



## Obtaining High Alfalfa Yields

- While different alfalfa operations may place slightly different values on the outcomes of yield, quality, and stand longevity, yield is the factor which has the most influence on profitability.
- Several factors play a part in successful alfalfa stand establishment: field selection and fertility, alfalfa product selection, planting practices, and control of weeds, diseases, and insects.
- Alfalfa harvest management can have a tremendous influence on yield, quality, and stand persistence.

There are various outcomes that can help measure the success of an alfalfa forage operation. Each alfalfa producer may place slightly different values on the outcomes of yield, quality, and stand longevity. However, yield is the factor which has the most influence on profitability. Whether an operation is harvesting three tons per acre or six, the costs of land, machinery, and most other things stay the same. Therefore, the ability to produce more per acre can have a major influence on the bottom line.

### Alfalfa Stand Establishment

Proper establishment of an alfalfa stand helps achieve the healthy, dense growth necessary to make alfalfa profitable. Several factors play a part in successful alfalfa stand establishment: field selection and fertility, alfalfa product selection, planting practices, and control of weeds, diseases, and insects.

Alfalfa is best suited to a well-drained soil with adequate water-holding capacity. Alfalfa roots can penetrate over 20 feet deep and can provide good drought tolerance.<sup>1</sup> An ideal location for alfalfa establishment should also be free of perennial weeds and herbicide carryover and be free of autotoxic compounds produced by a previous alfalfa crop. Alfalfa plants have a unique characteristic known as autotoxicity; they produce toxins that impair the development of new seedling root systems, thus limiting their uptake ability and increasing their susceptibility to other stresses. If alfalfa is to be planted into a field previously inhabited by alfalfa, a wait period should be observed to provide time for the toxins to move out of the root zone. It is



**Figure 1. Harvested alfalfa.**

recommended to grow a different crop for a year after terminating an alfalfa stand.<sup>1</sup>

Proper fertility is another important component of stand establishment and early growth. Balanced nutrition is required for high yield and quality, winterhardiness, and stand persistence. It is recommended to fertilize for high yield and not specifically for forage quality, as higher yield will help compensate for slight deduction in forage quality.<sup>2</sup> Soil testing should be done prior to seeding in order to determine fertility needs for each particular field.

The primary fertility concern for alfalfa yield and quality is liming. Liming to an appropriate soil pH of 6.5 to 6.9 helps to promote good plant growth and the Rhizobium bacterial function necessary for adequate nitrogen (N) fixation.<sup>1</sup> Because lime reacts very slowly to increase soil pH, it is best to apply it 12 or more months prior to seeding.

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Two other important fertility concerns are phosphorus (P) and potassium (K). For each ton of alfalfa harvested, around 14 pounds of phosphate ( $P_2O_5$ ) and 58 pounds of potash ( $K_2O$ ) are removed from the soil.<sup>1</sup> Phosphorus is needed to encourage root growth and, while K has little influence on stand establishment, it is essential to yield and stand survival. Both of these macronutrients should be tested for and applied prior to seeding. Phosphorus should be broadcast and incorporated prior to planting; however, additional P needed for established stands can be broadcast because the fine alfalfa roots near the surface can access it. Application timing and method for K is similar to that of P.

The majority of N in alfalfa is produced by the N-fixing Rhizobium bacteria in plant nodules. However, until N-fixing begins, alfalfa seedlings must rely on soil available N or a pre-plant application of 15 to 20 pounds per acre.<sup>3</sup> In order to ensure adequate N production by nodules, inoculation of alfalfa seed is beneficial regardless of whether or not the field has supported alfalfa in the past. If using preinoculated seed, make sure the seed was inoculated within the last six months.

Remember that both genetic and environmental factors influence yield and quality – selection should not be made based on one desirable trait alone. The purchase of alfalfa seed should be seen as a multi-year investment; therefore, the decision should involve some planning. Some of the primary things to consider when choosing which alfalfa product to use:

- Yield potential – consider high-yielding products from a similar soil type and climate. When evaluating yield data make sure it is over multiple years and not just one year.
- Persistence – in northern areas, this depends on winterhardiness and in southern areas, disease resistance.
- Winterhardiness – glyphosate-tolerant alfalfa products are available to help provide farmers with broad-spectrum weed control and application flexibility.
- Fall dormancy – determined by how tall alfalfa

grows in the month following a September 1 cutting. Choose less dormant alfalfa products that meet your winter survival requirement as these plants will green up earlier in the spring and recover more quickly between cuttings for higher season-long yields.<sup>1</sup>

- Disease resistance – determine the potential for specific diseases on your farm: bacterial wilt, leaf and stem diseases, and crown rots. Knowing what has been a problem in the past will help you choose appropriate alfalfa products. Product resistance is the most important disease control because there are few economical options available once a disease has been confirmed in a field.<sup>3</sup>
- Insect resistance – some products can provide resistance to some aphids.<sup>3</sup>
- Weed control – glyphosate-tolerant alfalfa products are available to help provide farmers with broad-spectrum weed control and application flexibility.

Prior to and at planting, some important decisions need to be made that can help influence the success of the alfalfa crop throughout successive seasons. In order to get the crop off to a good start, the seedbed should be free of perennial weeds, properly fertilized and prepared, and ready to plant during the ideal timeframe for the geography. Seed inoculation is recommended and should be completed prior to planting. Seed treatment to consider is metalaxyl which protects from Pythium and Phytophthora.<sup>3</sup> Alfalfa seedling diseases can be devastating and are more likely to be a problem in fields that have previously hosted alfalfa.

## Stand Maintenance for High Yields

In subsequent years following establishment, continued stand maintenance is necessary in order to maintain a desired level of production. Fertility, harvest management, and weed, disease, and insect pest management are all factors to consider. Of these, harvest management can have a tremendous influence on alfalfa yield, quality, and stand



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persistence. Harvest management involves planning for the number of cuts per season, date of cut, stage of maturity, interval between cuts, and cutting height. Because the stage of maturity is linked to yield, quality, and persistence, it is often used to determine when to harvest alfalfa.

Obtaining high yields requires cutting at late-maturity stages, whereas cutting early maximizes quality; however, focusing on just one or the other can reduce stand persistence and shorten the life of the stand. Some degree of balance is needed to preserve the stand and permit it to reach its potential. To maximize yield of high quality forage, the first two cuttings are critical as forage quality changes rapidly during this time period and delays can reduce the quality. For high yield and high quality, the first cutting should be taken at bud stage; generally mid- to late-May in northern areas and earlier farther south.<sup>1</sup> The second cutting should be taken 28 to 33 days after the first cut, or at mid-bud stage, whichever is earlier. After that, a subsequent cutting should take place 38 to 55 days later at 10 to 25% bloom.<sup>1</sup> Letting the stand mature a bit longer before the third cutting can build up root reserves and boost stand persistence. These later cuttings may help maintain forage quality to later maturity stages.

Alfalfa stands need a break from harvest during the six to eight weeks prior to the first killing frost in the fall. In northern areas, this timeframe is roughly the first of September through mid-October and later in more southern regions.<sup>1</sup> Having this rest period allows plants to build up adequate reserves of carbohydrates in the roots before winter begins. If plants are cut during this rest period, it will not only reduce the speed of regrowth the next season, but can reduce the yield of the first cutting. It can even cause the stand to thin. Waiting and making a final cutting after the first hard freeze (24 °F or lower) will not hurt alfalfa and may help reduce pest problems.<sup>4</sup> Minnesota researchers found that highest yields came from three cuttings during the growing season with a late-fall cutting.<sup>1</sup>

Often, farmers are tempted to harvest alfalfa during the rest period if significant growth has occurred, but

doing this would initiate regrowth and reduce root reserves during a critical time. If it became necessary to cut during the fall rest period, there are a few things to consider. The risk of stand damage is somewhat reduced under the following conditions: in areas with less severe winters,<sup>1</sup> if the stand is in bloom at the time of the fall cutting, it has been at least 45 days since the last harvest, and if the stand is old and at the end of its longevity.<sup>4</sup> Conditions where a harvest during the fall rest period are especially risky include: stands less than one year old, stressed fields, fields with inadequate fertility, and where the alfalfa product does not carry multi-pest resistance.<sup>4</sup> In general, it is better to cut an older stand as compared to a newer stand because an older stand has already had time to recover establishment costs. The decision to cut during the fall rest period is an individual one and should be made after careful consideration of the risk factors as compared with the need for additional forage.

## Summary

Producing alfalfa for high yields requires careful planning and implementation in both the establishment and management phases of production. When planning establishment of a new stand, consider field selection and fertility, alfalfa product selection, planting practices, and control of weeds, diseases, and insects. After the establishment year, continued maintenance of the stand can help achieve desired yield, quality, and persistence goals.

## Sources

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<sup>2</sup> Lissbrant, S., Berg, W. K., Volenc, J., Brouder, S., Joern, B., Cunningham, S., and Johnson, K. 2009. Phosphorus and Potassium Fertilization of Alfalfa. AY-331-W. Purdue Extension. [www.extension.purdue.edu](http://www.extension.purdue.edu)

<sup>3</sup> Alfalfa Production Handbook. 1998. Kansas State University Agricultural Experiment Station and Cooperative Extension Service. [www.bookstore.ksre.ksu.edu](http://www.bookstore.ksre.ksu.edu)

<sup>4</sup> Lacefield, G.D., Henning, J.C., Rasnake, M., and Collins, M. 1997. Alfalfa – The queen of forage crops. AGR-76. University of Kentucky Cooperative Extension Service. [www.ca.uky.edu](http://www.ca.uky.edu)

Websites verified 1/22/21.

## Legals

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Performance may vary, from location to location and from year to year, as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible and should consider the impacts of these conditions on the grower's fields.

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