NO-TILL ALFALFA PRODUCTION IN VIRGINIA

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Most of the approximately 120,000 acres of alfalfa grown in Virginia are on sloping fields subject to erosion. Many fields contain rocks that when brought to the surface by tillage equipment, make it difficult to prepare fine seedbeds.

Producers have welcomed the opportunity to establish alfalfa on these fields using no-till procedures, especially since yields from no-till plantings have been equal to conventionally planted fields. Farmers especially like being able to seed without delay because of less time required for seedbed preparation and the ability to plant when prepared seedbeds are too wet or too dry. Essentially no alfalfa was seeded no-till until 1981 when the extension education program was initiated based on research conducted at Va Tech and by neighboring'state universities. In 1983 there were nearly 250 no-till drills available in Virginia which were used to plant 9,200 acres of no-till alfalfa that year and 9,080 in 1984.

Several requirements for successful no-till establishment are spelled out for producers:

1. Competition from other plants must be eliminated.
2. Heavy thatch and plant growth tall enough to shade the soil surface must be removed.
3. Seedlings must be protected from insects when seeding in sod.
4. Seedlings must be protected from diseases.
5. Seed should be placed in the soil no deeper than **1** inch.
6. Soil fertility must be medium to high with pH above 6.4.
7. Seeding must be done at the proper time of year.

The fertility program for no-till alfalfa is essentially the same as for alfalfa grown in tilled seedbeds. When seeding in soils testing medium for P_2O_5 and K_20, apply 125 lbs per acre of each nutrient. On established stands in soils of above average productivity which test medium, topdress with 75 lbs of P_2O_5 and 165 lbs of $K20$ per acre in late fall or after the spring harvest.

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One of the primary concerns with soil fertility in no-till seeding is the inability to incorporate needed lime and fertilizer into the soil prior to seeding. It is emphasized to producers that fertility must be raised to adequate levels in the cropping rotation at least one year in advance of no-till seeding.

In order to be useful a practice must be versatile enough to fit into the varied cropping and forage systems used on farms. No-till alfalfa is being established successfully in a number of different situations.

Seeding into sod

Spring seeding of alfalfa into a mixed perennial sod killed that spring is not recommended because of weed competition with the new seeding. A dense tall fescue sod is an acceptable situation for spring no-till seeding. Graze the tall fescue sod short (1-2 inches), apply 2 pints of paraquat per acre after the plants are actively growing, then wait 14-20 days and apply a second paraquat application of 1-2 pints per acre. Include 7 lb of 15G Furadan per acre with the seed. This procedure automatically results in a late spring seeding which is subject to severe weed competition in most situations except where the sod is very dense and has few weed seeds present.

A variation of this which works very well is to graze the sod in early spring or take a hay cutting and apply 2 pints of paraquat. Then seed a summer annual smother crop such as foxtail millet or sorghum-sudangrass. Harvest the smother crop for hay in early August, apply 1 pint of paraquat, and seed in the last 10 days of August. No Furadan is needed in this situation.

The producer may elect to simply utilize the sod for hay or pasture until about August 1, then apply the paraquat twice, and seed using Furadan. Another alternative gaining wide use is the application of paraquat in mid-October to kill the sod. In early March, apply a second application to kill winter annual weeds, and seed using Furadan. Perennial broadleaf weeds should be controlled before killing the sod by use of a suitable herbicide program.

In each of these situations where sod is being killed, Roundup at 2-3 quarts per acre may be substituted for the broadleaf weed control and the double application of paraquat.

Seeding after crops other than sod

Spring no-till planting of alfalfa may be successful in fields planted to corn the previous season. Long-residual herbicides should not be used on the corn when planning to follow with no-till alfalfa. Seedings in mid-March may not require paraquat if the field is free of germinated weeds,

although there are usually enough winter annual weeds present to warrant an application of 1 pint of paraquat per acre.

There are several ways to successfully seed no-till alfalfa into small grain in the spring. One method is to spray the small grain with 1-2 pints of paraquat per acre when growth is 4-6 inches tall, then seed. The small grain will usually make regrowth which must be mowed when 5-6 inches tall to avoid competition with the alfalfa seedlings.

Alfalfa may also be seeded without tillage into standing (8-10 inches tall) small grain prior to harvesting for silage. Rye harvested for silage in the boot stage will normally produce Competition. Barley and wheat cut at the dough stage will produce little regrowth.

Forage may also be seeded into small grain stubble after a silage or grain harvest. If the silage harvest was made prior to dough stage, wait 5-10 days for regrowth to develop, then apply 1 pint of paraquat per acre to burn back the regrowth and kill weed seedlings. If the harvest was made at dough stage or later, apply 1 pint of paraquat per acre and seed immediately. Since harvesting for grain occurs late in spring, waiting until early August to spray with 1-2 pints of paraquat per acre and then seeding the forages is usually best. Volunteer small grain must be mowed after the seeding if it reaches a height of 5-7 inches.

Late August and early September seeded no-till alfalfa seedlings have been much less susceptible to heaving injury than seedlings established in prepared seedbeds. Seedlings emerge more quickly and make more rapid growth in no-till situations (Table 1). This is due partially to a more favorable moisture supply in the undisturbed soil and to better seed-soil contact. Crusting of the soil surface is also not a problem. Seedling survival and yields from conventionally established plantings in the first harvest the following year have been shown to decrease as planting is delayed beyond September 1 (Tables 2 and 3). Delay of 20 days beyond September 1 resulted in unacceptable stands the following year. On the other hand acceptable stands and yields at first harvest resulted from no-till plantings between September 1 and September 30. This makes it feasible to plant alfalfa after corn is removed for silage if using the no-till method. It also improves the likelihood of obtaining satisfactory stands when germination after planting is delayed due to dry soil conditions.

Table 1. Alfalfa Seedling Population and Weights Three Weeks After Planting on Four Fall Dates. D. D. Wolf, Blacksburg, VA.

Planting Method	Date	Population Plts/Sq. Ft.	Mg. Seedling Wt. Nov. 28 Top	Root	Total
conv.	2 Sept.	20	352	86	438
	18 Sept.	44	38	11	49
	28 Sept.	36	36	9	45
	10 Oct.	35	14	3	17
No-Till	2 Sept.	51	272	90	362
	18 Sept.	70	107	36	143
	28 Sept.	45	72	20	92
	10 Oct.	48	26	6	32

Table 2. Yields and Population of Alfalfa No-Till and Conventionally Planted on Four Dates in 1983 on North Facing Slope. D. D. Wolf, Blacksburg, VA.

Planting Method	Planting Date 9/1	9/10	9/20	9/30	10/10	LSD .05
	(1st Hay Yield (T/Ac)					
Conv.	0.95	0.46	0.00	0.00	--	
No-Till	1.75	1.34	1.86	1.54		0.45
	Total Season Yield (T/Ac)					
Conv.	3.10	1.60	0.00	0.00	--	
No-Till	4.45	3.31	3.88	3.78	--	0.42
	Plant Population Nov 1983 (No./Sq. Ft.)					
Conv.	33	44	28	35	--	
No-Till	45	46	50	39	--	10
	Plant Population April 1984 (No./Sq. Ft.)					
Conv.	20	12	0	0	--	
No-Till	39	42	35	39	--	8

Table 3. Yields and Population of Alfalfa No-Till and Conventionally Planted on Four Dates in 1983 on South Facing Slope. D. D. Wolf, Blacksburg, VA.

Planting Method	Planting Date 9/1	9/10	9/20	9/30	10/10	LSD .05
	1st Hay Yield (T/Ac)					
Conv.	1.38	1.19	0.84	0.12	0.00	
No-Till	1.74	1.48	1.85	1.41	0.72	.30
	Total Season Yield (T/Ac)					
Conv.	4.04	3.39	2.20	1.28	0.79	
No-Till	4.12	3.82	4.13	3.64	2.37	.46
	Plant Population Nov. 1983 (No./Sq. Ft.)					
Conv,	36	50	37	34	50	
No-Till	44	52	39	39	54	10
	Plant Population April 1984 (No./Sq. Ft.)					
Conv.	20	17	5	1	0	
No-Till	38	54	39	28	8	11

Disease Considerations

Sclerotinia crown and stem rot has long been present in Virginia. When fall weather conditions are favorable for its development, it has resulted in serious stand losses in conventionally fall seeded alfalfa and clover. In no-till fall seedings, it has become a serious problem in some fields when seeding into killed sods with clover present or in situations where clovers have been present in the sod in recent years. Since clover is a host for sclerotinia, many such sods apparently have large numbers of sclerotia present in the surface of the soil. Since these are essentially undisturbed due to lack of tillage, they are readily available to cause infection in no-till seedings. While most fall no-till seedings even under these conditions are successful, an alarming number of plantings are essentially "wiped out" by the disease.

Growers must be aware of this potential problem when making plans €or fall seeding into sod. The alternatives of killing the sod in spring and planting a summer annual smother crop before seeding or killing the sod in fall and planting in spring help to minimize the threat of sclerotinia.

Pythium or damping off is a seedling disease that can cause serious stand loss, particularly in cold, wet soils. While this has not been recognized as a serious overall problem there are instances, especially in spring no-till seedings where seedlings are lost due to this and perhaps phytophthora disease.

The availability of Apron as an inexpensive but effective seed treatment will be a great help in protecting new seedings from pythium and phytophthora diseases. As shown in Tables 4, 5, and 6, Virginia research has show it to be very effective.

Table 4. Alfalfa Germination in Pythium Infected Soil. D. D. Wolf. Blacksburg, VA.

Furadan lb./Ac.	Apron Treatment No	Yes	Avg.
	% Germination*		
0	33	79	56
2	35	85	60
Avg	34	82	--

*Count made 5 days after emergence from soil.

Table 5. Alfalfa Seedling Germination in Sterilized and Non-Sterile Soil as Influenced by Seed Treatment with Apron Fungicide and Furadan Insecticide. D. D. Wolf. Blacksburg, VA. (Exp. 1).

Soil Sterilized	Furadan[2]	Apron Treatment[1] No	Yes	Avg.
		% Germination		
Yes	No	53	82	68
	Yes	45	88	66
	Avg	43	85	67
No	No	33	79	56
	Yes	35	85	60
	Avg	34	82	58

[1]Two ounces/100 lbs. seed.
[2]Two lbs. active ingredient per acre sprayed over seed before covering.

Table 6. Alfalfa Seedling Germination in Sterilized and Non-Sterile Soil as Influenced by Seed Treatment with Apron Fungicide and Furadan Insecticide. D. D. Wolf. Blacksburg, VA. (Exp. 2)

Furadan	Soil Sterilized	Apron Treatment No	Yes
		% Germination	
No	No	39	81
	Yes	88	89
Granular[1]	No	23	86
	Yes	87	a5
Spray2	No	51	81
	Yes	87	85

[1]One lb. a.i./acre in row with seed.
[2]Two lb. a.i./acre over seed before covering.

Seeding Rates

Recommended seeding rate in Virginia for seeding alfalfa in conventionally prepared seed beds is 20 lbs. of seed per acre. In no-till seedings the suggested rate is 15 lbs. per acre. Observations have indicated that when seeding in rows with the no-till drills into essentially undisturbed soil, the lower seeding rate results in adequate numbers of seedlings. High seeding rates result in high populations of weak seedlings that cannot all survive. These observations plus data such as those in Table 7 justify the lower seeding rates for no-till establishment.

Table 7. Alfalfa yields from Four Different No-Till Plantings With Three Seeding Rates. D. D. Wolf. Blacksburg, VA.

Planting History	Harvest	Lb. Seed Planted/Acre 5	10	15
		---Yield (Tons/Acre)---		
1 Sept 84[1]	lst, 1985	1.08	1.19	1.14
28 Sept 84[2]	lst, 1985	1.23	1.13	1.19
	3rd, 1985	1.07	1.04	1.05
10 Oct 84[2]	lst, 1985	1.11	1.10	1.27
	3rd, 1985	0.95	1.03	0.99
24 Aug 84[3]	lst, 1985	0.85	1.45	1.38
	2nd, 1985	0.83	1.05	1.02
	3rd, 1985	0.87	1.06	1.04
	4th, 1985	0.84	0.99	0.89
	TOTAL	**3.40**	**4.24**	**4.33**

[1]Previous crop was millet.
[2]Previous corn crop removed for silage 20 Sept.
[3]Previous rye crop followed by millet smother crop.

Summary

In summary, the use of no-till establishment methods to establish alfalfa is rapidly becoming "standard procedure" in Virginia. No-till procedures are constantly being refined as new ideas and products emerge. The practice offers many practical advantages in terms of reduced soil erosion, less time and fuel required, more timely planting dates, and fewer rocks being brought to the surface. In spite of these advantages, there is no increase in cost and no decrease in yield or persistence when using no-till procedures.