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GUIDELINES FOR SUCCESSFUL ALFALFA ESTABLISHMENT ON ACID SOILS

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Background. Texas Agricultural Experiment Station scientists have determined requirements for sustainable alfalfa production on acid soils. Field-scale alfalfa production demonstrations have successfully been conducted with farm and ranch cooperators. Steps critical for successful alfalfa establishment and production follow.

Research Findings. On acid soils, successful alfalfa production guidelines include (1) Planning, (2) Site selection, (3) Soil evaluation, (4) Liming and fertilization, (5) Site preparation and seeding, (6) Weed control, (7) Insect control, and (8) Harvesting.

1. Planning includes determining the market potential for alfalfa. Economic projections for hay production are favorable. How will first-growth alfalfa be harvested during inclement weather? Will lime costs be offset by eliminating the cost of nitrogen fertilizer? Are soil conditions favorable for alfalfa? When setting aside acreage for alfalfa, will the farm or ranch have the necessary acreage remaining for grazing cool-season and warm-season forages?

2. Site selection is the most important consideration. Alfalfa needs a soil with excellent drainage, good aeration, high fertility, and low subsoil acidity. 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) and possibly manganese (Mn) can become toxic to root growth.

3. Soil sampling and analysis should be done in fall one year before seeding alfalfa on acid, sandy soils that need limestone application. Collect a representative sample from the surface 6-in depth for standard analysis; and a 2-6-in depth sample for boron. Sample the 6-12, 12-24, 24-36, and 36-48-in depths for pH. If pH is below 5.5, test for Al soluble in 0.01 molar calcium chloride. Greater than 1.5 ppm soluble Al may inhibit root growth. High Al in the 3-4-ft. depth will have less effect on alfalfa than will a high Al level in the upper subsoil depths. Aluminum >1.5 ppm in the 6-12 and 12-24-in depths may justify rejection of the site for alfalfa.

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 mixed into the soil by disking in early spring, even in an established stand of hybrid bermudagrass. Pack the freshly disked soil with a weighted roller to retain soil water. Leaving limestone on the soil surface limits alfalfa growth. 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. When soil test P

levels reach medium, fertilizer P rates can be reduced to 80 lb of P_2O_5/acre. Alfalfa contains 50 lb of potassium (K)/ton of hay (60 lb K_2O). Yields can be four to 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 inputs for alfalfa particularly on deeper sandy soils. Research showed that 3.75 lb of B/acre annually are needed for 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, weed-free seedbed. The seedbed for alfalfa planting should be sufficiently firm that the heel of an adult's boot leaves an imprint no deeper than ¼ inch. October is the optimum planting time for alfalfa on the Coastal Plain when soil moisture is sufficient for seedling survival. Early December seeding, although not recommended, has been successful when followed by several weeks of mild temperatures. Seeding rate varies around 20 lb/acre. Plant the seed no deeper than ¼ inch in clay soils and ½ inch in sandy soils using a double-disk opener drill. Firm the soil over the seed. Alfalfa seeded without press wheels on the drill can be covered using a weighted roller.

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. In a new alfalfa seeding, ryegrass should be sprayed before it exceeds 6-inches tall.

7. Insect control begins in mid-February, and sometimes earlier, with monitoring alfalfa for chewing damage by weevil larvae. New larvae are about 1/16 to 3/32-inch long, white to very light green or slate, and have a black head. Shot-holed terminal leaves indicate that larvae are present. Weevil control should be initiated when 40% of stems show chewing damage on new terminal bud leaves. Low mammalian toxicity insecticides are available for weevil control. Lady beetle adults and larvae can control aphids and late-hatch weevil larvae. Three-cornered alfalfa hopper girdles stems near the base and may need chemical control in mid-summer.

8. Harvesting alfalfa may be accomplished by haying, grazing, greenchopping, ensiling, or baleage. Crimping at cutting, followed by tedding speed drying. Slight dew helps prevent leaf loss from alfalfa during the haying operation. Grazing alfalfa is a science by itself, but grazing trials on alfalfa by TAES scientists at Overton indicated results that were less than satisfactory.

Application. Successful alfalfa production on limed acid soils is possible by following these guidelines. More detailed information on alfalfa production and alfalfa production-related sites is on the Internet Web sites "http://soils.tamu.edu" and "http://overton.tamu.edu/soils".