

## OPPORTUNITIES FOR NO-TILL ALFALFA IN KENTUCKY

Jimmy C. Henning, Garry D. Lacefield, and Andy Anderson<sup>1</sup>

There is a rising interest in the use of alfalfa in pastures, especially for dairy cattle, beef stockers and as supplemental summer grazing for cows with calves. Kentucky has the land resource to support 2 million acres of alfalfa without reducing acres in cultivated crops. Acres of alfalfa seeded for pasture use would be in addition to the 350,000 acres presently used primarily for hay. However, these additional acres are rolling and erodible and therefore alfalfa should be established by no-till methods.

Raising the number of alfalfa acres grazed as well as that harvested for cash hay would increase farm profitability. In a recent analysis by the University of Tennessee, grazing alfalfa (by lactating dairy cows) and alfalfa for cash hay generated greater profit per acre than corn silage, corn grain, grass hay, or soybeans (Figure 1).

Moving to more intensive pasture use, especially in dairy enterprises would reduce demands on and for waste handling facilities and result in improved environmental and water quality. Intensive rotational grazing systems would lessen the need for supplemental fertilizer on pastured acres due to redistributed manure and urine. Intensive grazing systems using alfalfa for beef stockers have produced over 1000 pounds of beef per acre per year in Kentucky.

Much of the technology needed for alfalfa grazing systems for beef or dairy cows is available and easily adopted, including high tensile electric fence, temporary fencing, and stock water systems. However, the techniques of no-till establishment, especially with alfalfa, have not been widely adopted because of lack of success.

The success of no-till seedings in Kentucky has been variable. Seeding into a small grain in spring or following a summer annual such as foxtail millet or soybeans has been more successful than drilling into a fescue sod suppressed by herbicides.

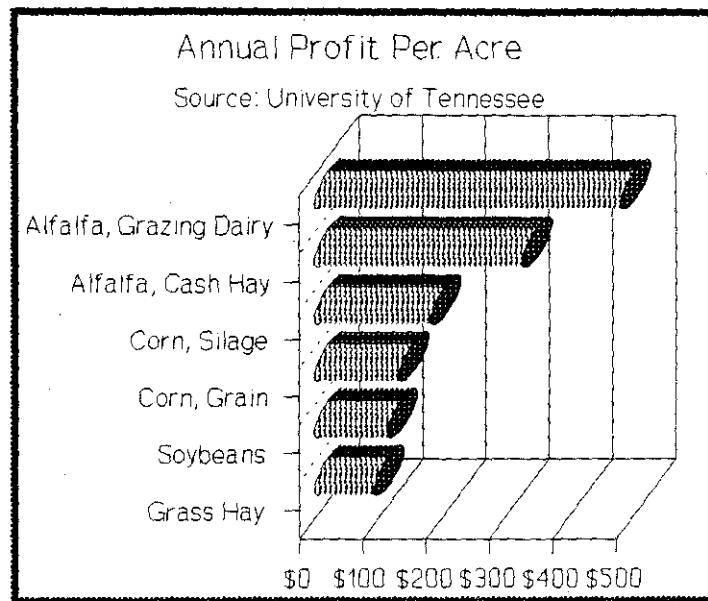


Figure 1

<sup>1</sup>Extension Forage Specialist - Lexington, Extension Forage Specialist - Princeton, and Engineer, Tye/Farm Equipment Group, P.O. Box 1120, Lockney, Texas 79241.

Seeding alfalfa using no-till techniques is advantageous for Kentucky and can be successful if certain principles are followed.

### Advantages of No-Till

There are several advantages to producers on rolling land to establish alfalfa via no-tillage techniques.

**Soil Conservation.** Missouri workers reported a range of 2 to 4 tons of soil loss per acre on alfalfa hay fields established conventionally. This compared to 14 to 35 tons/acre for soybeans and 13 to 25 tons/acre for corn. There was no comparison to alfalfa seeded no-till; although it would have been equal to or less than the 2 to 4 tons/acre average because tillage exposes soil to a high risk of soil erosion. Once the plants are established, the amount of water run-off and erosion is greatly reduced.

**Time.** Any practice which can be accomplished with the same end result (i.e. good stand) in less time is potentially advantageous. Conventional seedings in a properly prepared seedbed normally will require several trips over the field before the seed is sown. With no-till, only one pass over the field is required to place the seed in proper seed-soil contact. In addition to seeding, additional trips are required for fertilizing and weed control but are still less trips required than conventional. Researchers at the University of Kentucky during the mid to late seventies compared conventional to no-till (renovator) seedings. Results from these studies which were conducted in over 16 locations across the state showed 0.62 acres per hour for conventional and 3.90 acres per hour for a once-over renovator (no-till) seeding.

**Fuel.** Naturally if fewer trips over a field are required, then less fuel would be needed. In those same Kentucky studies, conventional seedings required 4.95 gallons of fuel per acre while the renovator seedings required 1.04.

**Cost per acre.** When you consider all costs, the expense of seeding an acre of alfalfa no-till is less than that of conventional methods. No-till seedings require more expenditure on herbicides but require fewer trips over the field and therefore less operator time and fuel.

**Moisture.** Moisture conditions in either spring or late summer can potentially show a no-till establishment advantage. In spring, often moisture is surplus, delaying seedbed preparation and seeding. With no-till, seeding can be made earlier since a renovator or no-till drill can be used in a field several days before the field can be tilled. In late summer, soils are often dry. Tillage lowers the already limited moisture present during seedbed preparation for conventional seedings. With no-till, very little moisture is lost due to seeding because only a small amount of the soil is disturbed.

### Disadvantages of No-Till

**Lack of Consistent Success.** Drilling alfalfa into suppressed sods in particular has not been consistently successful in generating thick, uniform stands of alfalfa. Reasons for this

lack of success include uneven fields, inadequate soil fertility, poor seed placement, maladjusted drills, disease, insects, and competition.

**Suppression Necessary.** In contrast to red clover, no-till establishment of alfalfa into sods requires suppression of existing vegetation with herbicides. Broadcast seedings of alfalfa on frozen ground are nearly always unsuccessful.

**Limited Machinery Access.** No-till seedings require access to machinery not readily available on most farms. Many counties have these available for rent on a per acre basis. However, often the demand for the drill is heavy during seeding periods and it is sometimes hard to get fields seeded during optimum conditions.

**Unfamiliar or Worn Equipment.** Drills differ in seed metering equipment, depth control mechanisms even on models made by the same company. Using a rented or borrowed drill means learning a new piece of equipment. Rented or borrowed drills may be worn and out of adjustment.

**Pests.** No-till seedings, again especially into sod, are subject to a variety of pest pressures, including sclerotinia stem and crown rot (fall seedings), some insects, and especially weeds. Many times, perennial weeds such as dock exist in pastures and cause persistent problems in the newly seeded alfalfa. While each are not present in every case, these factors significantly reduce success rates.

**Uneven Field Conditions.** The surface and texture of fields that have not been tilled tend to be uneven, hindering accurate and consistent seed placement. Uneven emergence and stands result.

**Fertility.** Although alfalfa fertility needs are the same regardless of seeding method, pasture fields tend to have had less lime and fertilizer than cropped fields. Therefore, lime and fertilizer needs for establishment into sod fields tends to be greater than when going into tillable ground.

### **Establishment Considerations for No-till Alfalfa**

#### No-till seedings following crops.

Farmers have been very successful getting good stands of alfalfa following crops such as corn, soybeans, wheat, or a temporary summer annual hay crop. A single herbicide application may be required just prior to seeding to kill any germinated weeds. For alfalfa to be successfully seeded directly into a living wheat stand in the early spring, plant no more than 1 bushel per acre and remove the wheat growth as hay or haylage. Soybeans or one of the foxtail/german millets are excellent interim hay crops prior to a late summer no-till seeding of alfalfa. These will not regrow after a late July or early August hay harvest and fields are usually free of most weeds. Spring seedings are easily made into stubble from the

previous year's corn or soybean crop. Use short residual herbicides in the year preceding alfalfa establishment.

#### No-till seedings into sods.

**Suppress sod competition.** Results when no-till seedings into sod fields have been highly variable in Kentucky. Competition from existing sods should be minimized by the use of herbicides prior to seeding. Glyphosate (Roundup) and paraquat (Gramoxone) are the primary choices in sod suppression herbicides. Glyphosate is a translocated herbicide and works best when the grass is actively growing. Sod suppression with glyphosate has been improved by the addition of ammonium sulfate in the tank. Glyphosate is often recommended for suppression of orchardgrass because it is tolerant of paraquat.

Paraquat is a 'burn-down' type herbicide with virtually no translocation. When sprayed in high volumes of water (>20 gallons per acre) and high pressure (>30 psi), paraquat is very good at suppressing tall fescue. A single spray of paraquat will give good suppression of tall fescue, but two sequential application will give better fescue control.

**Timing of herbicide application.** Paraquat can be applied immediately prior to seeding with no adverse effects on germination, emergence, or seedling growth. Glyphosate has been known to cause a depression in seedling emergence and growth when sprayed immediately prior to seeding. The exact reasons for this are unknown. However, it is possible that the emerging seedling is exposed to small amounts of glyphosate held on the thatch or on the dead and dying herbage and this results in seedling death. However, there is no labeled restriction or recommendation for the proper interval between spraying and seeding. In general, waiting 3 to 7 days after spraying should be adequate to avoid problems with glyphosate.

Paraquat or glyphosate may also be applied in the fall after tall fescue has started to regrow. The weakened sod will be damaged further by the winter and can be sprayed again if necessary in the spring. This 'fall/spring' herbicide application may be effective in killing most of the tall fescue present in the pasture.

It is possible to successfully establish alfalfa into sods that have been disked heavily to destroy most of the grass vegetation. However, this method is generally not as effective in sod suppression by herbicides. In addition, this practice leaves fields very rough and erodible.

#### Ensure Adequate Fertility.

It is a waste of time and money to try to establish or improve stands when the soil fertility and/or pH is too low to support productive plants. Fertilize and lime according to soil test prior to seeding. If possible, apply needed lime at least six months in advance. Alfalfa requires a pH of 6.4 to 6.7. Recent research from Virginia indicates that surface-applied lime is as effective in neutralizing soil acidity as incorporated material (Table 1).

Alfalfa yield, tons/a		
Limestone, tons/A	Incorporated	Non-Incorporated
0	2.0	1.4
1.25	4.3	4.2
2.5	4.6	4.6
5	4.3	4.6

Source: Wolf and White, 1992. National Alfalfa Symposium Proceedings, Roanoke, Virginia.

Level land is not a requirement for alfalfa. It can be successfully established and grown on any slope that is suitable for machinery operation. Alfalfa requires a well-drained soil for best production and persistence. Deep soils are best, since alfalfa plants are capable of developing deep root systems. Soils in which rooting depth is limited are not well suited for high production and stand persistence.

#### Use High Quality Seed.

Plant certified seed of an adapted variety. Varieties such as Buffalo, Arc, and Saranac yield about 1,000 lb/A less hay each year than improved cultivars. Uncertified seed may be low in germination, contain excess weed or other crop seed, and produce stands with uncertain performance and persistence.

#### Seed at the proper rate, date, and depth.

**Seeding rate.** UK recommends 15 to 20 lb/A of alfalfa seed in no-till establishment. Research from Penn State indicates that seeding rates higher than about 9 to 10 lb/A do not improve stands or yield when alfalfa is drilled in rows. However, the additional seed is justified to account for the added field variation experienced in no-till seedings. Fields to be established no-till (especially pasture fields) will typically be more variable in their soil and surface characteristics making precise seed placement more difficult than in research or tilled situations.

**Seeding Date.** Depending on the situation, no-till seeding can be done successfully in spring, or late summer. However, late summer seedings into killed sods are not generally recommended because seedlings are susceptible to infection by sclerotinia stem and crown rot that decimates stands. Sclerotinia only infects in the fall when young plants are kept continually wet from rain and dew. Alfalfa plants from a spring seeding or plants older than

1 year develop a natural resistance to sclerotinia infection. Several legumes are hosts of sclerotinia, and the inoculum can be brought into newly seeded alfalfa fields by wind. A history of sclerotinia within the county or on the farm indicates that stands are at a greater risk for infection.

**Use a seeder capable of precisely placing the seed in the soil.** A number of excellent no-till seeders are available. Each needs to be properly adjusted and operated to place the seed about  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in the soil regardless of soil conditions. In the spring, the tendency is to plant too deeply due to moist soil conditions. Deep planting delays emergence, reduces seedling vigor, and decreases seedling numbers in alfalfa. A rule of thumb for seeding depth with alfalfa: If you do not see some seed on top of the ground when seeding no-till, then there is a very good chance that you are seeding too deeply. Open the slit behind the disc openers to determine depth of seeding.

**Check calibration of seeding equipment.** Make sure that the drill is set properly to deliver the desired amount of seed. Drills differ in the types of mechanisms for adjusting seeding rate. Although, drills will have general settings for seeding rates of particular crops, the actual delivered rate will vary according to seed size, seed coatings, seed-flow characteristics, and the adjustment/wear of the seed metering device. Lime coated alfalfa seed will flow through seed boxes **faster** than uncoated seed (Table 2 ). Also, varieties and different seed lots differ in their flow rates, possibly because of differences in seed size and weight and also because certain coatings may make the seed 'slicker.' A cooperative study with the Tye Company revealed that 'Aggressor' seed with lime coating flows up to 41.6% faster than uncoated 'Aggressor' at the same drill setting (small seed box). Uncoated Pioneer Brand '5312' flowed though the same seeder faster than uncoated 'Aggressor.'

One way to do a rough field calibration is to figure out how far the drill should travel to deliver a pound of seed, collect the output from the seed tubes for this distance and then compare this amount to a pre-weighed pound of material. For example, if the desired seeding rate was 20 lb/A and was to be delivered by a 10 foot wide drill, collect the seed from all seed tubes for 218 feet ( $43560 \text{ sq. ft /A divided by } 10 \text{ ft} = 4356 \text{ ft to deliver } 20 \text{ lb of seed. } 4356 \text{ divided by } 20 = 217.8 \text{ ft to deliver one pound of seed.}$ ) While not terribly accurate or sensitive, this method will keep you from making large errors in seeding rates and does not require a scale.

**Table 2. The effect of variety and lime coating on seed flow through the small seed box of a 7-foot Tye no-till drill \*.**

	Pioneer 5312, Uncoated	Aggressor, Uncoated	Aggressor, Lime-Coated	
Fluted Roller Opening (inches)	Seed Flow, lb/A			% increase**
1/4	5.8	5.9	7.9	33.9
3/8	9.4	8.7	11.9	36.8
1/2	13.0	11.5	16.0	39.1
5/8	16.6	14.3	20.0	39.9
3/4	20.2	17.0	24.0	41.2
7/8	23.8	19.8	28.1	41.9

\* Data furnished courtesy of The Tye Company.  
\*\* Comparing Aggressor with and without lime-coating.

**Control Competition After Seeding.** Weed problems are common in fields of no-till alfalfa. Control these weeds by clipping, limited grazing, or by the use of herbicides if necessary. Keep grazing periods short and minimize the possible trampling damage. Spring seedlings should be ready to graze or cut for hay 75 to 90 days after planting.

#### Soil Insecticide Recommendations

Data from Missouri and Virginia indicate that using a soil insecticide at planting will improve alfalfa stands planted no-till into fescue sod. Most of this work has centered on Furadan liquid and granules, which has never been labeled for this use in Kentucky. However, Lorsban liquid and granules are labeled for use as establishment aids for no-till alfalfa in Kentucky. Data from the University of Missouri indicate that Lorsban liquid or granules are roughly equivalent to Furadan in improving no-till alfalfa establishment into fescue sods (Dr. Wayne Bailey, personal communication). These insecticides are effective in improving no-till alfalfa stands when there are white grubs, wire worms, or crane fly larvae present. In general, the granular formulation of Lorsban has been superior to liquid, probably because it has a longer residual effect (60 days compared to 14 to 21 days).

There is little Kentucky data on the effectiveness of Lorsban liquid or granules as establishment aids for no-till alfalfa. Field observations of no-till alfalfa seedlings made in the spring of 1994 with and without Lorsban liquid at establishment do not indicate that the insecticide treatments were effective. More field trials are scheduled in 1995.

#### No-tilling into Old Alfalfa Stands

Old alfalfa plants are auto-toxic to new alfalfa seedlings. Therefore, thickening up an old alfalfa stand by drilling more alfalfa is not recommended. Recent accounts in *The Furrow*

magazine have indicated that the use of extra metalaxyl (the active ingredient in Apron seed treatment and Ridomil fungicide) in the seed box will allow alfalfa to be successfully drilled into old stands.

However, recent research in Missouri and Kansas also indicates that seeding alfalfa into itself is not successful. In a field trial, Jim Shroyer at Kansas State University interseeded alfalfa into old alfalfa stands on six farms using metalaxyl at 1x and 2x labeled rates. He found the fungicide treatment to have no effect on alfalfa establishment. In addition, three of the six seedings were complete failures. At the others, the resulting thickness of the new alfalfa stand was inversely proportional to the thickness of the old stand.

Research conducted by Dr. Monroe Rasnake at the UK research station in Princeton has found that it may be possible to reseed alfalfa into old stands that have been killed by herbicides using intervals of as short as 3 weeks. However, in less than 2 years, alfalfa plant density has fallen from over 20 to between 5 and 6 plants per square foot. This decline is more rapid than would be expected in regular alfalfa seedings. Therefore, alfalfa established with little or no rotation between crops may have a shortened life due to increased pressure from leaf and soil-borne diseases.

How thin does an old stand have to be for successful reseeding? Research at the University of Missouri indicates that there has to be fewer than 1 plant per 5 square feet of area for an old stand to not affect the new seeding.

### Summary

Alfalfa acreage can be expanded in Kentucky through no-till establishment into sod fields. Key considerations for successful sod-seedings include minimizing competition from the existing sod or cover, fertilizing according to soil test recommendations, seeding at the correct rate, date, and depth, and controlling competition after seeding. Soil insecticides are available to control the feeding damage and seedling stand loss due to grubs, wireworms, and other soil insects, but there is little data from Kentucky suggesting that these are essential for success. Finally, drilling alfalfa into old alfalfa stands is generally not effective in producing thick productive stands. Revitalizing pasture acres with alfalfa coupled with improved grazing technologies can produce greater meat and milk per acre from a high quality crop while minimizing the cost per pound of forage produced.