

AGR-45  
 THE EFFECTS OF WEATHER ON HAY PRODUCTION  
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 J. K. Evans  
 Department of Agronomy

Even a slight amount of rain on curing hay can cause serious losses of feed quality. The losses occur because much of the nutrition in the plant is water soluble and can be removed by leaching. Studies have shown that rainfall of only 0.05 inch on hay which is partially cured is sufficient to cause leaching losses. Increasing amounts of rain cause greater losses by leaching and also by knocking off the leaves, which contain much of the protein in legume hay. The Agricultural Research Service has produced some data from experiments in Maryland which show what the magnitude of these losses can be for alfalfa. The results are shown in Table 1.

**Table 1. Effect of rain on cured hay**

<b>Crop Description</b>	<b>% leaves retained</b>	<b>% protein retained</b>	<b>% total digestible nutrients</b>	<b>% decline in milk production</b>
Standing Crop	100	100	100	0
Field Cured, no rain	62	72	59	6.7
Field Cured, rain <sup>1</sup>	38	55	52	13.6

<sup>1</sup>Rainfall amounts up to one inch.

Throughout the hay-harvesting season, rain in Kentucky is usually caused by either the passage of a front or by daytime convective showers. In the first case, a cool front will move through the state and be accompanied by a band of showers and thundershowers. This may occur at intervals of 3 to 4 days, or more than a week may pass without the passage of a front. Fronts are usually followed by clearing, cooler weather. High pressure centers which move across the country behind the fronts generally bring sunny skies, low humidity, and several days of good drying weather. The passage of a cold front, then, is a signal to the farmer that he can go ahead and cut hay. Some signs which indicate the frontal passage are: a shift of the wind to the west, clearing skies, lowering humidity, and a rapidly rising barometer. While high pressure centers move progressively across the country much like cold fronts, they will sometimes become stationary for several days and bring persistent fair weather. These times are usually extended dry periods with ample sunshine, light winds and low humidity. This is the ideal opportunity to cut hay.

Often in the summer months high pressure centers will become stationary along the southeastern coast of the U.S., and this causes a rather unsettled weather pattern in Kentucky. Southerly winds on the west side of the high pressure center will bring moisture from the Gulf of Mexico up into the Mississippi and Ohio Valleys. When the moist air is heated during the day it rises until clouds form and finally develop into showers. These are generally small showers which last less than an hour but can bring a

half-inch or more rain to a farm. This particular weather pattern can continue for several days. Some farms may not receive any rain, but anyone who cuts hay is taking a risk that one of the showers may move across his field. The weather forecast which is issued each day includes a "probability of precipitation," which is an estimate of that risk of getting a hay crop wet.

Since we cannot expect long periods of dry weather here in Kentucky, it's necessary to find a suitable period to harvest hay and store it in the least time possible. This means reducing the drying time to shorten the exposure to possible rain damage. The time required to dry a crop from its initial moisture content down to about 15% moisture is determined by a number of factors, such as plant species, density of the crop, soil moisture, and the way the crop is handled. For any given situation, a combination of weather factors can cause the necessary drying time to vary from a day to over a week of rain-free weather.

Studies of the weather factors which are related to the drying rate show the most important ones should be considered in this order:

#### Sunshine

The sun provides the energy required to evaporate water from the plants. During June and July, when days are long, we have about 15 hours of sunlight between sunrise and sunset. In October, when the last cutting is made, the hours of sunlight are reduced to about 10 1/2. The lower angle of the sun during autumn also reduces the amount of available sunshine. When selecting a field to be used for hay, it is worth remembering that slopes facing south receive more of the sun's energy, and their drying should be faster.

#### Humidity

The air which is moving across the top of the drying hay crop must be able to absorb the water which is evaporating and mix it with the rest of the atmosphere. In this regard, air behaves much like a sponge or a mop. Sunny, warm days have the effect of lowering the relative humidity of the air and thereby increasing its ability to absorb water while also increasing the rate at which water is driven from the plants.

#### Wind Speed

Since most drying takes place during the daylight hours, wind speed is an important factor during that time. Air next to the crop surface would soon become saturated under calm conditions and be unable to absorb additional water, so a certain amount of wind is necessary to replace it with drier air. Brisk winds and fluffy, porous windrows are distinct aids in increasing drying.

#### Dews

Heavy dews may also delay drying time. Normally, heavy dews occur on clear nights when the earth, cooling, radiates its heat back to the sky. As the surface temperature drops to the dew point, water vapor in the air is deposited on the leaves and stems of the hay. At sunrise, the energy which would otherwise be used to dry the hay must be used to first evaporate the dew. Related to the moisture content of the soil, heavier dews usually occur for several days after a good soaking rain, then decrease in intensity as dryness continues.

#### Moist Soil

A rain just before cutting may slow the drying rate by keeping the bottom part of the windrow moist even though skies are sunny and the humidity has lowered. Little can be done about this condition since cutting during fair weather right after a period of rain is an ideal strategy. However, an anticipation of slower drying and an additional turning or two may prevent this condition from becoming a serious factor.

An early, heavy crop which is less porous in the windrow will take longer to dry since it is difficult for the air to move through it. Also, early heavy crops usually have a higher initial moisture content and more water must be removed from them than from later, more mature cuttings, which may have a higher fiber content.

The rate of drying depends on the time of the year. Allow more days during the fall. The following table shows the average daily evaporation for each month:

<b>Month</b>	<b>Average Evaporation (inches/day)</b>
May	0.20
June	0.22
July	0.25
August	0.21
September	0.15
October	0.12

The use of hay conditioners to crush the stems of the plants as they are cut has been a very effective method of reducing the period of time the crop is on the ground and exposed to damage from rain. In some cases the time has been reduced to as much as half that of conventionally-mowed hay under identical weather conditions. Conventionally-mowed grass or alfalfa of average density and moisture content will require about the same amount of time to cure as it would take to evaporate about an inch of water from an open- metal watering trough. Conditioned hay has required only about as much time as would be needed to evaporate a half-inch of water from that same trough.

#### Haymaking Weather Tips

- Be Weather wise. Listen closely to the extended weather outlook and the daily hay cutting advisory in addition to the forecast.
- Try to cut your hay just after a cold front passes in order to have the longest period of dry weather for the crop to cure.
- Use a hay conditioner, if one is available, to help speed up the drying rate and reduce the time the hay is left on the ground.
- Put the hay into a porous, fluffy windrow so the air can move through it easily.
- If you turn a hay swath, do so when there is still dew on it in order to reduce the number of leaves lost by shattering. Try to avoid touching it during the middle of the day when the leaves are brittle and easily knocked off.

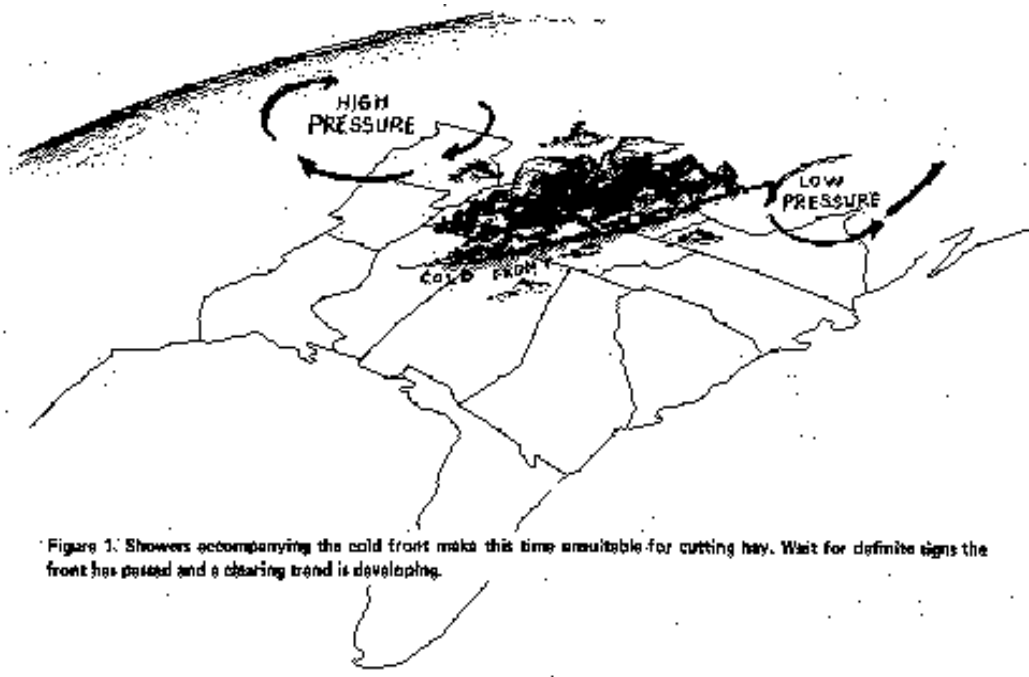


Figure 1: Showers accompanying the cold front make this time unsuitable for cutting hay. Wait for definite signs the front has passed and a clearing trend is developing.

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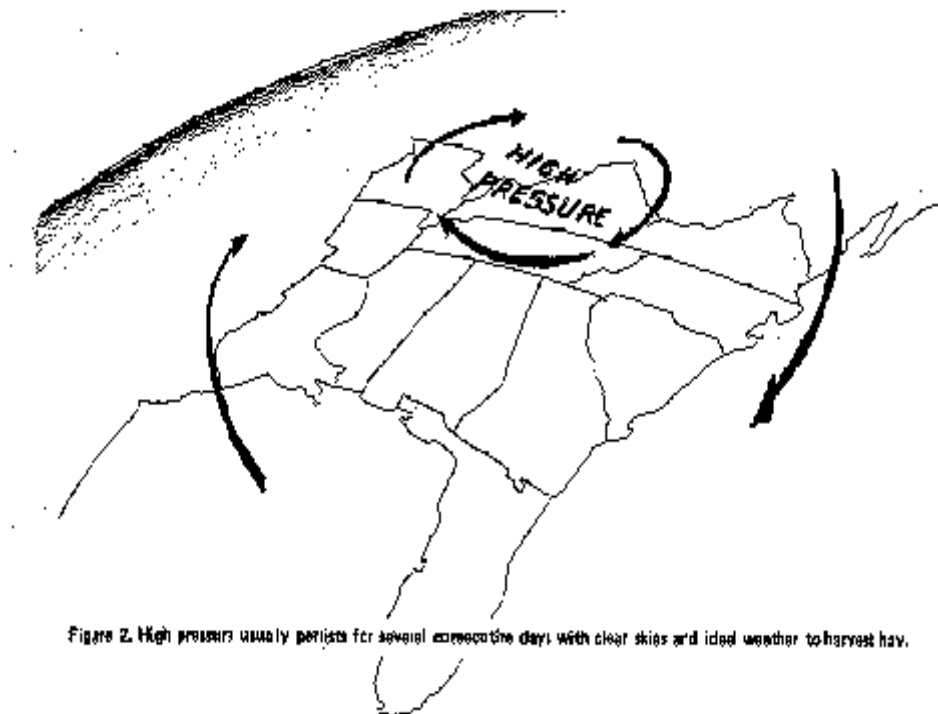
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**Figure 2.**

High pressure usually persists for several consecutive days with clear skies and ideal weather to harvest hay.

**Figure 3.**



High pressure along the Atlantic Coast brings humid air from the Gulf Region into Kentucky. Listen to the latest forecast and probability of precipitation to determine the risk of showers developing.

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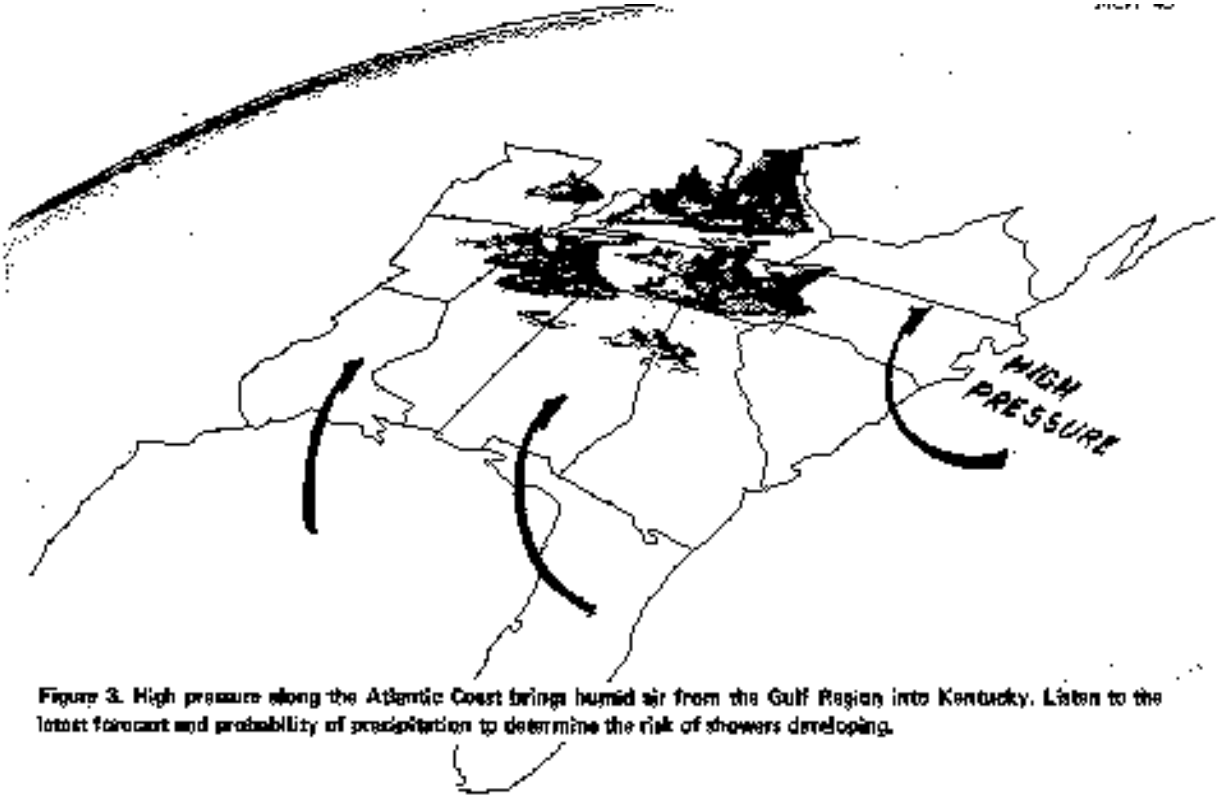


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