

## Seeding Alfalfa

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This NebGuide discusses alfalfa production, including site selection and preparation, fertilization, seed selection, seeding, companion crops, stand management, weed control and stand renovation.

Alfalfa can produce more protein per acre than any other crop in Nebraska. It can supply all the protein and large amounts of the vitamins, minerals, and energy needed by many livestock.

Besides being an excellent livestock feed, alfalfa improves the soil by adding nitrogen and organic matter, increasing water infiltration, improving soil structure, and controlling erosion. All these attributes make alfalfa a highly desirable crop for many farms and ranches.

Proper seeding techniques and seedling management are crucial to establishing a dense stand (*Figure 1*). High yields of good quality forage can result only from well-established, properly managed, dense alfalfa stands.

### Steps to Successful Alfalfa Seeding

#### 1. Select a suitable soil.

Alfalfa thrives on deep, well-drained loam, silt loam, or clay loam soils with a pH between 6.2 and 7.5. Sandy soils can produce excellent alfalfa yields when properly fertilized and irrigated. When alfalfa is grown on subirrigated sites, permanently wet soil should be at least 3 feet, and preferably 6 or more feet, below the soil surface, especially if the water table depth fluctuates by more than 2 feet through the year. Avoid poorly drained soils or those with high water tables because alfalfa will not survive under waterlogged conditions. Alfalfa also is poorly suited for saline or shallow soils.

Avoid seeding alfalfa into soils that contain residual herbicides from previous crops. (See NebGuide G1891, *A Quick Test for Herbicide Carryover in the Soil*.) Seeding alfalfa back into existing alfalfa fields usually is discouraged but can be successful under certain conditions. (See NebGuide G1993, *Reseeding or Thickening Thin Alfalfa Stands*.)

#### 2. Check fertility and pH of the soil.

Take soil samples to determine levels of available nutrients before applying fertilizer. If fields are to be irrigated or manure is to be applied, collect a water and/or a manure sample to determine the amount of nutrients supplied by these additions. Have samples tested at a reputable commercial laboratory. Contact your local Extension Educator for sampling and mailing instructions.

When requesting recommendations, set high but realistic yield goals. Do not try to save money by reducing lime or fertilizer



Figure 1. A dense stand of alfalfa starts with good field preparation, seed selection, and management.

inputs. High yields and persistent stands of alfalfa will easily offset small fertilizer savings.

#### 3. Apply lime, fertilizer, or manure.

Lime is the most important soil amendment. In soils with a pH below 6.2, alfalfa roots have difficulty forming nodules to fix nitrogen and some soil nutrients are less available. When pH of the surface 3 inches is below 6.2 and pH of soil below the surface 3 inches also is less than 6.2, apply the full lime recommendation. If the subsurface soil has a pH above 6.2, one-half the recommended rate usually is adequate because roots eventually will grow into the subsurface soils.

Preplant is the best time to apply manure and lime (when needed) for alfalfa. Incorporate both into the soil prior to seeding. If more than two tons of lime per acre is required, incorporate lime at least six months before seeding.

Most Nebraska soils need phosphorus to produce top alfalfa yields. The phosphorus can be broadcast and incorporated into the soil prior to seeding, or it can be band-applied by the drill at planting. Often band application at seeding is more effective than broadcast because it places readily available phosphorus near the roots of new alfalfa seedlings.

Alfalfa production on sandy soils often benefits from other nutrients. Sulfur is needed most often where soil organic matter is less than 1 percent and irrigation water (if used) is low in sulfur. Boron and potassium may improve yields on some sandy soils.

Alfalfa also uses many other mineral elements, such as zinc, copper, iron, and magnesium. Most Nebraska soils supply adequate amounts of these minerals. Nebraska research has not found a yield increase from adding these minor elements.

Nitrogen fertilizer generally does not benefit alfalfa; however, 10 to 15 pounds of nitrogen per acre applied at planting often improves establishment on sandy soils. Most commonly used sources of phosphorus also contain enough nitrogen for this use. Where soil pH of the surface 3 inches is low and lime was not applied, seedlings may become nitrogen deficient due to poor nodule formation and nitrogen fixation. Apply 10 to 15 pounds of nitrogen per acre at planting and one or two additional applications of 10 to 20 pounds each during the first two months of growth to decrease the likelihood of stunting.

See Extension Circular EC155, *Nutrient Management for Agronomic Crops in Nebraska*, for more specific recommendations.

#### **4. Prepare a firm seedbed.**

Alfalfa seeds must have close contact with soil particles and soil moisture to ensure rapid emergence. A firm seedbed also helps prevent seed from being planted too deep. Leave just enough loose soil to cover seed after planting. On a properly prepared and firmed seedbed, you should be able to bounce a basketball on it and sink in no more than 1/2 inch when walking across it.

Avoid rough, cloddy seedbeds because proper seeding depth and good seed-to-soil contact are difficult to control. Do not prepare a powdery-fine seedbed on fine-textured, clayey soils as soil crusting may occur after it rains and hinder seedling emergence.

Excessive irrigation after planting also can cause crusting or promote seedling diseases. If irrigation water is to be used, fill the top 2 to 3 feet of the soil to field capacity before planting alfalfa. Pre-irrigation, if needed, is especially important with surface water systems. Construct furrows or corrugations prior to planting.

Protect slopes from wind and water erosion during establishment. No-till seeding into small grain stubble can be particularly effective; however, annual weeds and volunteer grains must be controlled. Erosion can be reduced by using minimum tillage methods that permit crop residue to remain on the soil surface. Companion crops can reduce the hazard of erosion, but they must be removed before they compete excessively with new alfalfa seedlings.

#### **5. Plant productive varieties.**

Plant high quality seed of varieties with a high yield potential. Common seed or uncertified varieties are poor choices. Small annual yield increases will pay for the greater cost of high quality seed.

Select varieties with a winter survival index of three or less for stands that are expected to last for three to four years. Plant varieties with a winter survival index of less than three for stands expected to last more than four years. Since diseases and insects can be problems for alfalfa, select varieties resistant to pests common to your area. In fields that are likely prone to problem weeds, glyphosate-resistant varieties may be a good choice.

#### **6. Use inoculated, fungicide-treated alfalfa seed.**

Inoculating seed with the proper type of Rhizobium bacteria helps alfalfa form effective root nodules that convert nitrogen from the air in the soil into a form that plants can use. Thus, nitrogen fertilizer is not needed except in low pH soils as noted in Step 2.

Although Rhizobium bacteria often are present in soils that grew alfalfa recently, inoculating alfalfa seed is relatively inexpensive compared to the risk of poor nodule formation by these local bacteria. Most alfalfa seed is sold pre-inoculated, providing the necessary bacteria. In these instances, extra inoculation may not be necessary at seeding. Pre-inoculants, however, can be

damaged during handling and storage, especially from excessive heat. With late summer plantings or when using carryover seed, add fresh inoculum at planting time to help insure adequate nodule formation and nitrogen fixation.

Fungicide-coated seed will protect seedlings from various diseases. In some soils, seed coatings that include micronutrients needed by alfalfa plants or their associated Rhizobium bacteria as well as various additives to improve germination, seed handling, and survival may be useful. Many commercial seeds have these materials already attached.

Commercially coated (treated) seeds weigh more per seed than do raw seeds. Thus, at any specific seeding rate, coated seeds provide fewer seeds per acre than raw seeds. However, most research has shown that seeding rates should remain the same for raw and coated seed because the seed coating increases seedling survival sufficiently to offset the difference in the total number of seeds planted.

#### **7. Select pure alfalfa or an alfalfa-grass mixture.**

Pure stands of alfalfa usually produce the highest protein yield and often the highest tonnage on soils well suited for alfalfa. For certain classes of livestock, such as lactating dairy cows, pure alfalfa usually provides greater milk production potential than alfalfa-grass mixtures.

Grasses are sown with alfalfa for a number of reasons. Grasses fill in gaps in alfalfa-grass stands caused by poor alfalfa establishment or winter-killing. Grasses reduce weed invasion and soil erosion. If alfalfa is grazed, bloat is less likely to occur when two-thirds or more of the stand is grass. Alfalfa-grass mixtures cure more rapidly and ensile more easily than pure alfalfa. Damage from rain on windrows or outdoor-stored hay often is less for alfalfa-grass mixtures. Also, alfalfa-grass mixtures often provide a more balanced protein-to-energy ratio than pure alfalfa for many classes of livestock if this forage is the primary component of the diet. Most of the production from grass occurs at first cutting, so there is less advantage to having grass at later harvests.

#### **8. Seed at proper rates and dates.**

Seeding rates shown in *Table 1* assume that recommended seeding practices will be followed. Higher seeding rates can be beneficial in some situations. Higher seeding rates may stabilize erosion-prone soils more rapidly. Higher seeding rates often develop a full canopy more rapidly, providing better competition with weeds. Increasing seeding rate as much as 50 percent can overcome some, but not all, shortcuts or failures in following recommended seeding practices; however, sowing additional seed may not improve a stand when poor seeding management is used.

Seed alfalfa between April 1 and May 15 in eastern and southern Nebraska, between April 15 and May 15 in western and northern Nebraska, or in August at all locations. When alfalfa seedlings emerge in spring, they are very cold-tolerant. Seedlings will become more susceptible to injury from prolonged freezing temperatures after they reach the second trifoliolate stage of development. Seeding can be extended to May 31 in irrigated fields where good weed control is practiced.

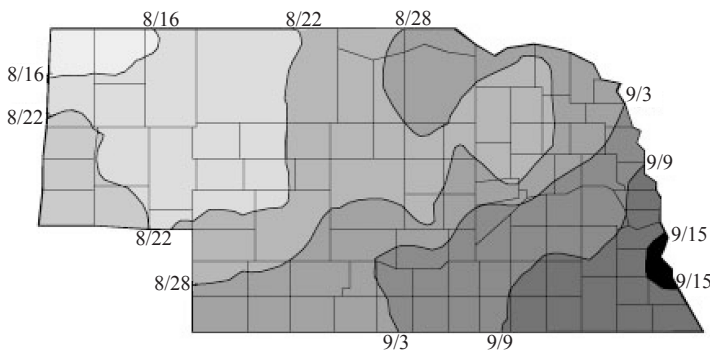
Soil moisture usually is favorable for plant establishment in early spring, but weeds can be a problem. August seeding avoids most weed problems, but depends on soil moisture, fall rains, or irrigation, and an adequate time for the plants to develop strong roots to survive the winter. Seedlings from a late-summer planting usually need about six weeks of growth after emergence and

**Table I. Seeding rates for alfalfa and selected alfalfa-grass mixtures grown for hay on dryland or under irrigation.**

<i>Dryland<sup>1</sup></i>	<i>Pounds per acre</i>
Alfalfa alone	12
Alfalfa	12
+ Oats	20
Alfalfa	8
+ Smooth brome	4
Alfalfa	8
+ Intermediate wheatgrass	6
Alfalfa	8
+ Orchardgrass (eastern third of state)	2
+ Smooth brome	3
<hr/>	
<i>Irrigated</i>	
Alfalfa alone	15
Alfalfa	15
+ Oats	20
Alfalfa	8
+ Orchardgrass	4
+ Smooth brome	4

<sup>1</sup>Dryland seeding rate may be decreased 30-40 percent in very dry areas like western uplands or increased 30-40 percent on subirrigated sites.

reach the second trifoliolate growth stage to survive the winter. Plant at least six weeks before the first hard freeze (28°F) in your area (Figure 2). If irrigation is not available, often it's wiser to delay seeding until the next spring than to risk seeding into dry soil in late summer.



**Figure 2. Planting before the indicated date usually provides at least six weeks before the first hard freeze (28°F).**

### 9. Use proven seeding methods.

Seed alfalfa 1/4 to 1/2 inch deep in fine-textured soils and 3/4 inch deep in sandy soils. Seeds placed too shallow may fail to establish healthy plants. Seedlings that develop from seeds placed too shallow will dry out rapidly and die or develop poor roots. Seeds planted more than 1 inch deep may be unable to reach the surface and emerge after germinating.

On firm, clean-tilled seedbeds, use a drill equipped with adequate depth control methods and packer wheels. This is usually the most reliable seeding method. Double seeding — seeding one-half of the seed while driving in one direction and the other half while driving at a right angle to the first pass — often results in more seedling ground cover and may improve success on erosive or potentially weedy sites. Double seeding also is more useful when the drill row spacing is more than 7 inches.

Another excellent method of seeding involves using specially built or modified drills that place seed directly into the stubble of

small grains without further seedbed preparation. This method is especially well-suited for sandy, erosive soils in central and western Nebraska. Stubble-seeding will not work well if weedy grasses or volunteer grain plants are abundant. Light disking or herbicides can control moderate amounts of weeds. Stubble seeding also is difficult if excessive straw remains. Remove excess straw by baling or chopping.

Seeding equipment that places seed between two corrugated rollers works well on fine- to medium-textured soils that have good moisture retention and a low erosion potential. Do not use the roller-type seeders on sandy soils because seedlings often dry out and die due to shallow seed placement.

Alfalfa seed also can be distributed broadcast using a fluid fertilizer applicator in a carrier of water or fertilizer solution. This requires special equipment and experience for good seed suspension and distribution so custom application often is recommended. Alfalfa seed also can be broadcast using a floater or dry spreader but is less likely to produce acceptable alfalfa stands compared to other methods.

Compared to drills and roller-type seeders, broadcast applications have less control of seed distribution and seeding depth. Seeding rate often must be increased about 25 percent for similar stand success. Leave more loose soil on the seedbed than when using a drill. After broadcasting, use a roller, packer, or flat harrow to get light soil coverage and to firm soil around the seed. Two passes with this equipment may be needed. Disking after broadcasting often places seed too deep in the soil. Sprinkle irrigate to firm and moisten soil. Do not use surface or flood irrigation soon after planting due to excessive seed displacement.

### 10. Manage companion crops carefully.

Companion crops (often small grains called “nurse” crops) are sometimes planted with alfalfa to provide rapid soil stabilization and seedling protection. They should be used only when needed. Otherwise, seed the alfalfa alone.

Do not plant companion crops to obtain a grain crop during alfalfa establishment. Companion crops compete with alfalfa seedlings for light, moisture, and soil nutrients just like weeds. Waiting to harvest grain from companion crops risks stand loss of alfalfa. If a grain crop is desired, plant the crop without alfalfa and then seed alfalfa into the stubble of this crop at a later date.

Remove the competition of the companion crop as soon as possible. One method is to spray a post-emergence grass herbicide labeled for use on alfalfa when the small grain is 4 to 6 inches tall if only a small grain is used as the companion crop. Delaying removal so hay or silage can be harvested is discouraged due to the extra competition. If it is harvested, however, remove no later than the boot stage of the small grain.

Oats is one of the better companion crops for spring- and fall-seeded alfalfa. Seed only about 20 pounds of oats per acre to prevent the oats from competing severely with young alfalfa seedlings. Only use oats that are free of weed seed. Do not use wheat, rye, triticale, or barley because they often are too competitive for alfalfa seedlings.

Peas also have been used as a companion crop, either alone or in combination with oats, to increase the protein concentration of the companion crop harvested as forage. Do not use peas in semi-arid regions because they can be very competitive with alfalfa seedlings. Seed 50 to 60 pounds of pea seeds per acre if used alone or 30 pounds per acre if planted in combination with 15 to 20 pounds of oats per acre. Remove the peas before oats reach the boot stage to minimize competition stress on alfalfa seedlings.

**Table II. Trouble-shooting establishment problems.**

<i>Symptom</i>	<i>Possible causes</i>
Poor growth; entire leaf is light green or yellowing with lower leaves affected first.	Poor nodulation due to low soil pH, wrong kind or lack of live inoculum bacteria, or death of inoculum due to direct exposure to fertilizer
Poor growth; yellowing or whitening of leaves along veins	Spotted alfalfa aphid
Poor growth; V-shaped yellowing at leaf tip	Potato leafhopper
Irregular, uneven emergence; stand better in wheel tracks	Seedbed not firm enough before planting
Irregular, uneven emergence; stand worse in wheel tracks	Soil compaction or crusting, possibly due to seeding when surface soil was too moist
Irregular, uneven emergence; stand varies in broad strips	Uneven distribution of broadcasted seed; change in soil type; herbicide injury; variable tillage
Thin, irregular stand emergence	Incorrect depth of seeding; poor seed quality; poor growing conditions; cloddy seedbed; soil crusting; autotoxicity (alfalfa into alfalfa); nematodes, weeds
Row skips	Planter empty; planter malfunction; insufficient control of depth of seeding
Dead seedlings	Phytophthora root rot; damping off; seedling blight; herbicide injury
Stems of seedlings cut	Webworm; cutworm
Leaves stripped off seedlings	Fall armyworm

## 11. Control weeds.

A firm seedbed free of growing weeds will provide alfalfa seedlings with a suitable environment for rapid growth. During establishment, limit irrigation with ditch water that can carry many weed seeds or be prepared to use extra weed control measures.

On non-erosive soils, seeding alfalfa alone and using preplant-incorporated herbicides for weed control usually will develop productive alfalfa stands most rapidly. Do not use these herbicides if a grass companion crop or an alfalfa-grass mixture is seeded. Preplant-incorporated herbicides will injure or kill small grain and grass seedlings. For more information see the *Guide for Weed Management in Nebraska* (EC130). Most small broadleaf and grassy weeds can be controlled in alfalfa seedings by using post-emergence herbicides. Do not use 2,4-D. Depending on the herbicide used, alfalfa may need to have at least two to four trifoliolate leaves to avoid herbicide injury. Some herbicides restrict use by livestock for at least 30 days after spraying. Be sure to follow label instructions whenever using a herbicide.

Glyphosate-tolerant alfalfa varieties should receive an initial application of glyphosate between emergence and 4<sup>th</sup> trifoliolate leaf growth stage to remove alfalfa seedlings that are not tolerant to glyphosate as well as to control weeds that are present. Remaining alfalfa plants will quickly grow to fill any gaps left by dying seedlings.

Sometimes pesticide use may be undesirable or herbicides may provide only partial control. If this happens and weeds are shading new alfalfa seedlings, clip the weeds at a height (usually 4 to 6 inches of stubble) that allows most leaves to remain on the alfalfa seedlings. Clip while weeds are short and use mowing equipment that will not smother young alfalfa seedlings with weed clippings. Remove clippings if they might smother seedlings.

## 12. Manage new stands carefully (*Table II*).

Observe soil moisture conditions closely on sprinkler-irrigated fields during germination and the first several weeks of growth, especially with late summer plantings. Moisture is needed for seeds to germinate and seedlings to develop, but excessive irrigation can cause erosion, soil crusting, and promote seedling diseases. Irrigation prior to planting helps reduce the need to irrigate frequently to aid establishment, lowering the risk of these problems occurring. Delay surface irrigation until plants are well rooted and avoid prolonged soil saturation.

Do not harvest alfalfa seeded during summer until the following spring. Allow spring seedings to start to bloom before all harvests during the year of seeding.

Grazing seedling alfalfa generally is discouraged and should only occur after plants start to bloom and when the soil surface is dry and firm enough to minimize physical damage to the crown or root by animal hooves.

Never harvest new stands between mid-September and mid-October; it is better yet to not harvest at all after mid-September. Stress from harvest during this period will disrupt development of winterhardiness, potentially causing more winterkill and thinner stands the next spring.

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