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REQUIREMENTS FOR SUCCESSFUL ALFALFA ESTABLISHMENT ON ACID SOILS

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Background. Attempts have been made in the past to grow sustainable alfalfa in East Texas. Over the last 10 years, requirements for alfalfa production on acid soils have been determined through research at TAES-Overton. Each of the following steps is critical for successful establishment and production of alfalfa, and must not be omitted in the process.

Research Findings. Planning, site selection, soil evaluation, liming and fertilization, site preparation and seeding, weed control, insect control, and harvesting are important considerations for alfalfa production on acid soils of eastern Texas.

1. Planning includes determining the intended use for alfalfa. Greatest benefits will be from haying or grazing with livestock that have potential for rapid weight gain or high volume of milk production. Evaluate the economics of establishment and maintenance for alfalfa. Will liming the soil to pH 6.8 to 7.0 be offset economically by not having to apply nitrogen fertilizer for alfalfa? Is the right type of soil available? Is there sufficient acreage for alfalfa to grow to first harvest without needing those acres for grazing cool-season annuals in mid-late winter?

2. Site selection is the most important consideration. Alfalfa needs a soil with excellent drainage, low subsoil acidity, high fertility, and good aeration. Alfalfa cannot tolerate extended wet soil conditions. A pH above 5.5 in the subsoil to 4 ft deep will allow greater root development and water use. Below pH 5.5, aluminum (Al) can become toxic to root growth.

3. Soil sampling and analysis for alfalfa should be done one year in advance of seeding. Fall is the best time to sample acid, sandy soils intended for alfalfa production. Collect a representative sample from the surface 6-in depth for standard analysis and for boron. Collect a representative sample of the 0.5-1, 1-2, 2-3, and 3-4-ft. depths for pH. If pH is below 5.5, test for Al soluble in 0.01 molar calcium chloride. Concentrations greater than 1.0 ppm Al can inhibit root growth and limit alfalfa yield. High Al in the 3-4-ft. depth will have less effect on alfalfa yield than if the same level of Al were in the upper subsoil depths. An Al level above 1.0 ppm in the 0.5 - 1 and 1 - 2 ft depth is justification for rejection of that site for alfalfa production.

4. Liming and fertilization need timely consideration. The finest particle-size limestone available should be applied at a rate sufficient to raise soil pH to 6.8 - 7.0 the winter before planting alfalfa in the fall. Limestone should be disked 6 inches deep in early spring. Disking should be done even in an established stand of hybrid bermudagrass. Pack the freshly disked soil with a roller to retain soil water. Leaving limestone on the soil surface reduces alfalfa yield. Soils that test low in phosphorus (P) require 120 lb of P_2O_5 /acre the seedling year. The P benefits

alfalfa more when it is disked into the soil rather than leaving it on the surface. In succeeding years, P rates can be reduced to 80 lb of P_2O_5 /acre, particularly if alfalfa is grazed. Alfalfa contains 50 lb of potassium (K)/ton (60 lb K_2O) of hay and yields can reach five tons/acre the seedling year. Alfalfa needs about 400 lb of K from the soil or fertilizer in succeeding years. Magnesium and sulfur are important for alfalfa particularly on deeper sand soils. Research shows that 3.5 to 4.0 lb of boron per acre are needed annually for good alfalfa production on Coastal Plain soils limed to pH approximating 7.0.

5. Site preparation and seeding are best accomplished by preparing a level and firm seedbed. The seedbed for alfalfa planting should be sufficiently firm that the heel of an adult's boot leaves an imprint no deeper than $\frac{1}{4}$ inch. Early October is the optimum planting time for alfalfa when sufficient soil moisture is available for seedling survival. Planting in early December has been successful when followed by several weeks of mild temperatures, but this is risky. Seeding rate varies between 15 - 20 lb of seed/acre. Plant the seed within the top $\frac{1}{4}$ inch in clay soils and $\frac{1}{2}$ inch in sandy soils using a disk drill and firm the soil over the seed. Alfalfa seed planted without press wheels on the drill can be covered successfully with a rolling packer.

6. Weed control is important. Grass and broadleaf weeds can be successfully controlled using preplant or post-emergent herbicides. Most post-emergent weed control measures must be delayed until after the second true leaf stage has been attained on alfalfa and before the broadleaf weeds are taller than 2 inches. Annual ryegrass must be controlled or it can shade and kill alfalfa seedlings. Ryegrass should be sprayed before it exceeds 6 inches tall.

7. Insect control begins as early as mid-February with monitoring alfalfa for chewing damage by weevil larvae on the terminal bud leaves. At this time the larvae will approximate $\frac{1}{8}$ inch in length and are white with a black head. Shot-holed terminal leaves indicate that larvae are present. Chemical controls should be initiated when 100% of 12-in-tall stems are affected. Low mammalian toxicity insecticides are available for weevil control. Aphids are controlled by lady beetles. The three-cornered alfalfa hopper damages a few stems but has not been a problem.

8. Harvesting alfalfa may be accomplished by haying, grazing, greenchopping, or as silage. A cutter-conditioner and tedding speed drying. Slight dew helps prevent leaf loss from dry alfalfa during the haying operation. Grazing alfalfa is a science by itself. Publications are available that describe the precautions and methodologies for successfully grazing alfalfa.

More detailed information on alfalfa production on Coastal Plain soils with links to other production-related sites is on the Web Site at "<http://overton.tamu.edu/soils>". Economics of alfalfa establishment and production on Coastal Plain soils is available on the Web Site at "<http://overton.tamu.edu/agecon>". On this site, point and click Forages, then Alfalfa budgets.