

NO-TILL FORAGE CROPS

J. KENNETH EVANS

INTRODUCTION

Sod planting of corn has developed into a widespread practice in Kentucky and many other states in the past 10 years. Sod seeding of small seeded legumes is a much older practice with reports in the literature as early as 1910 of seedings made in 1879 at Cornell University. In fact, broadcast seeding of clover on snow or frozen soil in late winter has been a widely used farm practice in Kentucky for probably over 100 years. Although this method of seeding has been most common in stands of small grains seeded the previous fall, many farmers also broadcast clover seed on the surface of fields containing perennial cool-season grasses. Historically some alfalfa seedings were made into small grain stands, but very little has been seeded broadcast into perennial cool-season grasses.

Prior to the early 1950's research was very limited on no-tillage or minimum tillage methods of seeding any forage species. Consequently, most farmers felt it was necessary to plow and prepare a fine seedbed if stands were to be obtained. Since much of the forage acreage in the eastern United States is quite susceptible to erosion, plowing and preparing seedbeds resulted not only in considerable expenditure of time and money but also unacceptable soil losses.

Considerable research efforts over the past 30 years have been devoted to establishment or re-establishment of desirable forage species with minimum disturbance of vegetative cover and soil. Today I want to state some ecological principles which must be satisfied if any sod seeding is to be successful. Next, I will discuss some research results and report some observations and experiences which illustrate how these principles may be satisfied.

STATEMENT OF ECOLOGICAL PRINCIPLES

Some ecological principles must, of necessity, be considered if any no-till forage seeding is to be successful. These are: (1) the existing vegetation must be controlled; (2) lime and fertilizer must be applied to satisfy needs of the species to be seeded; (3) seed must be covered; and (4) pests must be controlled.

CONTROL OF EXISTING VEGETATION

No-tilling small seeded species into heavy layers of thatch or into tall vegetation is inviting failure. Control or removal of the thatch must be

J. KENNETH EVANS is an Extension Specialist in Forages, University of Kentucky, Lexington, Kentucky.

accomplished to avoid damping off diseases and to remove hiding places for insects and slugs which will attack the new seedlings. Burning may be acceptable in some areas and unacceptable in other areas, but it works. Tall vegetation will provide excessive shade for some types of seedlings, but may be more acceptable for others. In our experiences, we would rank species such as crownvetch and birdsfoot trefoil as extremely susceptible to early seedling competition and red clover and white clover least susceptible to shading with alfalfa intermediate between these species.

It is highly desirable to have a pasture or grass field closely grazed before making no-till seedings. This is difficult to do if there are no fences or if the fields are located some distances from the cattle. It is also difficult to achieve close grazing by lactating dairy cows without limiting milk production, especially in late summer for autumn or early fall seedings. In cases where close grazing after seeding cannot be achieved or where the vegetative regrowth cannot be controlled by mowing, chemicals such as Paraquat or Roundup may be used prior to seeding to reduce the competition of existing vegetation for new seedlings. Ohio State University recommends a spraying with 2,4-D to control broadleaved species followed by a waiting period and Paraquat spraying to control the grass growth prior to seeding small seeded legumes. Tennessee has recommended strip spraying with Paraquat prior to seeding simply by rotating nozzles on the spray boom to get the desired coverage. Many Kentucky farmers have successfully used this method to establish legumes in grass when seeding was done in late winter.

We have been consistently successful in our experimental plots in establishing both red clover and alfalfa in either bluegrass or fescue by drilling seed into closely clipped sod and mowing the grass above seedlings of these species. Many farmers in Kentucky successfully renovate without tillage and without chemicals by using the grazing animal to control competition for the seedlings. Generally, we find that since alfalfa is more sensitive to seedling competition, it is desirable to spray a closely grazed or clipped sod with Paraquat (if suppression is desired) or Roundup (if more kill is desired) prior to seeding. It should also be pointed out that most farmers are very busy and will not observe newly seeded fields as frequently as researchers. Therefore more competition may be developed for the seedlings before it is observed and after it is too late to do anything about it without injuring the seedlings. If this is the case it is probably desirable to use chemicals in the control of existing vegetation. Selection of chemicals and combinations of grazing and clipping should be tailored to fit the vegetation to be controlled and the species to be seeded.

We have successfully established summer annual grasses into cool-season grass sods by drilling with no-till drills and band spraying Paraquat in 9" bands over the rows. Best production on these seedings can be obtained when nitrogen fertilizer is placed in bands 4" from the row. However, this is difficult to do at seeding if the drill has no fertilizer box. It is probably impractical to accomplish anything other than broadcast nitrogen applications after the first cutting or grazing of these species.

LIME AND FERTILIZE FOR THE SPECIES TO BE SEEDED

The most critical need for lime is obviously for species that have a higher pH requirement such as alfalfa. Seeding alfalfa or clovers into fields with a pH of less than 6.2 can, on some soils in the eastern United States, result in molybdenum deficiencies which reduce nodulation and nitrogen fixation. Also, proper liming facilitates phosphate availability and reduces quantities of toxic elements such as iron, manganese and aluminum which are in the soil solution.

It is also critical for legumes seeded into grasses that the phosphorus and potassium be brought up to the proper level for the legume species to be seeded. The addition of nitrogen fertilizers when seeding legumes into grasses will simply stimulate grass growth and result in competition for the legumes and necessitates much more careful management to control the existing grass by either grazing or clipping or chemical control prior to seeding.

With the warm season annuals seeded into cool-season species, we learned many years ago that there was excessive competition for both nitrogen and water if corn was no-till planted into cool-season grasses which were not killed. In fact, the first research done by Shirley Phillips on no-till corn into fescue indicated that unless one killed more than 70% of the existing sod, this competition would severely limit corn yields.

COVER THE SEED

We have had several graduate students at the University of Kentucky over the years who have done research involving various aspects of no-till seedings such as seeding rate, seeding time, herbicides, fertility, and seeding depth. In all of these experiments the one thing which has consistently increased size of seedlings and number of plants per 100 seed planted, is covering seed. It really doesn't matter how the covering is accomplished. For example, in the northeastern United States and as far south as freezing occurs, frost heaving will provide some cover for seed on thin grass stands or stands of small grain; that is seed put on top of the ground will be covered by the frost heaving. As the seeding is done later in the spring, past the time of freezing, it becomes more critical that the seed be actually placed in the ground. Also, the actual precise placement of seed at the desired depth is a much more efficient and consistent way of getting a stand. If we simply control the grass by spraying or grazing or both, and broadcast seed on top of the ground, we can get acceptable stands if the seeding is made in late winter while freezing and thawing is still occurring. If we use one of the no-till planters, we can reduce seeding rates and get equivalent stands. In approximately 25 experiments over the years with the no-till seeding equipment, we have found that there is never a need for more than 6 pounds of red clover seed per acre and probably no need for more than 10 pounds of alfalfa seed per acre, however we still use 15 pounds.

CONTROL PESTS

This is a principle which must be satisfied with any type of seeding but it can be more critical in no-till seedings. We have lost stands of seedling

plants to weeds, army worms, slugs, diseases, and unknown factors. We know that we have a serious problem in Kentucky with the clover root curculio. This insect is in the soil and is especially bad in some fields where clover or other legumes have been present for a long time. Root and nodule feeding of these insects can do great damage to seedling stands. Dale Wolf and his co-workers in Virginia have found damage to legume seedlings from the seed corn maggot feeding on the roots. In fact, we were shown an experiment in Virginia last year where Furadan had improved seedling stands **on** any area which had living cover over the winter. We have known for many years that no-till corn planted into a killed sod will show much more pest damage on both roots and tops, than corn planted on a prepared seedbed.

In some states, 24C labels have been approved for Furadan use **on** no-till forage seedings, however this is not the case in Kentucky. Our entomologists feel that the label requirement for incorporation of Furadan is not satisfied in the no-till planting. Other states interpret the label to be satisfied if a coulters is incorporating the Furadan in the furrow.

The Integrated Pest Management philosophy of applying only those pesticides which are needed prohibits the application of soil insecticides unless there is an economic level of a known insect population to be controlled. As a practical matter, it is difficult or impossible for a farmer to ascertain the soil insect population until it has already decreased or eliminated his stand. Our experience with no-till corn tells us there is more likelihood **of** root insect feeding on crops planted by the no-till method into old sods.

We should also recognize that the no-tillage method of planting forages can be no more universally applied than can no-till planting of corn. There are simply some soils and some weed problems in which no-till planting is doomed to failure. We can circumvent some problems by properly timing the planting to favor the seeded species. For example, we can obtain excellent stands of cool-season grasses and legumes in johnsongrass fields by working on johnsongrass control through the **summer** and doing the new seeding in autumn. The johnsongrass regrowth then frosts back and the cool-season species continues to grow for a period before dormancy is induced. **The** cool-season species will then begin growth early in the spring and be ahead of the johnsongrass at the **time** it begins growth.

SUMMARY

Several conclusions appear to be justified by data and experiences collected over the years.

1. Forages can be established without plowing and preparing a seedbed.
2. Some reduction in the competitive advantage of existing vegetation is needed to insure development of seedlings. This can be accomplished by close grazing prior to and after seeding, use of appropriate herbicides or a combination of the **two**. The value of herbicide appears to be greater in dry years.
3. Covering the seed results not only in better stands but more consistent stands than seeding on the soil surface.

- 4 . Use of a once-over renovator which precision places seed in a furrow permits use of seeding rates which are lower than normally used with conventional seeding techniques.
5. Control of pests which either eat or compete with the newly seeded crop is imperative if successful stands are to be established and maintained.