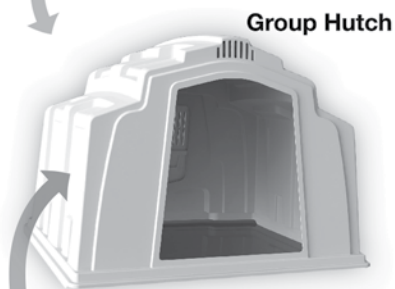




by Ev Thomas and Bill Mahanna

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## Growing degree days can also predict alfalfa harvest

**M**ANY farmers harvest alfalfa at the bud stage because it is assumed that this will result in the best combination of quality and quantity. Another approach, known as the PEAQ (Predictive Equations for Alfalfa Quality) method, combines alfalfa height and stage of development to predict the "on the stem" neutral detergent fiber (NDF) content of first-cutting alfalfa.

A third method that has gained popularity in recent years uses growing degree days (GDD) to determine the ideal time of first harvest. GDD are calculated by averaging the daily maximum and minimum temperatures and then subtracting a base temperature; this results in the GDD for that day.

### Modeled after corn

For corn we use a base temperature of 50°F to calculate GDD, but for alfalfa we use 41°F because plant scientists have determined that 41°F is the temperature at which alfalfa begins to grow. For example, if the daily high is 70°F and the low is 42°F,  $70 + 42 = 112 \div 2$  brings us to an average temperature of 56°F. Subtract 41 from this average to get 15 GDD for that day. One method of GDD calculation begins recording GDD after the average temperature exceeds 41°F for five consecutive days, while another system uses a fixed starting date such as March 1. The starting date varies depending on location.

For first-cut alfalfa, continue adding daily GDD until the total approaches 700, by which time the alfalfa should be in the bud stage. At 680 to 700 GDD the alfalfa should be between 38 percent and 40 percent NDF, though varietal differences and growing season effects can cause NDF to vary.

And 700 GDD isn't when you should start thinking about mowing: Alfalfa loses leaves during harvest, and when ensiled the fermentation process results in the loss of plant sugars. "On the stem" alfalfa with 38 percent NDF may wind up as 45 percent NDF alfalfa silage after harvest and fermentation are complete. Therefore, have equipment and labor ready and start harvesting at 700 GDD or slightly less.

For dry hay harvest there won't be as much sugar lost since the crop doesn't ferment, but plant sugars and leaves will be lost during the drying, raking and baling process. Some agronomists recommend waiting until about 750 GDD for alfalfa that's baled or ensiled in upright silos, but for top quality consider mowing at no more than 700 GDD.

There are pluses and minuses to the

GDD method: A plus is that the alfalfa doesn't need to be sampled, eliminating the possibility of sampling error. However, one GDD equation may not work across all environments.

A Cornell University study using temperature and alfalfa quality data from a wide range of environments found that the NDF predicted by the GDD method varied from the actual NDF (via forage analysis) by over six percentage points, which most farmers would consider unacceptable. Alfalfa with 40 percent NDF would feed much differently than alfalfa with 46 percent NDF. If you doubt this, ask your dairy nutritionist!

You should have at least 10 years of temperature data when using GDD to predict the harvest date for first-cut alfalfa. We'd suggest that you consult with extension specialists to gauge the reliability of the GDD system for your area.

Using GDD for second and subsequent alfalfa harvests isn't as reliable as for first-cut. One reason is that low soil moisture conditions during the summer result in the accumulation of GDD during a time when there may be little growth of the alfalfa. The GDD system also isn't recommended for alfalfa-grass, especially if there's a significant amount of grass in the stand. First-cut alfalfa-grass stands should be harvested before those with straight alfalfa, beginning in the fields with the highest proportion of grass.

### What about the fall?

The GDD system is also used to time the fall harvest of alfalfa. Quebec agronomists found that if there were at least 900 base 41°F GDD following the final harvest, the alfalfa would accumulate enough carbohydrates before a killing frost (25°F) to result in good winter survival.

The problem with this is that because you're relying on long-term averages you don't know how many GDD you'll actually get between the final harvest and a killing frost. And you can't use weather station data unless it's close enough to your farm to be reliable. Changes in elevation and proximity to large water bodies can make a big difference in both GDD accumulations and the date of the first killing frost.

This method is very conservative, and in much of the northern U.S. using it would result in a fall rest period of at least seven weeks before a killing frost. This would in many cases prevent a fall harvest, even where university research and farmer experience have shown otherwise. The Quebec research also found that if no more than 360 GDD accumulates following a fall harvest, there won't be enough regrowth to deplete the stored carbohydrates in the roots.

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