The Corporation looked for prefabricated bins that were low-cost, easy to assemble, and convertible to other uses on the farm. Because of wartime shortages of steel and other materials, a variety of alternative materials and technologies were tested through the program. Among the prefabricated bins purchased by the Commodity Credit Corporation in 1942 were:

- rectangular wooden bins ranging from 8' x 16' to 14' x 24' with shed and gabled roofs. Some had shiplap siding, and some were built of tongue-and groove planks joined at the corners with notches.
- 12-sided structures built of wooden staves. The 12-sided design made use of short pieces of wood.
- 12-sided bins of vertical siding over wood sheathing

- circular bins built of plywood
- circular bins built of two layers of insulation board reinforced with circular steel bands
- circular bins built of vertical wood siding reinforced with steel bands (Barre 1943; Long 1943: 8; Fenton 1942).

The government storage program operated until circa 1972.

After World War II there was another wave of granary construction as American farmers, still producing at high levels, faced bumper crops and too few storage facilities. The USDA collaborated with the Midwest Plan Service (based at Iowa State University in Ames) to draw and issue plans for grain storage structures to help take care of an estimated storage shortfall of one billion bushels. The Midwest Plan Service's resulting catalog, *Grain Storage Building Plans* (1949), was distributed through county extension agents, lumberyards, and other venues. It included a range of structures including some that could both store grain and double as garages, farrowing houses, etc. (Giese "Midwest" 1957; Midwest 1949).

By 1950 the storing of shelled corn in grain bins was on the horizon, as was increased use of mechanical drying. Writing in 1953, one agricultural engineer predicted, "Field shelling of corn, another probable development, would most certainly necessitate providing means for artificial drying of corn to reduce its moisture content to a point safe for bin storage. The field shelling method of harvesting corn would make the present slatted corncrib as obsolete as the horse stable" (Kaiser 1953: 36).

GRANARY DESIGN FEATURES

Centralized Versus Dispersed Storage; Permanent Versus Portable. Some farms used a centralized grain storage building for all crops. These were sometimes fairly large structures with built-in elevating equipment. Centralized structures were convenient because one piece of mechanical equipment could be used to convey all of the grain. This was especially useful in the years before portable conveyors became widespread. Centralized structures had some disadvantages including a high initial cost and the risk that the entire harvest could be lost to a single fire (Wooley 1946: 268-269).

Dispersed structures were advantageous because they could be placed near the field or stockyard, thereby reducing labor at harvest time or when feeding livestock (Wooley 1946: 268-269). The storage units could also be built one by one as needed.

Some farms used portable structures for maximum convenience. Some tenant farmers owned portable structures that they could move from farm to farm. Portable granaries were built on treated-wood skids and were light enough to be pulled by a team of horses or an average tractor. While low-cost, they did not usually last as long as fixed structures.

Location. Granaries were usually sited in locations that were well drained, were easily accessible by wagons and other equipment, were not too far from fields, and/or were near livestock feeding areas.

Size. The size of the granary depended on the size and type of farm. One author in 1912 recommended a 20' x 32' granary for a 160- or 320-acre Minnesota farm (Bassett 1912: 145). Small granaries held about 500 bushels of grain. Large structures could hold about 10,000 bushels.

Ventilators. Most granaries were windowless to keep out vermin. However, no matter what their size and style, granaries needed to provide adequate ventilation to keep the grain dry. This was critical, especially after farms adopted field combines. According to one agricultural engineer, "Before the days of the combine, when all wheat was cut with a binder or header and was shocked or stacked [outside], the grain had time to cure before it was threshed. The combine has eliminated this curing process and any excess moisture in the grain at the time it is harvested goes with it to the bin or market" (Bainer 1930: 249-250). To provide ventilation, many granaries had rooftop cupolas, monitors, or ventilators to draw air upward through the grain. Louvers in gable end walls were also common. Many granaries had vent shafts or flues within the bins to encourage air flow. Floors were raised above the ground for ventilation.

Drives. Many granaries and elevators had an interior drive for easier access. The drive could also be used to store implements and vehicles. If a built-in lift was present, the lift pit was often located beneath the drive. A grain cleaner (also called a fanning mill), which cleaned the grain so it could be used for seed, was sometimes operated from the central alley.

Doors. Granaries had small hatch doors in the upper walls and/or roof for filling. Man-sized doors at lower levels were used for unloading. Before mechanical elevators, granaries were filled by a worker with a shovel who usually stood in a wagon box.

Materials and Strength. Regardless of their size and materials, it was important that granaries be strong, well-braced, and balanced to provide stability against the weight of the crops. Wheat was the heaviest grain, exerting the most pressure on the walls and floor. Barley, oats, shelled corn, soybeans, peas, and flaxseed weighed successively less than wheat (Kaiser and Foster 1921: 54).

Woodframe granaries with ordinary stud walls were not usually strong enough and needed special bracing and internal cross-ties. Wood siding was sometimes installed on a diagonal for greater strength, or two layers of siding were used. If even more strength was needed in a wooden structure, it could be made with cribbed construction, often employed in commercial grain elevators. Cribbed walls were built of stacked boards laid flat with the broad surface down. The boards were overlapped on the ends and secured with spikes.

Round granaries were generally stronger than rectangular shapes. Round granaries were usually made of cement staves, concrete blocks, structural clay tiles, or metal, although wood and poured concrete were also used. While they were strong, masonry granaries were expensive to build and sometimes did not keep crops as dry as wooden or metal structures.

Foundations. Most experts recommended that granary foundations be made of poured concrete for strength. Setting the building up on large stones or concrete blocks was also common. According to geographers Noble and Cleek, "The most distinctive feature [of the granary nationwide] is the elevation of the building on several short piers of wood, stone, or cement block (Noble and Cleek 1995: 154).

Marauders. It was important that granaries keep birds, insects, and especially rodents from reaching the grain. Tall foundations helped deter animals, and it was recommended that bin floors be made of poured concrete or a combination of concrete and hollow clay tile to deter digging. Driveways often had gravel floors, and portable granaries had wood or metal floors. Some granaries had foundations that flared outward, or included skirts of sheet metal at the base of the walls, to keep out rodents.

COMMON TYPES OF GRANARIES

Common types of grain storage structures included the following:

Single Bins. Single-bin granaries were simple rectangular structures, usually with shed or gabled roofs. The smallest were about 8′ x 8′ or 10′ x 10′ and held about 500 bushels. Midwest Plan Service's 1949 postwar granary plans included several single-bin structures. They ranged from an 8′ x 12′ bin to a 22′ x 24′ single-bin structure that stored 3,400 bushels. Some were fixed on poured concrete, some were on skids, and some rested on concrete blocks. Siding materials included plywood, rolled asphalt, bricktex, or, for extra strength, a layer of drop siding over a layer of shiplap siding. Roofs were shed, gabled, and saltbox and were sheathed with corrugated aluminum, rolled asphalt, wood shingles, and plywood. Several of the Midwest Plan Service buildings could double as farrowing houses, brooder houses, or auto garages. By 1960, plywood, hardboard, and some plastics were also being used for single-bin structures (Midwest Plan 1949: 3-5; *Farm Building* 1953; Neubauer and Walker 1961: 210).

Double Bins. Double-bin granaries were rectangular structures with two grain bins separated by a single partition wall. Double bins could be built in phases with the second bin added as the farm's harvest grew. (One of the bins could also be a corncrib.) In 1933 the Midwest Plan Service offered a 12′ x 24′ woodframe, gable-roofed structure whose capacity was 2,000 bushels. The partition separating the bins was located mid-way along the 24′ wall, and there was a metal rooftop ventilator above each bin. The walls and roof were covered with galvanized sheet iron over shiplap siding. In 1949 the Midwest Plan Service offered two larger options, 20′ x 20′ (2,500 bushels) and 24′ x 24′ (4,500 bushels), with the partition aligned with the roof ridge. The Plan Service noted that these buildings could also serve as double garages for cars or trucks when not storing grain (Midwest Farm 1933; Midwest Plan 1949: 6, 13).

Double Bins with an Alley or Drive. A popular version of the double-bin granary had a central alley or a driveway, aligned with the roof ridge, that separated the two bins. The alley could range from a few feet wide to about 13′ wide and was often used to store machinery or vehicles, as well as provide air flow. A 1933 example was 31′ x 32′, with two 2,500-bushel bins separated by a 10′ drive (Midwest Farm 1933). The University of Minnesota offered plans for a version with an 8′-wide drive that was perpendicular to the roof ridge. The drive could also be used to store surplus grain (*Farm Building* 1953). The double bin with driveway model was the most common farm elevator design in 1921, according to one source (Kaiser and Foster 1921: 51).

Triple Bins with Drives. This structure had three bins and two driveways. The bins were located along the two side walls and in the center under the roof ridge.

Cross Driveways. Some farms used a cross-shaped granary with two intersecting driveways and four L-shaped bins, one at each corner. However, one 1921 source advised, "This type of crib has

little to commend it" and indicated that the driveways "occupy an excessive amount of space in proportion to storage capacity" (Kaiser and Foster 1921: 51-52).

Multiple Bins. A rectangular, gable-roofed granary sometimes had four or more bins. A typical form had a central alley or storage room approximately 6'- 8'-wide, surrounded by four bins. Total capacity was about 2,000 bushels (Midwest Plan 1949: 5; National Plan ca. 1950: 45; *Farm Building* 1953).

Plans for a 31' x 40' structure were offered by Midwest Plan Service in 1949. It had six bins – two above the 11'-wide driveway and four flanking the drive. Capacity was about 8,000 bushels. The building was to be covered with corrugated steel over shiplap siding (Midwest Plan 1949: 6; National Plan 1951: 27).

Continuous Multiple Bins. Some granaries had multiple bins built side-to-side, forming a long, shallow structure somewhat like a continuous poultry house. The granary could be built to any length and bins could be added as needed.

Multiple Bins with Built-in Elevator. Larger-capacity structures (e.g., 8,000 to 10,000 bushels) often had multiple bins and built-in elevators. These structures were more likely than smaller structures to have cribbed construction. In 1933, for example, the Midwest Plan Service was offering plans for a 30' x 30' elevator with built-in equipment and storage for 10,000 bushels. It had a gambrel roof and a rooftop monitor. The ground floor had six equal-sized spaces – five bins and a power room – that flanked a central drive. There were four additional bins overhead. Plans for two similar buildings were offered by Midwest in 1949 (Midwest Farm 1933; Midwest Plan 1949: 7; National Plan ca. 1950: 47; National Plan 1951: 27).

Combination Granaries and Corncribs. Combination granaries and corncribs were very popular. They are described under Corncribs, another individual farm elements section.

Round Masonry Granaries. In 1916 round grain bins made of structural clay tile were in "common use" in some states like Iowa (King 1916: 62). In 1941, round grain bins built of tile were being promoted by the Structural Clay Products Institute. The bins ranged from 10' to 20' in diameter and had domed roofs (Structural 1941: 16). In 1948 the Portland Cement Association was promoting circular granaries of concrete block (Portland 1948). Circular granaries of reinforced poured concrete were also built (Neubauer and Walker 1961: 209).

Round Metal Grain Bins. Cylindrical steel granaries or "grain bins" were one of the first agricultural uses for steel framing (also called "light-load" steel framing). Most were prefabricated, and many had central ventilation flues. They first became popular around 1910-1914 and by 1926 one steel manufacturer wrote, "The great fields of the Middle West are dotted with steel grain bins" (Sheet Steel 1926). The Butler Manufacturing Company of Kansas City sold its first steel bins in 1907, and during the New Deal supplied tens of thousands of bins to the USDA's Commodity Credit Corporation (Butler 2004). After World War II, metal grain bins were widely built. They could be steel or aluminum, with either smooth or corrugated walls. The corrugation could run horizontally or vertically (Neubauer and Walker 1961: 210). Among the many popular brands of metal bins sold in Minnesota were Behlen (company established 1935 in Nebraska), Brock (est. 1952 in Indiana), Butler (est. 1901 in Kansas City), Chief (est. 1950s in Nebraska), and Sioux (est. 1918 in Sioux Falls).

Round Wooden Granaries. During World War II, circular plywood bins became popular, and they were still being built in 1961. Examples included structures that were 14′ and 19′ in diameter. Some had rolled asphalt or coats of linseed oil and varnish on the exterior walls. Roofs were often coated with hot asphalt, or with linseed oil and then aluminum paint (Fenton 1942: 217-218, 222; Neubauer and Walker 1961: 210). The bins were also made of double-layered insulation board or vertical wood siding, both reinforced with steel bands (Barre 1943).

Polygonal Wooden Granaries. Some grain bins were polygonal wooden structures that were shipped in pre-built sections to be assembled on the farm (Brooks and Jacon 1994: 63). In 1942, for example, the Ever-Normal Granary program was distributing prefabricated 12-sided bins of at least two styles: built of wooden staves and built of vertical siding over 1″-thick wood sheathing (Barre 1943).

Large Shed Granaries. By 1930 a few farmers in states like Kansas were using round-roofed "hangar-type" sheds in which to store wheat. The sheds had corrugated iron walls and concrete foundations (Bainer 1930: 251). After World War II, these large grain storage sheds became much more popular. Stran-Steel, which sold many Quonset buildings for grain storage, referenced the Ever-Normal program in a 1948 advertising appeal: "The current government wheat loan to farmers approximates $2.00 per bushel plus 7 cents per bushel for stored wheat. In the face of current elevator storage costs of 13 5/8 cents per bushel, plus haulage and dockage for ground-stored wheat, farmers cannot afford *not* to have their own storage facilities. Quonset buildings, immediately available for this purpose, give their owners these profit-making advantages" (Stran-Steel 1948).

In 1949 the Midwest Plan Service was providing plans for two buildings that could be used as combined implement sheds and granaries. (They could also accommodate built-in grain-drying equipment.) One was a 32′ x 36′ structure whose Quonset-style roof was supported by laminated wooden arches. The walls were built of corrugated steel over shiplap siding. The second was a 28′ x 40′ structure with a gabled roof. It was built of corrugated aluminum over shiplap siding. Both had large sliding doors (Midwest Plan 1949: 13, 14).

Combination Granary-Self-feeders. Some portable single-pen granaries were designed to also serve as self-feeders for beef cattle, hogs, and other livestock. In 1949, for example, the Midwest Plan Service was offering plans for a 16′ x 16′ granary-self-feeder with a 1,500 bushel capacity. It had a gabled roof and "coffin"-style stud walls that tapered inward at the base. The walls were sheathed with a layer of drop siding over a layer of shiplap siding. Openings at the base of the walls dispensed grain such as shelled corn to the livestock (Midwest Plan 1949: 16).

Grain Bunkers. Grain bunkers – large three-sided structures used to contain and store grain – were in use by 1960. Bunker walls were usually 6′ to 8′ tall and needed to be well-braced. Walls of braced plywood, treated timbers, poured concrete, and prefabricated concrete were used. The grain was usually covered with a tarp (Neubauer and Walker 1961: 210).

ELEVATING EQUIPMENT

Granaries were filled and emptied by hand until the development of mechanical equipment that could elevate crops. If a mechanical lift (also called a "leg") was permanently installed in the granary, the

building was sometimes called an elevator. (The presence of this built-in equipment was sometimes the only difference between a "granary" and an "elevator.")

In most farm elevators, a wagon deposited the grain into a pit within the driveway. A drag or conveyor carried the grain to an upright elevator, which lifted it to the top of the granary. The rooftop monitor allowed the equipment to raise the grain high enough that it could be deposited into one of several interior bins or cribs. The farmer usually directed the chute to the correct bin using a wheel at ground level.

Portable elevating equipment, which could be wheeled up to granaries or grain bins, appeared on the market around 1904 (Kaiser 1953: 36). They were used on average Minnesota farms beginning in the 1920s. The machines were first powered by horses and later by tractors and gasoline motors. As portable equipment became more affordable, buildings with permanent lifts were built less often except on very large farms.

GRAIN-DRYING EQUIPMENT AND STRUCTURES

There was little mechanical grain drying on Minnesota farms before World War II and the use of the combine harvester. "The nearest approach to it was perhaps the practice of hanging in the attic those ears of corn selected for next year's seed" (Hukill 1957: 526).

Simple mechanical ventilators consisted of fans that blew air over and through the grain to speed drying. Dryers could also be run periodically to maintain storage conditions. Mechanical ventilators could be added to existing bins and cribs by, for example, adding a second, perforated floor above an original metal bin floor and using the space between the floors as the chamber into which the air was blown (Barre and Sammet 1950: 330-331).

Supplemental heat was often added to mechanical ventilation to dry the grain more quickly. One engineer explained:

> Grain drying on the farm before World War II was limited to a relatively few isolated installations. . . . [It] was following the war that grain drying equipment began to be readily available. Soon after the war manufacturers began making and selling driers which usually consisted of heaters and fans combined into single drying units with suitable controls. . . . At the same time, buildings and materials manufacturers have developed drying buildings, duct systems and various combinations for 'package' [marketing] distribution. About 1951 the Crop Dryer Manufacturers Association was formed (Hukill 1957: 526).

He added, "The only thing that stands in the way of [crop drying's] more universal use is the cost" (Hukill 1957: 527).

The use of artificial ventilators and dryers increased when farmers began using machinery that shelled corn in the field in the 1950s. The shelled corn was stored in grain bins rather than in corncribs and, because it was wetter than ear corn, it usually required mechanical drying before storage.

By the late 1950s, two methods of grain drying were being used on Minnesota farms: fast drying with heated air and slow drying with unheated air. Slow drying systems forced air through grain layers about 10' deep. The grain-drying structure was usually a modified storage bin with a raised, perforated floor, or a system of ducts on the floor for distributing air. Slow drying usually took several days to several weeks per batch. That generally made it impractical to use the same drying structure for repeated batches. Some farmers supplemented slow drying with an intermediate system in which air was heated 5 to 15 degrees above the outside air temperature. This speeded up drying slightly and ensured that drying continued even in humid conditions (Hukill 1957: 526-527).

Fast drying systems forced heated air through shallow layers of grain. Drying typically took from a few hours to a few days. Regular grain storage bins could be used for fast drying if the depth of grain was no more than 3'. However, special drying structures were more common. These came in a variety of forms, but all were easy to empty and refill. One type of drying structure held grain in two parallel, vertical layers from 6" to 18" thick. Heated air was forced into the space between the two layers and moved horizontally through the grain, passing through screens or perforated metal walls. This structure often included an overhead hopper that fed undried grain into the bin. This type of structure could be used for either batch or continuous-flow drying. In a continuous-flow set-up, there was often a portion of the drying bin where grain was cooled with unheated air before being discharged. A variation of this type of drying structure was the diamond-shaped bin with sloping grain compartments. Another type of drying bin was a rectangular box-like compartment with inverted "V" ducts, open at the bottom, that extended across the bin at several levels. Half the ducts supplied heated air and half vented the exhaust (Hukill 1957: 526-527).

Farmers in the 1950s also used wagon-bed dryers for fast drying. A layer of grain was spread on a wagon bed with a perforated floor and the drying air was forced upward through the bed. Some farmers had several drying wagons, and moved the mechanical dryer from one to another. Some wagon-bed dryers had movable beds, so that grain could be dried in a continuous-flow operation (Hukill 1957: 526-527).

PREVALENCE

Granaries were widely built on farms across Minnesota. Because they were often strong and well-built, it is likely that many are still standing, possibly converted to storage and other uses. Large, elaborate elevators were less commonly built and extant examples are probably uncommon. Small lightweight portable granaries and those built of materials such as plywood may not have survived. Early examples of prefabricated steel grain bins are likely to be extant.

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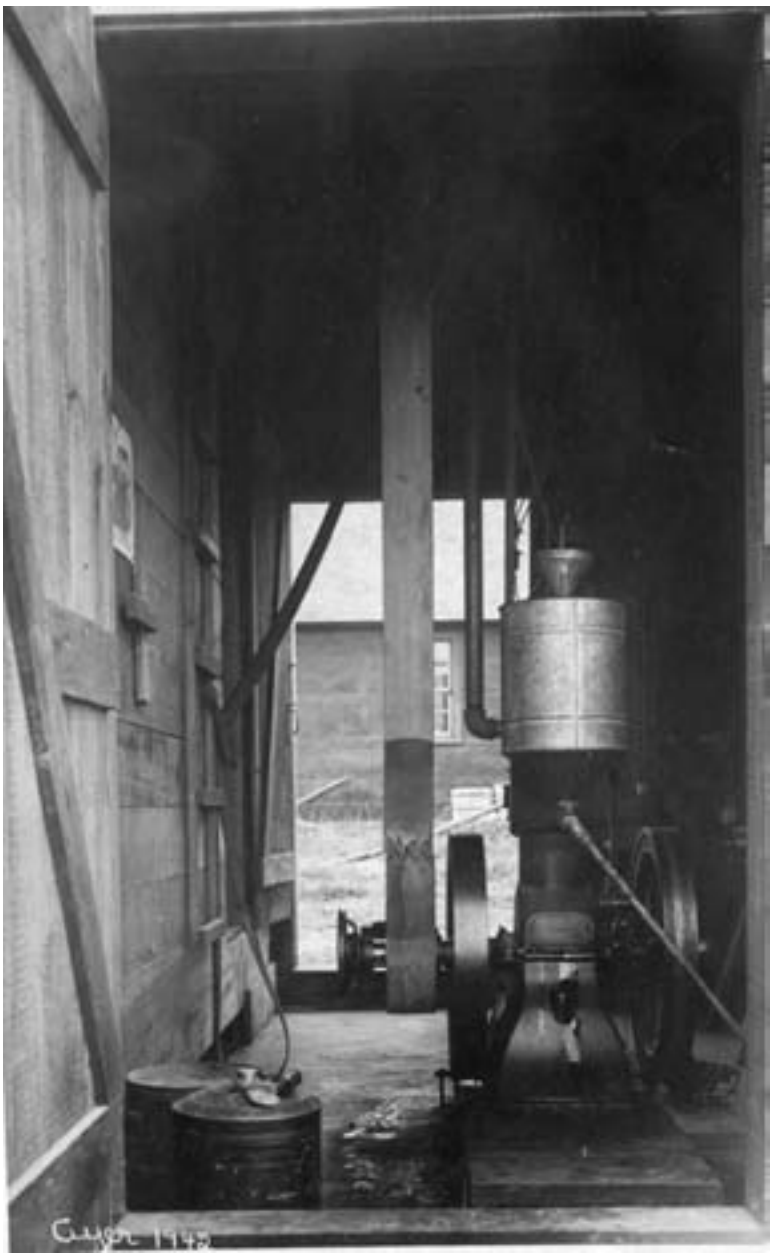
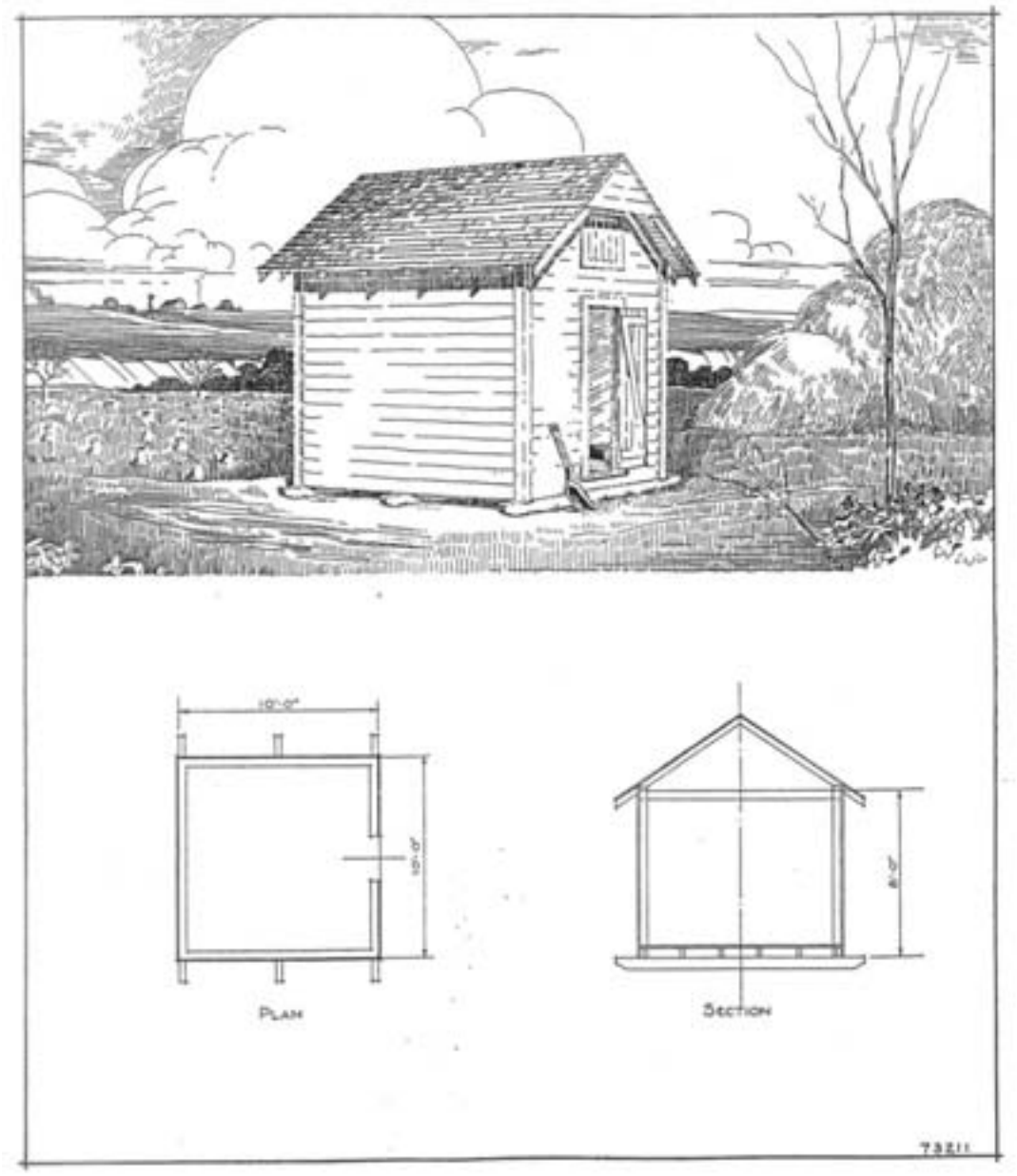


Farm granaries were built to taller heights once elevating equipment became available. The engine for this lift or "leg" was gasoline-powered. Location unknown, circa 1910. (MHS photo by Harry Darius Ayer)

Built circa 1885, this farm elevator had woodframe construction, clapboard siding, a scale for weighing, and elevating equipment that filled at least seven overhead bins. The elevator was also used for machinery storage. Twente Farm, Brown County, 1979. (MHS photo by Gimmestad)

Elevator on the Jean Duluth Farm, near Duluth, circa 1910. (MHS photo by Harry Darius Ayer)



A simple 10′ x 10′ portable granary on skids. It was built with braced wood studs and clapboard siding. From Midwest Plan Service's 1933 catalog of plans.

A metal grain bin located near the edge of a field, rather than within the farmstead. It has two hinged, oval hatch doors – a small door on the roof for filling and a larger door near the base for unloading. Framnas Township, Stevens County, 2004. (Gemini Research photo)

Portable elevators or conveyors became available around 1904 and were widely used throughout Minnesota. Granaries were filled through hatches located in the roof or upper walls. This granary probably has two bins. Fillmore County, 2001. (Gemini Research photo)

▪ GREENHOUSES, HOTBEDS, COLDFRAMES

- Built on Minnesota farms as early as the 1890s
- Used for starting vegetables in late winter or early spring

Hotbeds and coldframes – both a form of greenhouse – were apparently built on Minnesota farms as early as the 1890s. They were used to extend the growing season by starting vegetable crops early "for either home or market" (Mackintosh 1896). For example, plants could be started in a hotbed, whose heat was usually generated by composting manure, and then moved to a coldframe, heated only by the sun, to be hardened off, and then planted into a field or garden (Moore et al 1920: 213-215).

In 1896 the *Minnesota Farmers' Institutes Annual* published a plan for a hotbed greenhouse for Minnesota farmers. A hotbed (like the published plan) could be viewed at the University of Minnesota's farm in St. Paul. The hotbed depicted was a small 12' x 24' building that could be constructed of log, planks, or stone, and could be expanded at either end. It had a gabled roof whose ridge ran north and south. Both the roof and the southern gable end were glazed to allow sunlight to penetrate. The structure was built into a hillside and entered via a narrow door on the southern end. Inside was a narrow central path flanked by two boxed planting beds. The beds were filled with a 30"-deep mixture of horse manure and leaves or straw, topped by 5" of soil, which brought the upper surface of the beds about waist-high. Plants or seeds could be set out in the hotbed about February first, but shutters or other coverings had to be placed over the glass during the cold nights.

Such structures were still in use several decades later: University of Minnesota plans for farmers from 1953 included a low, 6' x 6' coldframe or hotbed. To be used as a coldframe, the structure was simply set on the ground. It could be used as a hotbed by placing it over 22" of buried manure topped by 5" of straw, and then packing additional straw around the outer walls. An electric soil bed heater could also be used *(Farm Building Plans* 1953).

While most greenhouses were framed with wood, by 1960 some farmers were using steel and aluminum frames because of their light weight and durability.

PREVALENCE

On-farm greenhouses and similar structures were likely built on farms near large metropolitan areas where fresh vegetables were sold to urban residents, and built on specialty farms that grew for the floral and nursery industry. Many of these farms have been lost to suburban growth, and it is possible that pre-1960 examples of such structures may be rare.

See also
Gardens (Vegetable)
Roadside Markets
Orchards

SOURCES

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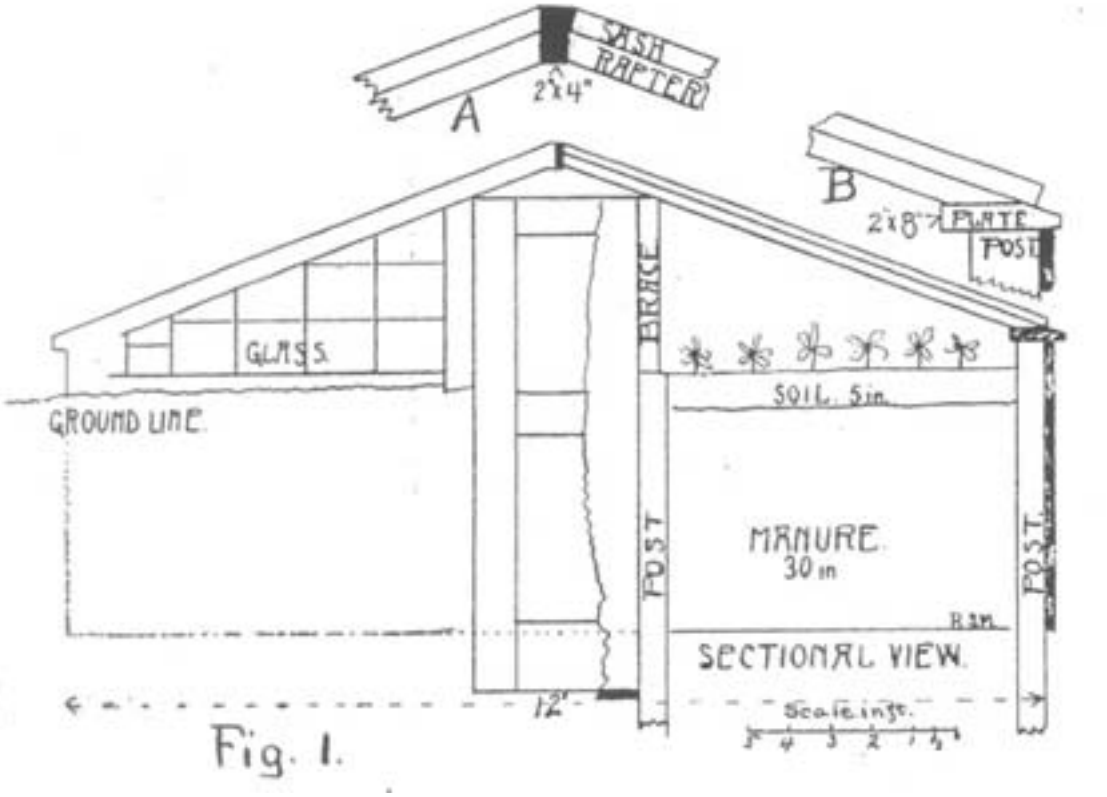

Plans for this hotbed were published for Minnesota farmers in 1896, and a demonstration model was built at the University of Minnesota. The 30" of composting manure under the 5" layer of soil provided enough heat to enable seeds and plants to be started as early as February 1st. From Mackintosh's "Hot Bed Greenhouse" (1896).

A hotbed being planted. The framework was set over several feet of manure and straw that generated heat as it decomposed. Note the window sash on top, which was typical for both hotbeds and coldframes. (Coldframes were similar to hotbeds but without the heat.) Location unknown, ca. 1910. (MHS photo by Harry Darius Ayer)