



## Answering the Alfalfa Rotation Quandary

When working with alfalfa growers, it is not uncommon to be asked how long an alfalfa field should stay in production. Alfalfa producers have a variety of expectations for stand life, with most of them thinking a stand should last anywhere from 4-6 years or more. However, growers also recognize some fields become less productive after just a few years. This difference between expectations for long stand life and high productivity leads to the all too frequent alfalfa rotation quandary.

Whether you are growing alfalfa as a high protein, forage source for dairy animals or harvesting alfalfa for commercial hay sales, profitability depends on keeping your alfalfa yields high. Rotation choices may be different on every operation, but similar questions must be answered to make an intelligent rotation decision.

### Alfalfa Decline

Data from University forage studies show average forage yields of alfalfa peak during the second and third year of production (1<sup>st</sup> year is seeding year). Alfalfa yields decline each year due to a variety of factors including disease, insect pressure, nematodes, wheel traffic, soil compaction, winter injury, drought, saturated soils, and other environmental stresses.

Among plant diseases, alfalfa crown and root rots are primarily responsible for thinning stands. Crown rot is a complex of several fungi including *Rhizoctonia*, *Stagnospora*, *Colletotrichum*, and *Fusarium*. Key root rot organisms include *Phytophthora* and *Aphanomyces*. Often, winterkill is blamed for alfalfa plant death; however, several studies have shown high stand loss during the growing season due to crown and root rots.

Wheel traffic frequently damages alfalfa crowns and creates entry points for crown and root rotting organisms. In addition to plant diseases, excessive or untimely wheel traffic can result in compacted soils. Compacted soils have less oxygen resulting in restrictive root growth and poor soil nutrient uptake. Poor root growth or crown damage frequently leads to plant health issues, poor winter survival, and limits yield potential of alfalfa.

Early and frequent harvest of alfalfa is important for producing high quality forages for dairy animals or commercial hay production. However, when alfalfa is cut in the bud stage for each cutting, additional stress is placed on alfalfa plants due to limited recovery of carbohydrates in the crown and roots. This stress weakens alfalfa plants and sets the stage for stand decline due to disease and other factors.

### Rotation Advantages

Rotation of alfalfa into another crop has a number of advantages, no matter when it is done. These include the following:

- Availability of nitrogen (N) for subsequent grain crops from the N-producing nodules found on alfalfa roots. USDA research shows that corn grown in the year following a healthy stand of alfalfa usually does not respond to added N except on light-textured soils subject to N losses from leaching.
- Total farm forage production is increased when rotating from alfalfa into corn for silage or HM grain on a more frequent basis.
- Rotation helps disrupt the life-cycles of pests such as corn rootworm and weeds, protecting against crop yield losses while reducing crop-protection input expenses. Also, farms with alfalfa in their rotation have a lower incidence of herbicide resistant weeds.
- Corn yields are typically 10 to 15% higher following alfalfa versus corn after corn. This rotation effect is independent of additional N available from alfalfa.
- Alfalfa rotation can be used as a tool to help minimize the effects of erosion and excess N use on water quality. With an increasing public scrutiny of water quality, alfalfa may provide a means to help manage this important issue.

While many advantages exist for planting alfalfa as part of your farm rotation, at least one challenge to farm productivity exists. A deep-rooted legume like alfalfa can reduce the amount of subsoil moisture available for the following grain crop. When managed carefully, by using short alfalfa rotations, this concern is minimized.



*Alfalfa field showing signs of stand decline and weed invasion.*

## Decision Time

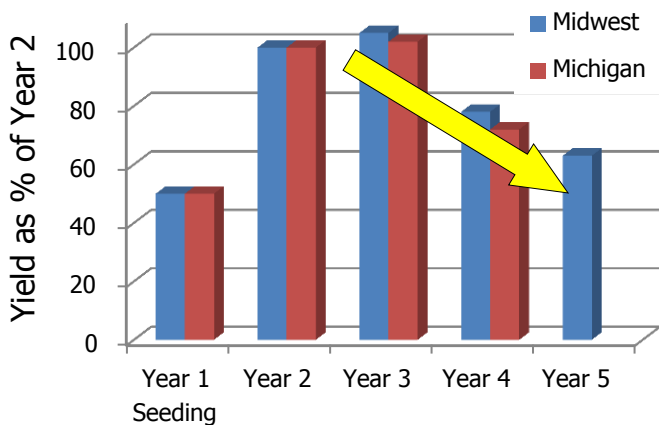
Making a decision to rotate out of alfalfa and into another crop hinges on a number of variables. The sidebar lists the most common factors to consider when deciding about rotation.

Several University Extension specialists have studied the costs and benefits of short alfalfa rotations versus keeping stands in place for longer periods of time.

Dr. Greg Roth at Penn State University, recommends short alfalfa rotations in situations where fertility is becoming limiting or for fields which have been intensively managed by early and frequent harvest schedules. He also suggests short alfalfa rotations in areas where corn rootworm pressure is high to help manage this pest in corn.

In a 2008 Univ. of Wisconsin study, Dr. Dan Undersander did an economic analysis showing greater profit per acre for an entire farm operation when using short alfalfa rotations.

Data from alfalfa forage trials show alfalfa yield declines on average 17% by year four and 34% by year five of an alfalfa stand (1<sup>st</sup> year is seeding year). At some point yields decline to a point where net losses occur. Determining alfalfa yield potential in the 3<sup>rd</sup> or 4<sup>th</sup> year of an alfalfa stand is a critical factor in making your rotation decision.



**Figure 1.** Alfalfa yield for five years in Michigan and the Midwest. (Dr. Phil Kaatz, 2011, Mich. State Univ.)

## Rotation Options

There are four options when faced with a marginal alfalfa stand and a rotation decision.

1. The first choice is to do nothing, keeping the marginal stand and harvesting what grows. This will likely mean low yields, high cost of harvest, and potential quality reduction due to grassy weeds.

2. A second option is to keep the stand through first harvest and then rotate into another short season annual crop. This could include early maturity corn for silage, soybeans, or other grass species. Planting corn or grasses will help capture the N benefit from the plowed down alfalfa stand.
3. A third option is to rotate out of alfalfa immediately in the spring and plant another crop like corn. Most studies show this choice helps maximize returns from these marginal alfalfa acres.
4. Finally, a grower may decide to enhance the productivity of a marginal alfalfa stand by overseeding with a grass species. This may help increase the forage yield of these acres for an additional year, but comes at an expense of generally lower quality forages.

Compelling economics may lead to some growers to decide to rotate, while others with limited rotation options may choose to extend stand-life by overseeding grasses to improve productivity.

Decision Factor	Don't Rotate	Maybe Rotate	Rotate Stand
Stand Age	1-2 years	3-4 years	4+ years
Alfalfa plant and stem count/ yield potential	>55 stems	40-55 stems	<40 stems
Plant health and vigor	Very Good	Average	Poor
On-farm inventory	Need Feed Soon	Limited	Very Good
Forage quality needs	Low-Mod Quality	Mod-High Quality	High Quality
Intensity of harvest schedule	Late Bud to Flower	Mid Bud	Early Bud
Severity of weeds	Low	Moderate	High
Chronic wheel traffic damage	Limited Damage	Moderate Damage	High Damage
Degree of soil compaction	Low	Moderate	High
Fertility status of field	Adequate to High	Moderate	Low
Irrigation or salinity concerns	No Concerns	Moderate Concerns	High Concerns

Circle the best choice for each factor. If the majority of your choices are in the **Maybe Rotate** or **Rotate** columns, then rotating out of this stand is probably your best, most profitable decision.

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