Commodity Spotlight

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The U.S. Hay Market: Higher Prices In 1996/97

Hay is one of the most widely produced U.S. crops. It is harvested in every state, and at about 60 million acres, trails only corn and wheat in harvested area. The farm value of U.S. hay output is typically $10-$12 billion annually, compared with $20-25 billion for corn, the leading U.S. crop.

Almost all hay in the U.S. is fed to ruminants—cud-chewing animals which have four-part stomachs capable of efficiently digesting roughage feeds—or to horses. Cattle, sheep, and goats are the primary ruminants raised in the U.S. for meat and milk. Diets for poultry and hogs consist mainly of feed grain and oilseed products, generally excluding hay because the simple stomachs of these animals cannot readily digest it.

While hay demand for horses and mules has declined significantly since the 1940's and 1950's when tractors became the principal source of power to pull farm implements, horses remain popular for pleasure riding, racing, and ranching. Significant niche markets have developed to serve horse owners, and large dairy producers willing to pay top dollar for high-quality hay.

The U.S. exports about 1 percent of its overall hay production (including meal and cubes). High-quality alfalfa produced in California and other western states is compressed and shipped to Japan. Small amounts of hay are also shipped to Canada and Mexico from the border states when local marketing opportunities arise.

Alfalfa is the major type of hay harvested in the U.S., accounting for about 62 percent of crop value, 55 percent of output, and 41 percent of acreage. It generally has a higher nutrient content, yields higher tonnage, especially in the irrigated areas of the western U.S., and sells for a higher price than other types of hay. The Northern Plains, Lake States, Mountain, and Pacific regions are major alfalfa producing areas.

Other types of hay include small-grain (about 7 percent of U.S. hay acreage), other tame hays (40 percent), and wild hays (12 percent). Small-grain hay (e.g., wheat or oats) is found largely in the northern and western U.S. Other tame hays (e.g., clovers, lespedeza, timothy, bromegrass, and Sudan grass) predominate in the South. Wild hay is found in all states.

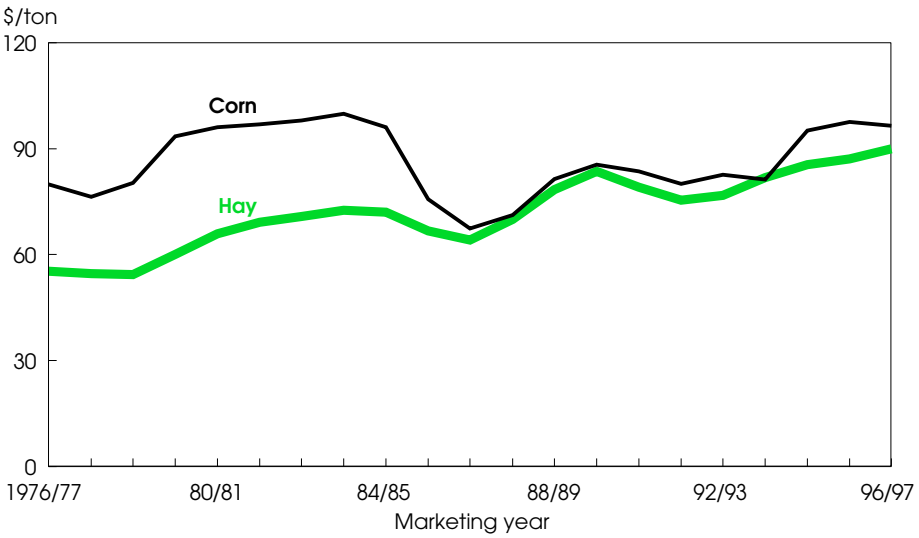
Hay Production Lower in 1996

The average U.S. hay price is expected to hit a record in 1996/97—around $90 per ton, up from $85 in 1995/96—due mostly to a lower hay supply as well as higher grain prices earlier in the season. Hay production is forecast at 152 million tons in 1996, down 2 percent from last year. With beginning stocks on May 1 nearly the same as last year, the smaller crop leaves the total hay supply down at least as much as output.

Higher-than-normal hay feeding in late spring and early summer—due to drought in the Southern and Central Plains and the southwestern U.S.—most likely reduced the total supply even more. Dry conditions in these areas had reduced grazing opportunities.

A regional production shift is also boosting the price expectations. Western states account for a larger share of the U.S. crop in 1996 than a year earlier, and a larger share of western hay output is alfalfa,

Hay and Corn Prices Tend to Move in Tandem



Season-average farm prices, 3-year moving average (e.g., 1976/77 is the average of 1975/76-1977/78). 1996/97 forecast for the season. Season begins in September for corn and in May for hay.

Economic Research Service, USDA

The Types of Hay

Alfalfa is a perennial legume (i.e., converts atmospheric nitrogen to a plant-usable form) that is used for hay, haylage (cut green and stored before curing is complete), or green chop (fed immediately to livestock). Alfalfa can also be used for soil improvement and soil conservation. In areas where it is well adapted, alfalfa has the highest yield potential of any perennial forage legume. Alfalfa has limited use as pasture because it does not withstand grazing well. In addition, livestock can become ill if they overindulge on young alfalfa plants, due to buildup of stomach gas.

Red clover is a short-lived perennial that is adapted to wetter and lower pH soils than alfalfa. It is easy to establish, and yields well during the first year or two. It is well suited for use as the forage legume in short rotations with corn. The tendency for its thick stems to dry slowly has been a deterrent to its widespread use.

Growers of ***alfalfa-grass mixtures*** consider the grass crop in the mixture when scheduling harvests. Orchardgrass, perennial ryegrass, reed canarygrass, and tall fescue can tolerate numerous cuttings without jeopardizing the stand and are compatible with frequently cut alfalfa. Timothy and smooth bromegrass cannot tolerate frequent cutting, and stands of alfalfa mixed with these grasses cannot be cut as often as pure alfalfa.

Small grains (i.e., oats, barley, and wheat) may be planted with the intention of harvesting as hay, or a farmer may decide after planting to harvest the small grains as hay. Drought may reduce the plant's value as grain, or a shortage of other forage may make the grain crop more valuable as forage than as grain. Small-grain hay tends to be fed to beef cattle where high-protein content is less important than for dairy cattle.

Orchardgrass is a perennial, cool-season, tall-growing, bunch-type grass. It establishes rapidly from seed and is suitable for pasture, silage, or hay. It is especially well adapted for mixtures with alfalfa or red clover and withstands frequent cutting better than other cool-season grasses. Orchardgrass is found throughout much of the northern U.S., where it can be grown in dryland areas with at least 20 inches of precipitation or with irrigation.

Smooth bromegrass is a leafy, perennial grass used for hay and early-spring pasture in the north central U.S. A deep-rooted, cool-season grass, smooth bromegrass requires relatively heavy applications of fertilizer for good yields. The forage quality of smooth bromegrass compares well with other cool-season grasses, depending primarily on the stage of maturity.

Tall fescue is a deep-rooted, long-lived grass that spreads by short underground stems called rhizomes. One of the most drought-tolerant forage grasses, it is also tolerant of poor drainage, alkalinity, and salinity. It is the only cool-season grass that can persist in many parts of the South. Tall fescue is widely used as pasture and hay for beef cattle and sheep in the southern and east central U.S. It is grazed by animals during April through early June, and again in the fall.

Timothy is a perennial, shallow-rooted, cool-season grass that is well adapted to the Northeast and upper Midwest. Its shallow root system, however, makes it poorly adapted to drought-prone soils. Consequently, timothy is most widely grown in areas with moist, cool environments. Timothy is the hay of choice for horse owners and can also serve as a horse pasture.

Bermuda grass is a major warm-season, sod-forming grass used for pasture, hay, lawns, general-purpose turf, and erosion control. It is best adapted to relatively fertile soil in humid southern states, but is found as far north as Maryland and the southern part of the Corn Belt.

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which is higher priced than other hay. In addition, western alfalfa is generally higher in quality and brings a higher price than eastern and midwestern alfalfa.

This year's lower hay production, a result of reduced yields in several states, reflects generally unfavorable growing and harvesting conditions. In the northern half of the U.S., wet weather kept producers from harvesting the first cutting on time, reportedly reducing hay quality. Second- and third-cutting alfalfa output and quality were curtailed by dry conditions and insects.

In the southern U.S., particularly Texas, dry weather sharply reduced early-season hay yields. But ample precipitation in August and September improved rangeland prospects and led to additional alfalfa hay cuttings. On balance, hay output is forecast to increase in Texas as greater acreage offsets lower yields. Favorable weather and greater harvested area has contributed to increased output in several states, particularly Kansas and California.

Strong grain and soybean prices in 1996 have also supported the price of hay. The U.S. harvested larger corn and soybean crops this fall, but low beginning stocks slowed the rise in 1996/97 grain and soybean supplies. Feed grain and soybean prices have declined from early summer's eye-popping highs, but remain strong compared with levels of just 2 years ago. Consequently, hay prices could remain relatively robust well into 1997.

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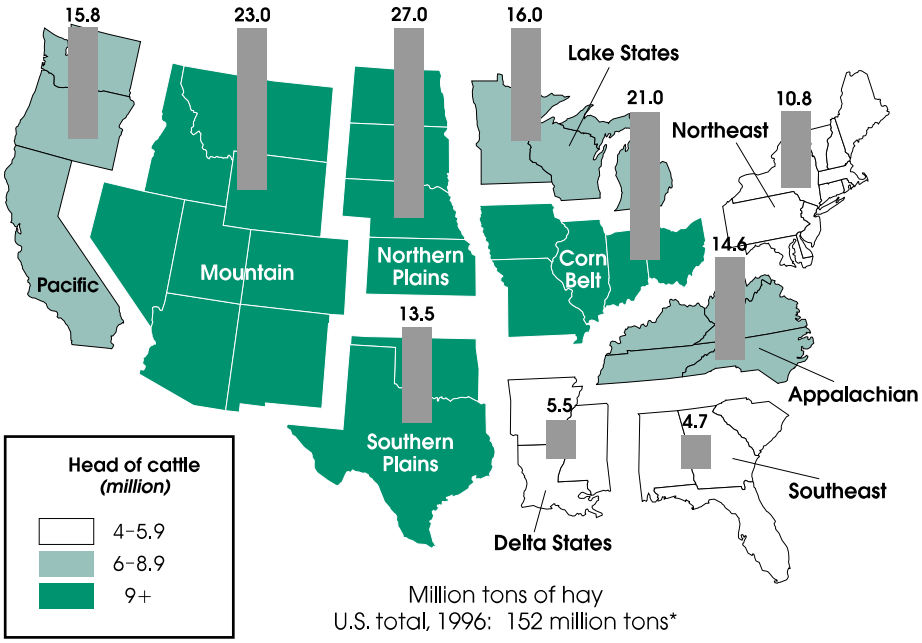
Hay Output Is Concentrated in Regions with Larger Numbers of Cattle



*Forecast.

Economic Research Service, USDA

Declining beef and dairy cow numbers are moderating demand for hay and limiting price increases. Unfavorable forage conditions and low feeder cattle prices in the spring encouraged heavier-than-normal beef cow slaughter this year.

A Component of the Feed & Forage Supply

Hay is a significant component of the U.S. feed and forage supply. The price and availability of hay, along with its feed value relative to other feed sources, determine when and to what extent hay is used in feed rations.

As an important part of the diet for ruminants, hay provides fiber necessary to effectively digest nutrients in the hay and companion feeds. Like other feeds, hay is also a source of energy, protein, minerals, and vitamins. A balanced ration of these elements enhances animal performance (e.g., increases meat or milk output or improves cow/calf productivity). Because feed accounts for 50-60 percent of the total cash expenses for milk production, for example, fine tuning feed rations to cut costs and boost output directly affects producer profits.

Dietary requirements vary by animal category (e.g., beef vs. dairy cows) and stage of development (calf vs. feeder steer). For example, beef cattle can use low-quality hay with less loss of output, whereas it markedly reduces milk output in the dairy sector and boosts the need for supplemental feeds (e.g., soybean meal and corn gluten feed).

Feed grains and their products and *oilseed meals* are major feeds for hog and poultry operations. Finishing feedlots for cattle tend to use high-quality hay for roughage and nutrient value, supplemented with concentrate feeds. Annual average corn and hay prices, while not moving in lockstep, tend to move together, indicating a degree of substitution between these two major feeds. In addition, hay and corn production tend to rise and fall together, which causes prices to move in tandem.

Pastures and rangelands provide year-round forage for most cow/calf operations. Much of U.S. grazing land is either acreage that is temporarily removed from crop production, or land that remains in grass because it is too poor in quality or too fragile for crop production. When snow cover makes foraging difficult or if the cattle have consumed most of the existing vegetation, feeding of hay becomes necessary.

Corn and sorghum (cane) silage provides roughage and nutrients for cow/calf operations and for feedlots where cattle are fed for marketing. (Silage is produced from nearly-mature corn and cane sorghum that is chopped and stored in an oxygen-free environment for fermentation, which preserves the feed). Although silage is normally fed during the winter and spring following harvest, it can be stored for several years. Hay feeding may supplement silage feeding, or even replace it when silage supplies run low.

Another feed source is fall and winter *grazing of grain fields*. Livestock can graze corn or sorghum (grain and stubble) left behind by harvesting equipment. Also, new growth on fields of winter wheat can support cattle grazing before and during plant dormancy. Grazing winter wheat, if properly managed, may actually improve yield potential. (The wheat crop is harvested the following spring and summer.)

Some farmers convert *small-grain straw* (e.g., wheat and oat straw, removed from the field following the grain harvest) into livestock feed. Bales of straw are stacked in a large pile, which is then encased with heavy plastic. Anhydrous ammonia (a gas consisting of nitrogen and hydrogen—a widely used fertilizer) is injected into the enclosed stack. The straw absorbs the gas, boosting the protein content of the straw. This procedure is particularly viable when hay prices are strong, as in 1996. (A similar technique is used for increasing the protein content of silage, adding urea, another nitrogen-hydrogen compound.)

High Transport Costs Limit Shipping Radius

Hay is bulky. Its weight per unit of volume is only about one-tenth that of grain, which results in relatively high transportation costs. The cost of truck transport, for example, can run about 8 cents per ton-mile for hay, compared with only 5 cents for grain. Consequently, hay is usually marketed and fed in the area

where it is produced, and cattle inventories are relatively close to major feed supplies, especially hay.

In fact, about 70 percent of hay output is consumed on farms where it is grown—livestock producers tend to grow their own hay. But that portion has declined from 80 percent in the late 1970's. The trend toward purchasing rather than raising hay for on-farm use reflects the long-run trend toward larger livestock operations in the U.S., especially in the Southwest. The fast-growing dairy industry in that region (particularly California) relies heavily on purchased hay.

Cattle operations often purchase hay on the cash market to supplement their own production. In addition, hay, especially alfalfa, has become a major cash crop, especially for farmers who are primarily crop producers. An added advantage of growing alfalfa is improved soil productivity for crops planted in subsequent years.

Hay is marketed through a number of different channels. A common avenue is farmer-to-farmer sales. In some parts of the country (e.g., Pennsylvania), hay is sold through auctions, sometimes in conjunction with livestock auctions. In the irrigated production areas of the West, some hay is sold through marketing associations. Hay is also sold through dealers and brokers, and some large dairies and hay dealers contract directly with producers to supply hay.

Premium-quality hay, unlike most hay, may be shipped long distances. For example, Colorado's "mountain meadow" hay (native grasses grown at a high altitude) is a preferred horse feed and is shipped to as far away as Florida. Premium alfalfa from Utah and other mountain states is shipped throughout the U.S. and exported to Pacific Rim countries, especially Japan.

Differences in prices of hay across the country—due largely to shifts in surplus and deficit areas—provide incentives for hay trade between regions. But large price spreads are necessary to overcome high transportation costs and provide the incentive to ship from surplus to deficit regions.

Handling After Harvest

The timing of harvest involves tradeoffs between forage yield, quality, and stand longevity. As plants mature, yield increases, but protein content of the hay declines, and the amount of fiber that is not readily digestible increases. Cutting alfalfa in the pre-bud stage results in the highest quality hay, but yields are low and it depletes the plant's carbohydrate root reserves and weakens the stand. Cutting alfalfa when about one-tenth of the plants are blooming generally results in high-quality hay and leaves adequate root reserves for regrowth.

Once hay has been cut and has dried sufficiently (1-3 days, depending on moisture conditions), it is compressed into bales. Rectangular bales are usually removed from the field and stored for later use, usually in a shed or barn. Large round bales are often stored outdoors—they tend to shed water, limiting spoilage. Bales stored outdoors are sometimes covered or completely wrapped in plastic.

Over the years, handling hay has been extremely labor-intensive. Many baling machines produce small, rectangular bales, which are typically hand stacked onto wagons for transport to a storage site. The shape of the bale allows for maximum usage of storage space. But because each bale is carried and positioned by hand, considerable labor is required to store the bales (and to retrieve them for feeding). To reduce labor requirements, some farmers and hay handlers use specially adapted tractor loaders in conjunction with attachments to balers that group the bales.

Beginning in the 1980's, balers that made large round bales (about 5 feet in diameter and 5 feet wide) became popular, and dramatically lowered the cost of handling hay. The bales are moved with tractor loaders or other attachments on tractors or pickups. Small square bales remain popular on small farms and for producing high-quality alfalfa and horse hay that is shipped long distances. Square bales (including large ones, measuring about 4 by 4 by 6 feet) incur lower transport costs compared with round bales, which do not stack as densely.

Instead of being fed directly, alfalfa hay is sometimes processed into pellets, whereby higher quality hay can be blended with lower quality hay. Mills often guarantee a minimum protein level in their pellets.

Rain on curing hay reduces quality and yield. Farmers can reduce these losses by ensiling hay. Some dairy operators with their own hay production, for example, lessen the chances of rain damage by harvesting the first cutting as "haylage" (produced like silage) or green chop (fed immediately after harvesting).

Typically the forage is cut and wilted for a time before being stored. The wilting time for haylage is substantially shorter than the curing time needed for hay. Depending on weather conditions, alfalfa haylage may require 1 day or less between cutting and removal from the field, while hay may require a 3-day period. This shorter exposure for haylage lowers the risk of rain damage relative to the risk associated with making hay.

Hay yields—and hence prices—are especially sensitive to weather conditions in the dryland areas, as demonstrated this year in the Southern Plains. For example, the price of good-quality alfalfa in mid-August was $130 per ton in Texas, compared with $112 in Oklahoma, $85 in northern Kansas, and $52 in western Nebraska. With more alfalfa produced in the Central Plains than in the Southern Plains, this is a typical regional price relationship. But regional production shortfalls this summer led to higher-than-normal prices in Texas and Oklahoma.

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To some extent, limited market information reduces market efficiency. Farmers in one part of the country (or even within the same region) may not know of a market opportunity to buy or sell hay. To address this problem, temporary phone hotlines for prospective hay buyers and sellers are often set up in states with acute hay needs. Also, information on hay prices and market conditions in most producing states is available from USDA's Agricultural Marketing Service. Several electronic hay exchanges have cropped up on the Internet, which serve as clearinghouses, albeit small at present, for those interested in trading hay.

Hay Prices to Remain Firm into 1997

Reduced hay supplies are expected to keep hay prices firm into 1997. Assuming normal weather this winter, stocks will likely be down at the beginning of next season. A harsh winter, with extended periods of snow cover, would increase demand for hay and further reduce stocks from a year earlier, while a mild winter would allow increased grazing and relieve upward pressure on hay prices.

In years such as 1996 when subpar weather affects hay production in several parts of the country, high prices in hay deficit regions may lead to more interstate trade than in other years. But because of relatively high transportation costs, hay production will continue to be quite extensive across the U.S., and located relatively close to where livestock is fed. *[Dennis A. Shields (202) 219-0649 and Allen Baker (202) 219-0360; dshields-@econ.ag.gov; albaker@econ.ag.gov]* AO