NO-TILL ALFALFA ESTABLISHMENT

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The topic "No-till Alfalfa" was discussed at the V Annual Alfalfa Conference this past February in Elizabethtown. At that conference, we reported results of demonstrations that had been conducted along with preliminary results of some of the research underway. In the presentation today, I would like to review some of the opportunities for no-till alfalfa and discuss some additional research results.

Advantages of No-Till

There are at least four obvious 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 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 since "establishment" usually provides the greatest threat of soil erosion. Once the plants are established, the amount of water run-off and erosion is greatly reduced. We have all observed a well-tilled seedbed following a heavy rain resulting in ruts where tractor tires ran and ditches which follow the path of water run-off. No-till establishment can greatly reduce the amount of soil loss during establishment.

Time - Any practice which can be accomplished with the same end result (i.e. good stand) in less time is potentially advantageous. Conventional seedings normally will require several trips over the field to get the seed planted in a properly prepared seedbed. 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 spraying 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.

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, we often experience a shortage of moisture. Limited moisture present is often lost during seedbed preparation for conventional seedings. With no-till, very little moisture is lost due to seeding since only a small amount of the soil is disturbed.

Requirements for Successful No-Till Establishment

Land - Level land is not a requirement for alfalfa. It can be successfully established and grown on any slope which 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 optimum production and stand persistence.

Fertility - A soil test is the most economical investment in the overall alfalfa fertility program. Soil test results should be used to determine the need for lime and fertilizer. With no-till seedings, apply needed lime at least six months in advance in order that the surface applied lime will have additional time to react with the soil.

Quality Seed and Inoculum - Use high quality (certified) seed of an adapted variety and inoculate at the time of seeding.

Seeding Depth and Rate - Several types of no-till drills are now available in Kentucky. Regardless of the type of machine used to seed, the primary objective of the machine is to place the inoculated seed in the soil at the proper depth and desired rate.

Control Competition - Competition from existing vegetation must be controlled. Herbicides are available and labelled which when used according to label instructions can suppress the competition permitting the alfalfa to become established.

Pests - Any pest (insects, weeds, diseases) which prevents alfalfa seed from germinating, emerging and becoming established can result in stand failure. Of all the areas of no-till establishment, "pest" is the one of greatest concern to us at present.

Research and Observations

Researchers and extension personnel at the University of Kentucky have conducted several no-till alfalfa experiments and demonstrations over the last ten years. Although stands have been successfully established, considerable inconsistencies have been observed in both research and demonstrations throughout the state. In general, greatest success has been obtained when seeded into small grain and row crop stubble. The environment which has resulted in more failures has been grass sods, especially sods with a history of legumes.

Virginia Experience - In 1979-80, workers in Virginia conducted several studies on no-till alfalfa which resulted in a basic no-till "recipe":

Apply 2,4-D if broadleaf weeds are present. After 10-14 days, apply Paraquat plus surfactant. Wait 14-20 days and make another application of paraquat. Seed 15 pounds of inoculated seed per acre plus 10 lb of 10G granular Furadan per acre in the row with the seed.

This basic "recipe" or some variation of it has been readily accepted in Virginia with no-till acres going from less than 200 in 1981 to over 11,000 in 1985.

The difference in the Virginia recommendations over what was tested throughout the 70's is the soil insecticide. To date, research on no-till alfalfa has not shown conclusively, exactly what soil insects are causing problems or being controlled. This lack of understanding has been frustrating to agronomists, entomologists, and producers. Entomologists at the University of Kentucky have identified the clover root curculio as one possible soil insect of concern. Work is continuing in Kentucky and other states to identify insects, environments and other factors that may limit no-till alfalfa establishment.

In 1984, a 30 acre demonstration was established in the spring in Breckinridge County. The demonstration consisted of a 30 acre fescue-orchardgrass sod where most of the clover had gone out. The field was divided in half and sprayed with paraquat (1/2 with one application, 1/2 with a split application) with a check through the center. Twelve varieties were seeded with a no-till drill across the herbicide treatments. A soil insecticide was used to treat one-half of selected varieties. Satisfactory stands were obtained on both herbicide treatments, although the split application of paraquat had better stands with less competition during establishment. At all sampling dates, Furadan treated plots were superior to non-treated plots. Similar results were observed during seedings made at Princeton during late summer using various combinations of herbicides. Excellent stands were obtained across most herbicide and Furadan treatments. Stands were rated in October for plant height, vigor and plant density. Furadan treated plots were superior to non-treated plots.

During late summer 1984 and spring 1985, additional studies were initiated at Princeton. Tall fescue sod was treated with different herbicides and rates during August-September of 1984 followed by no-till seeding in September. Excellent stands were obtained. Table 1 shows dry matter yields for 1985.

Table 1. Dry Matter Yields of No-till Alfalfa.

Treatments	Dry Matter Yields	
	Furadan	No-Furadan
Roundup 2Q	7,677	7,267
Paraquat Q	8,600	7,858
P + P	10,502	9,269
Q + P	11,228	9,520
Q + Q	10,192	8,361

Tye Seeder, Classic 15#, Seeded 9-14-84, 4 harvests 1985.

In spring 1985, additional studies were seeded into an old fescue sod that had clover in previous years. Tables 2 and 3 show yields for 1985. Plots were seeded with a Tye Drill on 4-17-85 and three harvests taken during 1985.

Table 2. Alfalfa Yields With and Without a Soil Insecticide.

Treatments	Dry Matter Yields			
	1	2	3	Total
Anstar	227	1091	1087	2405
Anstar (furadan)	1712	2250	1104	5066

Table 3. Dry Matter Yields of No-Till Alfalfa With Different Seed Treatments.

Treatments	Dry Matter Yields			
	1	2	3	Total
Apollo II	470	1186	780	2436
Apollo II (Apron)	1342	2208	1058	4608
Apollo II (Furadan)	1778	3338	1264	6380
Apollo II (Maginum)	1508	2918	1135	5561

A more comprehensive study was established during September 1985 to evaluate additional treatments on no-till alfalfa establishment. Stand counts through fall show differences. Yield and stand counts will be taken next year.

Additional information is needed to determine factors limiting stand establishment, especially in grass sod environments. At present, there is no soil insecticides labelled for use in Kentucky. Work in Kentucky has not shown an economic advantage of soil insecticides for no-till alfalfa into small grains, row crop stubble, following warm-season annuals (sudex, beans-milo, etc.).