Establishing Alfalfa: Part 1

Old Stands Bleed Dollars

Grower beware: Rising production costs increase the importance of evaluating that old alfalfa stand.

by ***Ed Haag***

Editor's Note: *This is the first installment of a three-part series exploring when and how to establish a new stand of alfalfa.*

With hay production costs rising — fuel alone has doubled since 2001 — it has become a necessity to know that what you are harvesting justifies the costs of cutting and baling. Accordingly, knowing exactly how long to keep an alfalfa stand in production is essential to any bottom line.

"If you are working with less than an optimum stand, you are going to have significantly higher production costs," says Dan Undersander, University of Wisconsin (UW) professor of agronomy. This translates directly into fewer dollars in the grower's pocket.

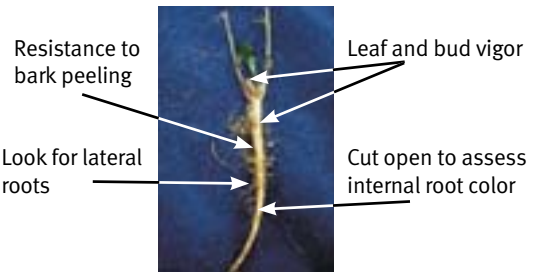
"Fixed costs are more than 50% of the cost of growing a crop of alfalfa," he says, "which means the additional cost for higher yields is minimal and greatly reduces the cost per ton."

Undersander says that, in general, the highest possible yields are the most profitable yields to the farmer. "It is proven that you can harvest twice as much hay for only 10% more fuel," he says. "The key issue is to be in the high-yield range."

He cites as an example a field that produces 6 tons per acre. "With that kind of tonnage, you are looking at a cost of $60 to produce a ton of alfalfa," Undersander says. "Drop that down to 4 tons to the acre, and your production costs jump up to $87 a ton."

The need to maintain optimum production is so critical to the bottom line that in some situations, it is more cost-effective to purchase alfalfa than to harvest it out of a low-yielding field.

Fig. 1: An alfalfa plant



Alfalfa grass mix not exempt

If you think this issue only applies to pure alfalfa stands, think again. The circumstances might be slightly different with stands that have an alfalfa-grass mix, but the final outcome is the same. When alfalfa density decreases, unless one intervenes with fertilizer applications, the overall yield will drop and production costs on a per-ton basis will rise.

The added wrinkle in dealing with the mix is that the nitrogen-fixing ability of the alfalfa contributes to the quality and volume of the grass hay.

"If you have more than 30% grass in the mix, then you have too little alfalfa to fix enough nitrogen (N) to optimize your yield," Undersander says. "You will have to fertilize to make up the difference."

Rotation crops also affected

Steve Norberg, Oregon State University (OSU) field crops and watershed management Extension agent, sees more at stake than just the loss of hay yield when an alfalfa stand is kept in longer than is economically justified. In most locations, a rotation crop, such as corn, is recommended before alfalfa is replanted.

"We always recommend rotation before reseeding alfalfa because of the plant's allopathic or autotoxic properties," he says, adding that mature plants actually create a microenvironment that inhibits alfalfa seed germination.

By rotating into corn for at least one season before reseeding into alfalfa, the autotoxic properties resident in the soil have time to dissipate. "These autotoxins are water-soluble," Norberg says. "Given a year, they will wash away."

Rotating into corn or another nonlegume also allows the grower to take advantage of the nitrogen deposited by the bacteria growing on the roots of the alfalfa. This can mean a substantial savings in fertilizer.

Norberg notes that when an alfalfa stand begins to thin, the population of nitrogen-fixing bacteria drops. The reduction in nitrogen production from one year to the next can be dramatic. In the second year you might have 150 pounds (lb.). As time goes by, it might drop to 60 lb.

Growers who are accustomed to spending next to nothing on nitrogen for their corn find themselves facing considerably higher fertilizer bills because of the decision to leave their mature alfalfa field in production one to two years longer than they should.

More reasons to check

Besides the obvious universal reasons not to leave an alfalfa stand too long, there are other reasons that only apply in specific regions.

For example, in northern California, where ground squirrels have proven to be a major problem for alfalfa growers, researchers have found that the longer an alfalfa field remains undisturbed, the more likely it is to be affected by rodent populations.

In states like Minnesota and Wisconsin, where quack grass and other grassy weeds are a problem in forage, mature stands of alfalfa that are experiencing major thinning can be more vulnerable to the opportunistic invaders than younger, more densely populated stands.

Undersander notes that until recently the question of maintaining a stand for any length of time was not an issue in states like Minnesota and Wisconsin. The winter hardiness of varieties grown in the Midwest and Northeast a decade ago was so poor that winterkill dictated replacement before other factors came into play.

"For a long time we had trouble keeping stands in for over three years," he says, adding that this has all changed with the release of new winter-hardy varieties. "With the new varieties, it is now feasible to keep stands in for four to six years," he says.

Evaluating a stand

Growers with tight schedules and tighter budgets are now tempted, after a terse perusal, to declare a mature stand of alfalfa "good enough" to remain in production another year.

But, those proclamations might return to haunt them when they start to calculate the profits they might have seen by taking the field out of production.

For Undersander, it makes more sense to thoroughly evaluate a field before determining its fate. To him, passing judgment on stand viability is not just a matter of a quick look in the spring or fall. Nor is it just a matter of comparing historical yield records with current ones. Instead, he and other forage experts say a wide variety of variables, ranging from stand density to plant health, should have a bearing on whether a field remains in production for one more year, or if it is taken out and reseeded.

Stem density critical

Probably the single most important factor determining viability is stem density. It is a simple fact: the more stems per square foot, the higher the yield potential (see Fig. 2). In a UW study comparing stem density with plant density, stem density proved to be the best indicator of yield potential.

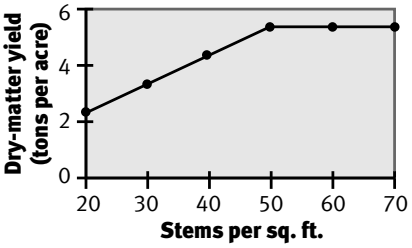
Undersander notes that real yields can be affected by other variables, such as moisture availability, as well as disease and pest pressures. This is true for both new and old stands.

To count stems, Undersander recommends building a 2-foot (ft.) square of ½-inch (in.) PVC pipe, 17 in. × 17 in. A wire ring with a 19-in. diameter will also suffice.

A grower should use the device to take four representative samples from each field. Researchers have found that the process works best in stands 6- to 8-in. tall.

When counting stems, count only those that represent a harvestable plant — 2 in. or taller. Once a total is reached, divide the number by 2 to get your final per-square-foot stem count.

Fig. 2: Alfalfa stem count and yield potential



UW research indicates that in stands with stem counts of 55 stems per square foot or higher, plant density is not limiting yield (see Table 1). Unless there are some serious questions about the overall health of the stand, it should remain in production.

With a stem count of 40-54, a grower should expect some yield loss directly related to plant density. Plant health will be the deciding factor in whether or not a stand is replaced.

If the stem density is 39 stems or less, a grower should seriously consider replacement.

Table 1: Stem counts, per square foot

Stems per sq. ft.	% maximum yield
55 or more	100%
40-54	75%-92%
< 40	stands too weak to keep

Table 2: Minimum number of healthy plants per square foot for a desirable alfalfa stand

New seeding	20+ plants per sq. ft.
Year 1	12-20 plants per sq. ft.
Year 2	8-12 plants per sq. ft.
Year 3 or older	5 plants per sq. ft.

Plant health a factor

While a stem count estimates *current* yield potential, a root and crown health evaluation estimates *future* yield potential. Unhealthy plants are more vulnerable to pests, diseases and winterkill.

A grower can evaluate the health of his stand by digging plants from four representative locations. Samples should include the top 6 in. of the root. After examining the crowns for size, symmetry and number of shoots, cut the plant lengthwise and examine (see Fig. 1).

UW researchers have broken plant health into four categories based on the presence of discoloration/rot in the stem and root. Category 1 has no discoloration or rot. Category 2 has some discoloration or rot. Category 3 has significant discoloration or rot, and in Category 4 more than 50% of the root and stem has discoloration or rot.

Followup studies concluded that healthy stands had less than 30% of their plants in Categories 3 and 4, while unhealthy stands had more than 30% of their plants in Category 4.

Undersander notes that markets should also play a role in deciding whether or not to replace a field in a particular year. He points out that it is more cost-effective for those who use their own hay to take a field out of production when alfalfa is plentiful and the replacement cost for those lost years is minimal. The other advantage in taking out an alfalfa stand while alfalfa is plentiful applies to the increase in yield one receives when a nonlegume annual is planted directly after alfalfa.

"Corn yields about 10% more following alfalfa than it does wheat [or] any other nonlegume crop," Undersander says.

Alfalfa-grass evaluation

For Undersander, the key to producing optimum yields on an alfalfa and grass stand is maintaining the right balance between the two plants.

"Obviously, with 100% alfalfa you will get the highest yields, but you can add 20% to 30% grass without affecting it too much," he says, adding that once the balance moves closer to a 50-50 ratio, yields begin to decline more precipitously.

He notes that probably the easiest way to evaluate the percentage of each plant is to remove a sample from a bale and separate the alfalfa from the grass.

"You can get a fairly good idea on the percentages from looking at the two piles," Undersander says.

In addition to looking at the percentages in the mix, an on-site inspection of the stand should be made periodically. Areas of concern would be weedy patches — which he believes should be torn out and reseeded — and bare patches with diameters of 6 in. or greater.

Once it's gone

Until recently, most alfalfa experts warned there was little that could be done to restore the density of a mature stand once the population started to decline. Because of the autotoxicity, drilling alfalfa seed directly into a mature stand didn't work. Research has shown that after about a year, plants were mature enough to be producing enough autotoxins to inhibit seed germination.

But there were unexplained exceptions, especially in heavily irrigated areas, where direct reseeding into mature stands did work. Both Norberg and Undersander now believe water from extensive irrigation dilutes and washes away the water-soluble autotoxins, allowing the newly sewn alfalfa seed to germinate.

"We have seen the same results in relation to rainfall," Undersander says. "If there was a lot of rainfall, there was less autotoxicity."