Agricultural Extension Service
The University of Tennessee
SP434-C

Alfalfa
High-quality Forage Production

Gary Bates, Associate Professor, Plant and Soil Science

Alfalfa (scientific name *Medicago sativa*) is one of the most well known and widely used forage crops in the world. Its high yield and quality allow it to be used in feeding programs for many different types of livestock. In Tennessee, alfalfa is used primarily as a feed for horses and dairy cattle. Alfalfa could also potentially be used in beef cattle operations as a feed for animals with high nutrient requirements, such as lactating cows or backgrounded calves.

The versatility of alfalfa makes it useful in many operations. Whether it is used for hay, silage, grazing, green-chop or as a rotation crop, alfalfa is unrivaled in its ability to produce high yields of an exceptional quality forage. To produce this forage, a certain degree of management is required. It is important to pay attention to details before establishment, as well as throughout the life of the stand. Success with alfalfa depends on three steps:

A. Establish a good stand.
B. Maintain a good stand.
C. Harvest at the correct stage.

Establishing a Good Stand

One of the keys to being successful with alfalfa is to start with a strong, dense stand. A field with a good stand will produce high yields with reduced competition from weeds. Conversely, a weak stand will have excess weed

pressure, possibly reduced yields and almost certainly a reduced stand life. To improve chances of having a strong stand, follow these recommendations:

1. **Select a well-drained soil.** Alfalfa should be grown on what is considered the best soil on the farm. A deep, well-drained soil is needed for the alfalfa to develop a vigorous root system. Poor drainage will increase disease problems, result in more winter kill and cause lower yields and shorter stand life.

   If the selected site has a high amount of weed pressure, take time to concentrate on killing these weeds before the alfalfa is seeded. Perennial weeds such as curly dock and horsenettle are easier to deal with when no alfalfa is present.

2. **Fertilize and lime according to a soil test.** The proper pH and fertility are essential for good seedling vigor. A pH of 6.5 - 7.0 is recommended for alfalfa. If the pH is below 6.2, apply the recommended amount of lime at least six months before seeding. If the pH is below 5.8, seeding alfalfa no-till may not be desirable until a soil test shows an adequate pH. Be sure to apply the recommended amounts of phosphate and potash at seeding. Two pounds per acre of boron should also be applied.

3. **Select a recommended variety.** More alfalfa varieties are available than any other hay crop. There are large differences between varieties in yield potential, pest resistance and winter hardiness. One of the biggest mistakes that can be made is to pay attention to all the other details in establishment, and then decide to try and save a little money by selecting uncertified seed or seed of an inferior variety. Check with your local Extension office for the current list of recommended alfalfa varieties.

   Most recommended varieties are pre-inoculated with the proper *Rhizobium* bacteria. If the seed is not coated, be sure to apply alfalfa inoculant to the seed prior to planting. Consider using some type of sticker material to help the inoculant stay on the seed during planting. Proper inoculation is required for root nodulation and nitrogen fixation.

4. **Place the proper amount of seed into a good seedbed.** Alfalfa should be seeded at the rate of 15 to 20 pounds of seed per acre for a pure alfalfa stand. The alfalfa can be seeded into a prepared seedbed, or seeded no-till into a killed sod. If no-till methods are to be used, be sure that all existing vegetation has been chemically killed. Seed should be placed $1/4$ to $1/2$ inch deep.

   In many cases, grasses must be seeded with the alfalfa to reduce soil erosion during stand establishment. In this situation, use 15 pounds of alfalfa with six pounds of either orchardgrass or tall fescue, or four pounds of timothy. If tall fescue is used, be sure to use an endophyte-free variety. The endophyte can still result in reduced performance in animals grazing or consuming hay from infected tall fescue, even if it is in a mixture with alfalfa. The effect of the endophyte may be reduced because of the alfalfa, but animal performance will be superior when an endophyte-free tall fescue, orchardgrass or timothy variety is used.

5. **Seed at the proper time.** Alfalfa can be seeded in both the spring and fall in Tennessee. In the past, the predominant time of seeding has been fall. Fall seedings usually need six to eight weeks to germinate and grow before the first hard freeze. Alfalfa should be seeded from August 15 to September 15. Do not plant before adequate moisture is available in the soil.

   It is important for the alfalfa to have adequate growth going into the winter because of the potential damage from sclerotinia stem and crown rot. Crown rot is a fungal disease that infects plants in the late fall/early winter. Young, fall-seeded plants are at the greatest risk of death because they are not big enough to withstand the disease. Early seeding allows plants to be larger, giving them a better chance to withstand the disease. However,

early seeding does not necessarily ensure immunity. If sclerotinia has been a problem previously, consider establishing the alfalfa in the spring. If you plan to use no-till, avoid fall planting. Seedlings planted no-till do not establish as quickly as those planted conventionally, and will be smaller and more susceptible to crown rot damage.

If you will be spring seeding, plant from March 1 to May 1. Spring seedings generally require an early application of a grass herbicide to decrease crabgrass competition. Be sure to plant the alfalfa after the danger of frost has passed.

6. **Control weeds during establishment.** Competition from weeds can be one of the major factors limiting alfalfa stand establishment. Most weed species grow very rapidly as seedlings, and are more competitive than the alfalfa seedlings for light and nutrients. Weeds such as henbit, chickweed and annual ryegrass can be problems in fall-seeded alfalfa, while crabgrass is a major competitor in spring-seeded alfalfa. Herbicides can be used to reduce this competition. If a grass is seeded with the alfalfa, grass herbicides cannot be used. Check with your local Extension office about current alfalfa herbicide recommendations, or obtain Extension PB 1521 *Hay Crop and Pasture Weed Management* for additional information.

Maintaining a Good Stand

Managed correctly, a stand of alfalfa should last five years or longer. Just as with the establishment phase, attention to detail during the life of the stand is important in getting good yields for several years.

Fertility

Soil samples should be taken every two or three years to determine how much lime, phosphate and potash need to be applied. Low fertility levels can cause stand loss and increased weed pressure. Apply two pounds per acre of boron each year. Nitrogen is not needed on alfalfa. In years between soil test, apply 60 pounds of phosphate and 190 pounds of potash per acre.

The fertilizer can be applied any time of the year. Splitting the annual application for phosphate and potash do not provide any economic benefit; one yearly application is sufficient.

Insect and Weed Control

The alfalfa weevil and potato leafhopper are the two major pests in alfalfa. The alfalfa weevil is usually a problem in March and April. Weevil larvae can be found in the growing tips of stems. Insecticides should be applied when 40 -50 percent of plants show some leaf damage. The potato leafhopper is usually a problem during the mid- to late-summer period. Fields should be scouted regularly during the growing season for both of these pests to monitor insect damage. Check with your local Extension office for current insecticide recommendations.

Weed pressure should be minimized during the season to maintain healthy and productive stands. A dense, vigorous stand is one of the best weed control measures possible, but certain weeds (such as crabgrass) tend to be problems that develop every year, no matter how thick the stand of alfalfa is. Monitor the fields regularly to determine weed pressure and the need for herbicide application. Check with your local Extension office for herbicide recommendations for specific weed problems, or obtain Extension PB 1521 *Hay Crop and Pasture Weed Management*.

Reseeding a Thinning Stand

As alfalfa stands get older, plants tend to die out and the stand becomes thin. Research has shown that when there are less than 40-50 stems per square foot, yield will be reduced. If a stand is getting thin, yields can be maintained by either drilling orchardgrass or red clover into the stand. This will provide the extra forage plants needed to get the maximum yield from a field. Four pounds of timothy or 6 pounds per acre of orchardgrass or endophyte-free tall fescue can be seeded in September to improve the stand thickness.

It is not recommended to try and “thicken up” a stand of alfalfa by adding alfalfa seed to an established stand. The old alfalfa plants produce a toxin that keeps any new alfalfa seedlings from

becoming established. This is known as *autotoxicity*. A field needs to be completely out of alfalfa for at least one year (and preferably two) before being reseeded to a new stand.

Harvesting at the Correct Stage

The forage from alfalfa can be used in many different ways, including hay, silage and grazing. The most important factor in getting high quality forage from alfalfa is to harvest in a timely manner. Just as with any other forage, as alfalfa matures, it has increased fiber levels and decreased protein.

The yield of an alfalfa stand is dependant upon several things, such as variety, moisture, fertility and harvest management. Yields can normally be expected to range between four and six tons of dry matter per acre. Table 1 shows the yield from alfalfa variety tests in several locations across Tennessee.

New spring seedings should be harvested when they reach full bloom. This allows the plants to become well established and develop a good root system. All later harvests should be made when 10 percent of the plants are blooming.

Fall seedings and established stands can be harvested at the bud stage for the first cutting, and then at the 10 percent bloom stage for all later cuttings.

The last harvest in the fall should be made before mid-September. This will allow plants time to build up root carbohydrate reserves. Harvests can be made later than this if the plant is at the full bloom stage. The alfalfa can be grazed during the winter to remove any top growth, if the alfalfa is dormant. Be careful to not graze when the field could be damaged by trampling.

Summary

Alfalfa is a high-quality forage crop that can be used in many different ways. However, it takes a higher level of management than many of the grass pastures in Tennessee. The key to being successful with alfalfa is attention to details. Fertility, weed control and proper harvest methods need to be priorities. While alfalfa is one of the more expensive and difficult crops to grow and maintain, it is unrivaled in terms of yield of high-quality forage.

Table 1. Average dry matter yield (tons/acre) of alfalfa variety tests in Tennessee during 1993-96.

Location	Number of varieties	1993	1994	1995	1996
Knoxville	23	5.9	6.9	5.5	4.9
Spring Hill	21	5.6	6.1	6.6	4.8
Crossville	22	---	4.6	6.1	4.6

Graves and co-workers. 1996 Performance of forage crop varieties. University of Tennessee Agri. Exp. Stat. Research Report 97-04.

SP434C-5M-7/98 E12-2015-00-031-99
A State Partner in the Cooperative Extension System
The Agricultural Extension Service offers its programs to all eligible persons regardless of race, color, national origin, sex or disability and is an Equal Opportunity Employer.
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
The University of Tennessee Institute of Agriculture, U.S. Department of Agriculture, and county governments cooperating in furtherance of Acts of May 8 and June 30, 1914.
Agricultural Extension Service
Billy G. Hicks, Dean