

Hay

Cutting, curing, and baling plants for livestock feed

Hay sits at the intersection of growing crops and raising livestock. It's both a cash crop and a dense, highly nutritious food essential for cattle, horses, and sheep in winter.

Hay is any vegetation from which the stem tops, leaves, flowers, and seeds are cut, dried (cured), and baled for livestock feed. It can be wheat, oats, barley, or pea plants, but most Montana hay is a mix of alfalfa (a relative of wild clover) and wheatgrass.

Hay, which is pale green when baled, is different from straw, which is mostly used for animal bedding. Golden tan straw, the cut-and-baled stems of harvested grain, has little nutritional value, though it is sometimes mixed with hay or silage to add fiber to cattle or horse feed.

Montana is among the top five hay-producing states in the country, and hay is second only to wheat as a revenue-generating



Above: Running across round bales on a ranch near Fort Belknap, Blaine County.

PHOTO BY TODD KLASSY

Left: Red Angus eating hay in winter.

SHUTTERSTOCK

The process of harvesting, baling, and stacking is known as “putting up” hay. The term comes from when all hay was literally “put up” with pitchforks and later beaverslides onto tall stacks that kept the hay relatively dry due to the small surface area exposed to rain and snow.

crop. The state's second-biggest moneymaker after wheat is livestock, which rely on hay.

Ranchers tend to grow their own hay and keep it for their cattle. Excess is sold to other Montana ranchers or those in other states where hay crops have been damaged by drought or flooding. Some years, Montana sells more hay than it buys, and in drought years when alfalfa harvest is low, it buys more than it sells.

Alfalfa is a perennial that produces well for about six years before it needs to be reseeded. Each summer alfalfa is usually harvested once or twice—known as a second cutting—or, if warm and dry weather allows, a third time.

Alfalfa is a thirsty plant, requiring more water per acre than any other crop in Montana and consuming roughly 40 percent of the irrigated water in the state. It's often grown in valleys next to rivers and streams that have flows diverted or pumped for irrigation.

IRRIGATION

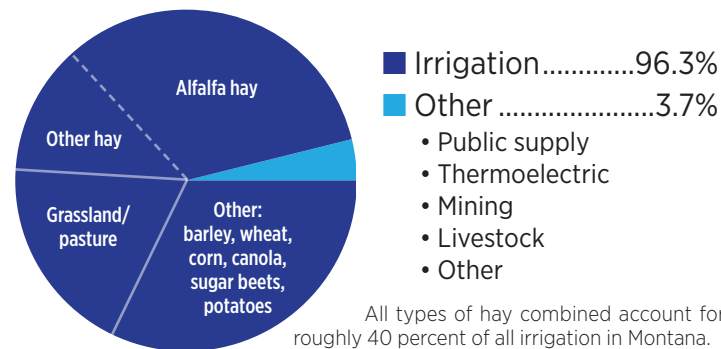
Irrigation is an ancient watering method developed by the Navajo in the southwestern United States one thousand years ago, and by Mesopotamians thousands of years before that. Montana pioneers began irrigating as soon as they arrived, often digging ditches by hand from nearby streams and rivers to funnel water to small plots.

To encourage farming in the arid West, the federal government built reservoirs, like Fort Peck, installed diversion dams on major rivers, such as the Yellowstone, and funded irrigation projects. Farmers then established



Round hay bales during harvest season in the Big Hole Valley near Wisdom.

Total Water Withdrawals in Montana



All types of hay combined account for roughly 40 percent of all irrigation in Montana. SOURCE: USGS



complex systems of ditches and canals, with pumps, headgates, and diversions that direct water from rivers and reservoirs onto fields.

What's known as "flood irrigation" uses gravity to move water through a web of canals and ditches out onto crop fields. Some standing water evaporates, but most seeps into the soil, where it hydrates plant roots before percolating down and recharging the aquifer and nearby streams.

Flood irrigation requires a lot of manual labor to open and close ditch gates and diversion dams, but it's otherwise relatively inexpensive.

"Sprinkler irrigation" sprays water over the top of crops much like rainfall. One of the most common irrigation devices is a center-pivot sprinkler, with aluminum tubes on metal frames that revolve around a central pump and engine. The frames circle the field as sprinklers spray water. A single tube can be as long as half a mile, dispersing hundreds of gallons per minute, typically from a well. Pivots can be operated from a smartphone miles away.

Low-pressure (drip) sprinklers are a recent variation of pivots that use flexible tubing to deliver water directly to the plants instead of shooting it into the air, where much can evaporate before reaching the crops.

Wheel line sprinklers may be seen on

Pivot irrigators spray water onto plants like rain as the sprinklers wheel around a central pump and engine. Traditional flood irrigation, on the other hand, floods fields with water that soaks down to the roots and then the aquifer.



Center-pivot irrigation allows Montana hay farmers to grow alfalfa in regions that historically were far too dry for the water-hungry crop.

smaller hay farms irrigating alfalfa. Wheel lines consist of large metal wheels, powered by an engine in the middle, that slowly move a lateral pipe with sprinkler heads spaced 30 to 40 feet apart in a straight line across a field.

Over the past 50 years, increasing numbers of farmers have replaced flood irrigation systems with center-pivots or started using pivots on newly farmed land. The shift is based on the accepted wisdom that pivots make more efficient use of water, leading to greater crop yields and better water conservation.

But in recent years, scientists have found that some pivot systems end up conserving less water than previously believed. The complex reasons are spelled out in a 2020 Montana Water Center report (montanawatercenter.org/irrigation-efficiency-landing-page).

Scientists at the center have also found that reduced flood irrigation may result in less underground aquifer recharge, which is needed to help maintain stream flows during late summer.

Because water is so precious in dry

Montana, most irrigation is managed by irrigation districts or public or private ditch companies. Employees called ditch riders monitor water use to ensure everyone is using their legally allotted amount. Disputes are resolved through district courts.

CUTTING AND BALING

For thousands of years in Europe and the Middle East, hay was cut by hand using a

curved blade called a scythe or sickle, then gathered and "put up" in tall piles to dry.

Modern mechanized haying starts with a swather (windrower) that cuts the alfalfa or grass. A large rotating reel pulls the plant into oscillating blades like those on a hedge trimmer that sever the stems. The crop falls onto a conveyor, which feeds it out in a row behind the machine. Long lines of cut alfalfa are called "windrows" because they resemble the rows of uprooted aquatic plants that form along windswept lakeshores in summer.

In wet conditions, windrows are raked and flipped using a rake attachment on the tractor, to allow the bottom layers to dry (cure) for a few days before a baler machine picks up the cut alfalfa and compresses it into compact bales.

There are two main baler types, both pulled behind a tractor. A square baler gathers the cut crop and compacts it into rectangular-shaped bales, wrapped with two or three strands of knotted baling twine. Small bales, known as "squares," weigh 45 to 70 pounds, light enough for a strong person to carry. Squares are usually produced on smaller hay fields and are mainly sold to



The Haymakers, by Julien Dupré, 1892, depicts the traditional method of gathering and loading cut hay before mechanization.



Traditional beaver-slide hay stackers are still used in some areas. Left: Horses pull ropes attached to pulleys that pull the hay-laden rack. Right: a finished haystack. See a beaverslide in action at:



Clockwise from above left: A swather (windrower) cuts hay with a rotating wheel that pulls the plants into a cutter that resembles a long hedge trimmer; to dry hay in wet conditions, a hay rake fluffs and flips the long rows left behind the swather; a round baler rolls the cut crop into rounds that weigh up to a ton; bales are then loaded with hydraulic lifts onto truck trailers or stored in stacks. Bottom: a standard 60-pound hay bale produced by a square baler.



Water rights

As far back as the late 1800s, demand for water by farmers, ranchers, miners, municipalities, and others began outstripping supply. Most western states responded by adopting a legal framework for water rights, called the Prior Appropriation Doctrine, commonly summarized as “first in time, first in right.” This means water users with the oldest claims have the first (senior) priority for water.

Let’s say there are two different ranches along a stream. The one by the mouth has a senior 1890 water right, and the one farther upstream has a junior 1910 water right. If, during a summer when water levels are low and the downstream ranch is not getting enough water to meet its needs, the owner can insist the upstream rancher stop irrigating.

Another element of prior appropriation is “use it or lose it.” This means water rights holders must put water to a “beneficial use” or risk losing the rights altogether. This was originally meant to prevent senior water rights holders from allowing their water to “uselessly”—the thinking at the time—flow down into rivers while neighbors with junior rights who needed the water received none.

For decades, Montana law only recognized “consumptive” uses, such as irrigation, as a beneficial water use. Not until 1973 did the state recognize the “non-consumptive” use of instream flow for trout habitat. That allowed conservation-minded landowners to lease some of their water to FWP, Trout Unlimited, and other groups so that young trout in spawning tributaries have enough water to survive the summer.



Work crews place steel rebar over wooden forms to create a diversion dam on the Yellowstone River, 1934.

Hay sculptures

A rural fall tradition in Montana’s hay country is for students, especially those belonging to 4-H or FFA, to make sculptures from bales and rounds. The biggest concentration is along the 21-mile Montana Bale Trail from Hobson to Utica to Windham, part of the yearly What the Hay contest. Students vie for top prizes in the sculpture competition, with entrants from all over Montana and even other states. The sculptures must be made mostly of hay or straw and titled with an appropriate pun, such as “Wild Bale Hickok,” “Will-Hay Nelson,” or “Wizard of Strawz.”



horse owners with only a few head of horses or to hobby farmers. Large rectangle bales weigh around 1,000 pounds and may be seen stacked on semi-trailers for transport.

A round baler rolls cut alfalfa inside the machine and wraps it with twine or netting to hold its shape. In winter, rounds are trucked onto rangeland and unrolled, providing hungry cattle with a long carpet of cured grass or alfalfa.

The advantages of round bales are they take less labor to move around and their shape sheds snow and rain better than flat-topped bales. The disadvantage is weight, up to a ton, and the need for special hydraulic arms to lift them onto truck beds for transport.

A few hay producers still use the beaver-

slide hay stacker, invented in Montana’s Beaverhead region in the early 1900s. Loose hay is loaded onto a 30-foot-tall lodgepole pine rack. Then, using ropes and pulleys powered by horses or a tractor, the load is pulled up and over another lodgepole pine rack and dropped into a wooden bin. When the bin is full, the frames are removed, revealing a two-story-high haystack. Hay stacked like this is less likely to



rot because there is relatively little surface area on which water and snow can collect. Beaver-slides are still used in the Big Hole, Beaverhead, and Little Blackfoot valleys, and a few other areas.

Because deer and elk also like eating hay, particularly in winter, ranchers surround their stacks, bales, and rounds with wood or wire fences. For landowners who provide public hunting, FWP crews may install temporary plastic fencing to protect hay from deer and elk.

Most hay is used or sold within a year or two. Hay exposed to outdoor weathering can lose its nutritional value and become moldy. One reason Montana is such a successful hay state is that its dry climate keeps hay bales in good condition. 🐾