No-Till Forage Production

The Crop Science Society of America defines pasture renovation as "the improvement of a pasture by the partial or complete destruction of the sod, plus liming, fertilizing, seeding, and weed control as may be required to establish desirable forage plants."

No-tillage is a widely applied term referring to many reduced tillage seeding practices-zero-till, minimum-till, sod seeding, top seeding, over-seeding, slot seeding and inter-seeding. Since pasture renovation refers to the renewal or restoration to vigor of old, worn-out pastures by introducing desirable forage species, most of these terms can be directly related to pasture renovation procedures.

Fundamentals

Planting new pastures or rejuvenating old ones by minimum or no-till methods is a viable option for North Carolina growers. Over the years, research and experience have proven that several methods or variations such as sod seeding, minimum-till, surface seeding, etc. will work.

Regardless of method, certain fundamental principles apply to no-till or minimum-till pasture seedings. These include:

(1) Test the soil and apply the needed nutrients and lime. If pH is below 5.8 and a legume is to be planted, apply lime several months before seeding.

(2) If weeds dominate the area to be seeded, control or eliminate these weeds prior to seeding by mowing or using herbicides. If broadleaf weeds are present, spray 0.75 to 1 pound per acre of 2,4-D amine in late May to early June but not later than 6 weeks before seeding. To control hard to kill perennial weeds, such as dogfennel or red sorrel, tank mix 0.25 pound per acre of Banvel plus 0.75 pound per acre of 2,4-D amine. Spray in May or early June but not after June 15.

(3) When no-till seeding a legume into a grass sod, there should be at least a 50 percent stand of desirable grass (fescue, orchardgrass or bluegrass).

(4) The sod *must be supressed* by grazing, clipping, chemicals or combinations of the above prior to seeding. No more than 1 to 2 inches of grass stubble should be present at seeding.

(5) Judicious grazing or clipping may be needed during the establishment period in order to control excessive competition from the grass.

(6) Planting at the proper time can be critical to obtaining a good stand.

(7) Insects can destroy seedling legumes rapidly. They are especially troublesome during hot, dry autumns. The decision to spray or not should be made on a site by site situation analysis.

No-Till Planting Methods

Sod Seeding *with No-till Drills.* Several drills are available that are designed to place seeds in contact with the soil without significantly disrupting the sod (Midland Zip seeder, Tye Pasture Pleaser, Moore or KMC Unidrill, John Deere 1500 Power Till, and others). These drills operate by making a narrow slit or trench in the soil and placing the seed into the trench at ¼ to ¾ inch depth. Almost all of these drills have pack wheels which firm the soil around the seeds. Often a conventional grain drill can be used, especially for the large seeded forages, when soil moisture is favorable.

Planting can be done any time during the recommended seeding periods if the ground can be penetrated by the disk openers. Dry, hard, soils often make fall sod seeding difficult for light-weight drills and grain drills. No-till drills can also be successfully used when seeding directly into small grain stubble or other crop residue if the amount of residue is not too great.

Minimum-till. This method involves partial destruction of the sod by disking, harrowing or other light tillage methods that disturb about 50 to 60 percent of the sod. A drag or cultipacker may be used for smoothing. Seeds can be broadcast on the surface and cultipacked or they can be sown with a standard grain drill or no-till drill. When seeding in the spring, disking may be clone in early winter before the soil becomes too wet.

Surface Seeding. This method is used only for late-winter or early-spring seedings. During this period, soil moisture is normally near field capacity. Seeds are broadcast onto the surface of closely grazed or clipped pastures (1 to 2 inches) in late February or early March so there is a good chance that freezing-thawing or rainfall will result in good soil-seed contact. If seeding is delayed until mid-March it may be desirable to band spray Paraquat at time of seeding to reduce grass competition. After sowing, it may be helpful to use a drag or spike tooth harrow to assure soil-seed contact. Cattle can also be used to tread seeds into the soil surface.

Aerial Seeding. This is a surface seeding method and thus if it is to be used for perennial pastures all of the concepts stated for surface seeding apply. Fall sowing of winter-annual forages onto crop land by airplane has been successful in some situations. The most common practice is to "fly-on" rye or ryegrass seed into soybeans just prior to leaf drop. When the bean leaves fall they provide a mulch for the seed thereby providing for better germination. However, a short term residual herbicide which has no label

restrictions on succeeding crops should be selected in the soybeans for successful emergence of the over-seeded crop.

Examples of Applications of No-till Practices for Establishing Forage Crops

(1) Seeding perennial legumes such as ladino clover,, red clover or alfalfa into cool-season grass sods such as tall fescue ***or*** orchardgrass.

(2) Seeding winter annual grasses and legumes like rye, ryegrass, crimson clover, subclover or hairy vetch into warm-season perennial pastures such as bermudagrass.

(3) Seeding summer annuals such as sorghum-sudan hybrids, sudangrass hybrids or pearlmillet into small grain stubble or into "worn-out" cool season pastures prior to reestablishment of the perennial pasture.

Table 2
No-Till Seeding Rates

Crop	Rate per acre
Alfalfa	20-25 lbs
Crimson clover	15-20 lbs
Hairy vetch	20-30 Ibs
Ladino clover	4-5 Ibs
Pearlmillet	15-20 lbs
Red clover	8-12 lbs
Rye	2-4* bu
Ryegrass	20-40* lbs
Sorghum-Sudan	20-30 lbs
Subclover	15-20 lbs

* For aerial seeding use the high rates.
Use quality seeds (certified if available). Always inoculate legumes with the proper strain of N-fixing bacteria.

Special Considerations

When seeding into perennial grass sods, it is often desirable to use chemical as well as physical suppression of the grass top-growth. Clipping or grazing the grass to 1 to 2 inches plus the use of Paraquat, a contact herbicide used to kill or suppress the grass, will give small legume seedlings a better chance to compete for light, water and nutrients. Paraquat may be applied as a broadcast or as a banded spray. In either case, 1 to 2 pints of Paraquat per sprayed acre is usually sufficient. Add 1 pint of Ortho X-77 Spreader per 100 gallons of spray mixture. Use 25 to 35 gallons of spray mixture per sprayed acre. Paraquat controls many annual weeds and gives top-kill of perennial weeds.

Table 3
No-Till Planting Dates

	Clover into Perennial Cool-season Grass Sod	
	Preferred	**Possible**
Mountains	July 25 - Aug l0*	
	Aug 1 - Sept 1	Aug 1 - Sept 15
	Mar1-Mar20	Mar1-Apr15
Piedmont	Aug 25 - Sept 15*	
	Oct 7 - Oct 15	-Aug25-Oct25
	Feb 20 - Mar 10	Feb 15 - Mar 20
Coastal Plain	Sept 1 - Sept 30*	
	Oct 7 - Oct 15	Sept 1 - Oct 31
	Feb 15 - Feb 28	Feb 10 - Mar 15

	Alfalfa into Perennial Cool-season Grass Sod	
	Preferred	**Possible**
Mountains	July 25 - Aug l0*	
	Sept 15 - Oct 1	July 25 - Oct 15
Piedmont	Aug 25 - Sept 15*	
	Oct 10 - Oct 20	Aug 25 - Oct 20
Coastal Plain	Oct 15 - Oct 25	Sept 1 - Oct 31

	Summer Annuals into Small Grain Stubble or "Worn-out" Cool-season Pasture Sod	
	Preferred	**Possible**
Mountains	May 15 - May 31	May 1 - June 30
Piedmont	May 1 - May 31	May 1 - June 30
Coastal Plain	May 1 - May 15	Apr 25 - June 30

	Winter Annuals into Bermudagrass Sod	
	Preferred	**Possible**
Mountains	-	-
Piedmont	Aug 25 - Sept 15	Aug 20 - Oct 15
Coastal Plain	Sept 5 - Sept 20	Sept 1 - Oct 31

*The best time to sod seed depends on the prevalence of insects in late August and early September and the drought prediction for September. If insects are not evident and moisture is adequate, plant on the early dates.

Some points to remember when planting alfalfa or clover are:

Insects. Insects such as grasshoppers, crickets, leafhoppers, armyworms and slugs can be devastating to young forage seedlings during some years. The most severe problems have occurred in late-summer and early-fall plantings, especially during dry periods.

The best way to combat insect damage is to survey fields at planting to decide if populations are heavy enough to cause damage to emerging seedlings. If populations are heavy (for example, 5 to 8 grasshoppers per square foot), spray with approved insecticide at planting or before germination occurs. The decision to spray should be based on a field by field survey of insect populations.

Another approach to combat insects is to make fall sod plantings 3 to 5 weeks later than dates recommended for conventional establishment. The onset of cool weather usually results in diminished insect populations while the sod offers protection to young seedlings from heaving and winter injury.

Alfalfa. When drilling alfalfa, always broadcast Paraquat at time of planting or shortly before. Since Paraquat kills on contact it will kill germinating alfalfa seedlings if spraying is delayed (often seeds germinate in 3 days). At present, planting alfalfa into perennial grass sods in late winter-early spring is not recommended.

Clover (fall planting). When drilling clovers into sod during the fall, the use of Paraquat may or may not be needed. This depends on the amount of residual soil nitrogen, soil moisture, and insect population following planting. If soil moisture is limiting it is advisable to spray Paraquat before or *immediately* after planting. About one-half of the sod should be sprayed in 6 to lo-inch bands and the seeding row should be within the band.

If moisture is not a limiting factor and residual soil nitrogen is low, spraying may not be advantageous, but the area should be kept grazed as close as possible without allowing cattle to bite the tops out of the developing seedlings.

Clover (spring planting). Paraquat will not be necessary unless plantings are made late (when grass is vigorously growing). Plantings made after March 30 do not usually have a good chance for survival because of stress from moisture, temperature and grass competition.