Alfalfa is the most important forage legume in Maryland. It has the highest yield potential and the highest feeding value of all perennial hay crops. High quality alfalfa hay and corn silage are a perfect combination; the protein of alfalfa complements the energy of corn silage. While the protein value of alfalfa is of major importance, its energy content is also high and should not be discounted. High yields of alfalfa harvested at the proper stage of maturity compare favorably with corn silage in production of energy.

Alfalfa is well adapted to a wide range of climatic and soil conditions and can be successfully grown throughout Maryland. However, it is best adapted to deep, well-drained, loamy soils. It is very sensitive to acidity and seldom succeeds on acid soils. Thus it generally requires large amounts of lime along with readily available supplies of P and K.

One of the primary concerns in seeding new stands of alfalfa is the threat of soil erosion while the new seeding is becoming established. Valuable top soil can be lost and the field laced with ruts and gullies that can damage equipment and be dangerous to equipment operators during the life of the stand. Technology is now available to consistently establish excellent stands of alfalfa without the need for conventional tillage. No-till seeding not only reduces soil erosion, thus leaving the field in better physical condition, but also conserves soil moisture for germination and new seedling growth. Additional benefits are reduced fuel, labor and time requirements, avoiding the problem of soil crusting frequently encountered with conventional seedings and seeding on an already firm seedbed. On soils where rocks are a problem, no-till allows them to remain below the soil surface, thus reducing the need to pick rocks before and/or after seeding.

Successful no-till alfalfa establishment requires a number of precise management procedures. While no-till establishment has many advantages over conventional seedings, a higher level of MANagement (MAN is a key factor) is required than for conventional seedings. The MANager must pay more attention to details for this technique to be successful.
The most consistently successful method of no-tillage establishment of alfalfa has been late summer seedings into small grain stubble, particularly barley stubble. This method has been used in research trials and on-farm seedings with excellent results. It allows a period of time for moisture conservation since there is not an actively growing crop on the field once the small grain is harvested. Also, moisture is not being lost due to tillage operations as would be the case with conventional seedings. Weeds are generally much less of a problem with late summer seedings than with spring seedings.

No-till alfalfa seedings can be made in the spring but stand failures are much more likely than when seeding into small grain stubble in late summer. Severe weed competition is almost always a problem with spring no-till seedings; this is especially true for summer annual grasses. Herbicides for weed control in seedling alfalfa generally provide only partial control. Excessive competition from weeds in spring no-till seedings can drastically reduce forage quality during the seeding year, but even more importantly, plant population, stand vigor, and stand longevity can be reduced.

We generally do not recommend no-till seeding of pure stands of alfalfa into permanent grasslands, including old pasture sods. In most cases, fields that have been in permanent grass tend to be the poorer fields on the farm. They may have shallow soils or they may be poorly drained, and the pH and fertility are frequently low. These conditions are not conducive to highly productive alfalfa. Weeds can be a particularly difficult problem in older grass sods. When the grass is killed or suppressed by a herbicide, there is frequently a flush of weed growth later on that severely competes with the alfalfa seedlings. A much better procedure would be to plant no-till corn into the sod and seed a small grain after the corn is harvested. Alfalfa could then be no-tilled into the small grain stubble as will be outlined later.

If you desire to establish a legume hay crop in grass sod, consider seeding red clover rather than alfalfa. Red clover is much better adapted to these conditions.

Seeding into the small grain stubble allows a full grain crop during the seeding year for alfalfa. Grain seeding rates do not have to be reduced as is recommended when alfalfa is seeded with spring grain. Late summer seedings of alfalfa provide full production the following year. The stubble reduces soil erosion and provides protection for the young, tender alfalfa seedlings from direct intense sunlight and possible damage from blowing sand or soil particles.

The following list of guidelines should help in planning your no-tillage alfalfa establishment program.

Guideline 1. Plan Ahead

Preparations for seeding need to begin as much as 2 years prior to the actual seeding. Since alfalfa requires well-drained soil, high pH (6.5 to 7.0), and high soil fertility, selection of fields to be seeded should be given careful consideration. Select the most productive fields on the farm. The better the soil conditions, the greater the potential
for highly productive stands. Lime and fertilizer must be applied 1 to 2 years earlier in the rotation when the soil is tilled or long enough in advance to allow movement into the soil when surface applied.

Where broadleaf weeds are present, they need to be eliminated before seeding either through tillage or herbicide application. Residual herbicides from previous crops must also be considered in this planning. Problems of triazine carryover can be encountered with alfalfa following corn, particularly in fields that have been in 2 or more years of no-till corn. It may be necessary to reduce triazine herbicide rates in the final year of corn or to switch to shorter residual herbicides such as Bladex, Dual and Lasso. Lime should be applied prior to the last year of corn. In a rotation of 2 or more years of no-till corn followed by no-till small grain and no-till alfalfa, application of lime prior to the last year of corn releases triazine herbicides bound in the acidic layer while the field is still in corn. Delaying the lime application until immediately prior to seeding the alfalfa can result in triazine toxicity to the alfalfa and stand failure.

Many of the newer herbicides recently labeled for use in corn (e.g. Accent and Beacon) and soybeans (e.g. Classic, Gemini, Pursuit, and Scepter) carry very severe rotational restrictions. If any of these materials have been used, please consult the label prior to planting alfalfa.

**Guideline 2. Determine Soil Nutrient Levels - Soil Test**

Analysis of a representative soil sample is the best method by which existing soil nutrient levels and fertilizer recommendations can be determined. Soil pH and existing levels of nutrients can be used with the history of a field to develop a sound fertility program. A shortage of one nutrient results in poor utilization of other nutrients and generally results in substantial yield loss. On the other hand, using more of any nutrient than is necessary is not only inefficient but is a waste of money.

Soil samples should be taken to a 2-inch depth and indicated on the soil test questionnaire as a no-till alfalfa seeding. The 0 to 2-inch sample is a must for fields that have been in no-till corn and will not be plowed following the last year of corn. Surface applications of nitrogen fertilizers to the corn frequently result in this layer being quite acidic. Since alfalfa is a deep-rooted perennial, a second sample of the normal plow layer should also be taken. Samples may be submitted to the University of Maryland Soil Testing Laboratory. Information and mailing materials can be obtained from local county extension offices.

**Guideline 3. Apply Lime and Fertilizer**

Alfalfa is no different than other crops in that productive stands and high yields are obtained only when the crop is adequately limed and fertilized. Alfalfa requires plentiful supplies of readily available calcium (lime), phosphorus and potassium. The pH should be in the range 6.8 to 7.0 at the time of seeding. Because high pH and good fertility levels cannot be realized on some soils immediately with surface application of lime and fertilizer, these materials should be applied at least 6 to 12 months ahead of seeding for best results.
Lime corrects soil acidity and supplies calcium (or calcium and magnesium, depending upon the material). It not only increases the availability of practically all essential plant nutrients but promotes the growth of nitrogen-fixing bacteria and reduces the toxic effects of aluminum and manganese.

Phosphorus is especially critical for young seedlings. A readily available supply of phosphorus within reach of the young seedling is essential for normal root development and seedling establishment. Application of 20 to 30 pounds of P2O5 per acre in the row at seeding is frequently beneficial on soils testing medium or low in P2O5.

The demand for potassium by young seedlings is relatively low. It is much more important once stands are established and high levels are essential for maintaining productive long-lived stands. High yielding alfalfa stands may remove in excess of 500 lbs K2O per acre per year and must be replaced each year if productive stands are to be maintained.

Guideline 4. Select High Yielding, Persistent Varieties

There are many varieties available to choose from. No one variety is necessarily superior to all others. It is advisable to have stands of several different varieties on your farm. Varieties with different parentages and different levels of resistance or tolerance to insects and diseases may react differently to particular insect or disease problems. Thus not all of your alfalfa should be affected the same way under any given condition.

There are no hard-and-fast rules for selection of varieties. They should produce high yields, have sufficient winterhardiness and be resistant to diseases and insects that are problems in the area of production. The diseases of primary importance in Maryland are anthracnose, Phytophthora root rot and bacterial wilt. Consideration should also be given to Verticillium wilt resistance, especially in the northern counties.

High quality seed is essential for good alfalfa stands. Certified seed should be used to insure varietal purity and high seed quality.

University of Maryland variety performance data along with other sources of information can be helpful to you when selecting varieties.

Guideline 5. Apply Herbicide to Eliminate Competition

Good weed control is essential for successful no-till alfalfa seedings. It is important that all existing vegetation be eliminated so that it will not be using soil moisture that should be conserved for the new seeding nor be competitive with the young seedlings during establishment. This is in contrast to no-till pasture renovation where it is sometimes desirable to retain at least part of the existing vegetation.

Barley stubble has advantages over wheat or oat stubble because the earlier harvest for barley allows more time for weed control and moisture conservation as well as earlier seeding of alfalfa. Following harvest of barley, allow time for as many weed seeds to germinate as practical so
that maximum weed kill will be accomplished. This will generally be 2 to 3 weeks following grain harvest. Then apply 1.0 to 1.5 pints of Gramoxone Extra (0.31 to 0.47 lb ai/Aparaquat), depending upon type and amount of vegetation present, in 20 to 60 gallons of water per acre. Always use a surfactant as specified by the label.

A second application of 1.0 to 1.5 pints of Gramoxone Extra is made at the time of seeding to eliminate weeds that have developed since the first application. The length of time between the two herbicide applications should be at least 2 weeks and may be as long as 5 weeks.

If weeds are not present it may not be necessary to make one of the Gramoxone Extra applications. If a dry period has existed for several weeks and the history of the field would indicate that there is likely to be a significant amount of ungerminated weed seeds on the soil surface, delay seeding the alfalfa until after rain. Weeds should be allowed to germinate and then killed with an application of herbicide. If the soil is dry when the first application is made and no rain occurs to germinate the surface weeds, no-tilling alfalfa into the dry soil can be disastrous. Weeds such as chickweed and henbit will germinate with the alfalfa as soon as it rains. The chances for success are greatly increased when the weeds are allowed to germinate and then are killed when the alfalfa is seeded.

No-till seedings into oat stubble will generally not allow sufficient time for two herbicide applications, particularly in western Maryland. In this case it is especially desirable to follow a good weed control program in the small grain, followed by a single application of 2 to 3 pints of Gramoxone Extra at the time of seeding alfalfa.

If perennial broadleaf weeds or perennial grasses such as quackgrass are present, glyphosate (Round-up + others) should be used rather than Gramoxone Extra. Glyphosate is a non-selective translocated herbicide and will control many annual and perennial grasses and broadleaf weeds plus many tree and woody brush species. However, application must be made when the target weeds are at the correct stage of growth for most effective control. Thus seeding should be timed accordingly. Apply 1 to 2 quarts (1 to 2 lb ai) in 20 to 60 gallons of water per acre. Rate may need to be increased to 5 quarts, depending upon weeds to be controlled. Seeding should be delayed at least 7 days after application to allow proper translocation into underground plant parts and to reduce competition to the emerging alfalfa seedlings.

Guideline 6. Inoculate Seed

New innovations in legume seed inoculation have been developed in recent years. These innovations have advantages over the commonly used methods (water, milk, colas, etc.), especially under adverse conditions for rhizobial survival. Since soft drinks are acidic, they can be detrimental to the rhizobia. Successful legume inoculation under adverse conditions generally depends upon coating large amounts of inoculant on the seed, keeping it there until the seed is in the ground, and ensuring survival of the rhizobia in the soil until the young seedlings are infected.

Some of the inoculation products on the market contain two separate packages of materials; a sticker supplement and the inoculant powder. The sticker supplement is used to bind the humus inoculant to the seed.
It has been estimated that some of these new techniques coat each seed with up to 12 times more rhizobia than are coated by conventional methods. The sticker supplement also provides some nutrients which help the rhizobia survive in the soil.

If you don't wish to buy a commercial sticker, sugar water and cornstarch have proven to be effective in research trials. Use at least two cups of sugar per quart of water, thoroughly moisten the seed, and then add 16 ounces of inoculum per 20 pounds of seed. This is much more inoculum than most growers are accustomed to applying, but remember that the purpose is to increase the number of rhizobia per seed so that enough will survive for effective nodulation even under adverse conditions. With more favorable seeding conditions and good soil moisture in the seedbed, the amount of inoculum could be reduced. The cornstarch is added after thoroughly mixing the inoculant with the seed. The purpose of the cornstarch is primarily to dry the seed so that it does not clump.

Thus, seeding can begin immediately. The cornstarch also provides some nutrients for the rhizobia.

Inoculants should be stored in a refrigerator from time of purchase to time of use. The seed dealer should also have stored the inoculant in a refrigerator or cooler. If the dealer has the inoculant stored on a windowsill, next to a heater or other warm locations, purchase your inoculant elsewhere. The rhizobia bacteria are living organisms that can be killed at high temperature. Also, **ALWAYS CHECK THE EXPIRATION DATE BEFORE PURCHASING ANY INOCULANT MATERIALS OR ANY PRE-INOCULATED SEED. Do not purchase out-of-date inoculant.**

Regardless of the inoculation technique that is used, a little extra time and expense to do the job right will save time and money in the long run, especially if the crop does not nodulate and either must be reseeded or have nitrogen fertilizer applied in order to get satisfactory yields. More rhizobia in the area of the developing root means more nodules and thus more nitrogen fixed.

**Guideline 7. Properly Adjust Seeding Equipment**

Use the same seeding rate as would be used for conventional seedings. A rate of 15 to 18 lb/acre will provide excellent stands if properly seeded. Adjustment and operation of a no-till drill is affected by type of mulch or cover, terrain, type of soil, and soil moisture conditions in which it will be operating. Satisfactory seedings require proper metering and uniform seed placement. Depth of seed placement will vary with the type of mulch or cover, type of soil, and soil moisture conditions. The key is to provide good seed/soil contact without placing the seed too deep. Where conditions are good, a depth of less than 0.25-inch is preferred. However, this is seldom the case and seedings are usually deeper (0.5 to 1-inch) than normally recommended with conventionally prepared seedbeds. In general, the heavier the soil and the higher the moisture content, the shallower the seed should be placed. In contrast, the lighter the soil and the lower the soil moisture, the deeper the seed should be placed.

No-till drills should be heavy enough to ensure proper penetration of the soil or be designed for the addition of supplemental weight. They should also have sufficient durability for no-till operating
conditions. Desirable drill features include: 1) rolling coulters to aid in cutting through existing mulch covers (plain, notched, or ripple coulters will cut and penetrate better than wide 1 to 2-inch fluted coulters), 2) double disc seed furrow openers that line up precisely with cutting coulters for proper seed placement in the soil, 3) depth bands, wheels or other methods of controlling the depth of each seeding unit, and 4) a press wheel following each seeding unit to firm the soil around the seed. Narrow press wheels, no wider than 1-inch are preferred unless the press wheels have a narrow center ridge running in the slit left by the double disc openers. The press wheel increases in importance as soil texture increases and soil moisture decreases. Where soils are heavy and soil moisture is high the use of a press wheel can actually be detrimental. In these cases it may be desirable to leave the seed furrow open to allow the seed to germinate and grow. If the slit is closed with a press wheel the seed may be covered too deeply and be unable to emerge.

Guideline 8. Seed at the Proper Time

Seeding should be timed with rainfall so that adequate soil moisture is available at the time of seeding. For the mountains of western Maryland, alfalfa should be seeded between August 1 and September 1 as soil moisture permits. For central and southern Maryland and the Eastern Shore the dates are approximately August 10 to September 10. If soil moisture is favorable for seeding during the early parts of these periods, early seedings are generally more vigorous and become better established before winter. Seedings made after the cut-off dates are more subject to winter injury and possible winterkilling since the plants do not have as much time to develop and become established.

Application of 15 to 20 lb N per acre often results in increased seedling vigor and better stands. Response to nitrogen will depend upon the history of the field. The greatest response will obviously be where residual soil nitrogen levels are low. If the drill is equipped with a fertilizer hopper, nitrogen and phosphorus fertilizers can be mixed and applied in the row at seeding. The rate should not exceed 30 lb N per acre. Higher rates can have a depressing effect on nodulation as well as result in injury to the seedlings.

Guideline 9. Management During Establishment

Even though the plants may make considerable growth during the late summer and fall period, they should not be cut or grazed. Clipping or grazing seedling stands weakens the plants and results in greater susceptibility to winterkilling. New seedings should be protected from undue competition of weeds. Timely clipping of weeds at a level above the alfalfa or application of herbicides may be needed to ensure seedling survival (consult a current edition of EB237, Pest Management Recommendations for Field Crops, for a listing of herbicides labeled in your area). The new seeding should be monitored for insect and disease problems at least weekly for the first 6 to 8 weeks after seeding. If insects are damaging the seedlings, insecticide application may be necessary.

Special Considerations
With the advent of no-till drills, many farmers became interested in trying to rejuvenate old alfalfa stands by no-till reseeding. This practice is not recommended. Attempts to improve poor stands that are 4, 5 or more years old generally fail due to a build-up of disease organisms, insects, etc. Rather than attempting to rejuvenate declining stands, take advantage of the nitrogen provided by alfalfa and rotate to corn. If small grain follows the corn, alfalfa can then be no-till seeded into the small grain stubble as outlined. For best results the field should be out of alfalfa for at least 2 years. Crop rotation aids in breaking disease and insect cycles as well as providing more opportunities and alternatives for weed control.

**SUMMARY -- Manage, Manage, Manage**

There are no shortcuts and no substitutes for good management. Poor management before and/or after a no-till seeding can result in wasted effort. The nine guidelines listed should provide useful guidance for successful no-tillage establishment of alfalfa. Part of the time saved by no-tillage practices might be used to plan proper stand management for the future.