

# Managing Depleted Alfalfa Stands: Overseeding and Other Options

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The productivity of alfalfa fields typically declines over time due to loss of plants and weakening of crowns from disease or other factors. These factors include traffic injury, nematodes, insect damage, weed competition, winter injury, compaction of soils, saturated soil, drought and heat stress, and rodents. As stands decline, weeds invade open areas and become more difficult to control. Eventually, yield and forage quality decline to a point where a difficult decision must be made as to whether to keep or remove an alfalfa stand.

Compelling economics may encourage some growers to remove old alfalfa stands to plant crops of higher value. Alternatively, lack of rotation opportunities may encourage others to look for ways to extend the life of their alfalfa stands, including overseeding grasses or legumes to improve productivity. Continuing to harvest a depleted stand may not be economical, especially when yields fall significantly, such that the costs of production exceed potential returns.



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## Chapter 15

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There are three basic options for dealing with depleted alfalfa stands:

- Continue to harvest a marginal stand.
- Remove the stand and rotate to another crop.
- Attempt to increase yield and extend the stand longevity by overseeding or other measures.

This chapter provides a framework for this decision.

## Analyze the Economics of Stand Removal

The relative economic value of each of these choices is the primary consideration for managing depleted alfalfa stands. An economic analysis should include an analysis of the returns for maintaining the old stand without renovation, the value of a potential rotational crop, and the costs associated with overseeding the stand and its potential market value. The anticipated yield, quality, and price of alfalfa produced from a new, renovated field or overseeded forage crop must be compared with continuing to harvest a marginal stand.

Unfortunately, the economics of stand removal are difficult to assess due to the many factors involved (see sidebar). Weed or pest pressures, excessive soil compaction from wheel traffic, or irrigation problems may dictate that depleted stands be removed. Crop rotation opportunities may encourage growers to remove old alfalfa stands and plant crops of higher value. Alternatively, production of alfalfa mixes may provide a significant market opportunity for the horse market, causing growers to consider overseeding old stands with grasses or legumes. In each of these cases, the relative costs and potential returns of each option must be considered. The agronomic advantages of crop rotations that break disease cycles and assist in managing weeds and the opportunity for soil renovation should not be forgotten in an economic analysis.

## Continue Harvesting Depleted Stands?

An obvious (and the easiest) choice is to continue to harvest a depleted stand. However, this may be the least desirable choice from an economic perspective, because yields may decline 20, 30, or even 50 percent less than normal in older or damaged stands. A decision to continue harvesting may raise the cost of production per ton, since most costs (irrigation, harvesting, land) are fixed. Additionally, quality is usually very low in depleted stands because of weed intrusion, further reducing the potential value of the crop. Once yields have fallen 25 percent below normal and weeds become a factor, an evaluation of the field should be made.

Sometimes, lower yields are due to fertility or irrigation problems. If alfalfa stands are good, the roots are healthy, and weeds can be controlled, analysis of the soil and plants to correct fertility problems may enable growers to improve productivity of older stands. If root systems are disease-free and absent of soil com-

### Factors to consider when deciding whether to replace, extend, or overseed an alfalfa stand

- Plant population of existing stand
- Vigor of remaining plants
- Projected yield and quality of old versus new stand
- Rotational crop opportunities
- Weed intrusion in the old stand
- Chronic traffic damage of existing stands
- Degree of soil compaction
- Irrigation problems necessitating soil tillage or leveling
- Fertility status of the field
- Market opportunities for mixed alfalfa–grass or overseeded crop

paction and nematodes, sometimes older fields can be brought back through fertilization (if nutrients are limiting), careful irrigation practices, and lengthening the cutting schedules. However, reclaiming an old stand with cultural practices is usually unsuccessful.

More often, older stands that are compromised by diseased and weakened plants, low plant populations, or weeds are candidates for either crop rotation or overseeding (Fig. 15.1). Although stand persistence is a desirable quality in alfalfa, growers should take a hard economic look at depleted stands and rotate to other crops or overseed to renovate older stands, rather than to continue harvesting sub-optimum fields.

### When Do Alfalfa Stands Become Questionable?

Stand viability is often evaluated by measuring the number of plants or stems per unit area. Under most conditions, when alfalfa stands fall below four to six plants per square foot, yields begin to decline. However, numbers of plants are not the only factor. The health, size, and regrowth potential of individual plants are also important to determine the viability and regrowth potential of alfalfa stands.

Table 15.1 shows common plant densities for alfalfa in the seedling stage and subsequent production years, as well as those for older stands. The number of stems per unit area is usually more important than plant density because the number of stems determines crop yield and also affects competition with weeds through canopy cover. Stem densities above about 55 stems per square foot have been found to adequately maintain yields whereas some yield reduction is expected from 40 to 55 stems per square foot. Growers should consider some type of renovation when stem densities fall below approximately 39 stems per square foot (Table 15.2). If stem counts are generally above this level and weeds are kept in check, continuing to harvest the crop may be the best strategy.

It is also important to examine the health of existing plants to identify problems that would shorten regrowth potential of the stand. Dig up 15–20 plants over a representative

area of the field. Roots from plants with considerable root disease (e.g., *Phytophthora* or *Rhizoctonia* root rot as discussed in the alfalfa disease chapter, Chapter 10) should be compared with healthy, white roots. The size of the

**FIGURE 15.1**

When stands fall below an acceptable level, crop rotation or overseeding are the most viable options.



**TABLE 15.1**

Common stand densities for alfalfa in various years of production. Stands are considered suboptimum when they fall below 3–6 plants/ft<sup>2</sup>, but numbers of stems per unit area (see Table 15.2) is more important than numbers of plants

Production year <sup>1</sup>	Stand density (plants/ft <sup>2</sup> )
Seedling stand	> 25 (range 25–80)
End of year 1	15–25
End of year 2	10–15
End of year 3	6–12
Old or weakened depleted stands	< 4–6, consider replacing stand or overseeding with another forage.

**TABLE 15.2**

The impact of stem density on the yield potential of alfalfa\*

Stand density (stems/ft <sup>2</sup> )	Effect
> 55	Stem density does not limit yield.
40–55	Some yield reduction is expected.
< 39	Consider replacing stand or overseeding with another forage.

\*Adapted from University of Wisconsin recommendations (Undersander et al., UW Extension Bulletin A3620).

root and crown and the number of vigorous buds on the crown are also good indicators of plant health and regrowth potential. Although some disease is typically present in older fields, stands with more than 50 percent moderately or severely diseased plants will likely have continued plant losses and yield reduction.

## The Advantages of Crop Rotation

When the costs of producing alfalfa hay negate net returns, rotation to another crop has a number of advantages and is generally the recommended practice. Crop rotation after 4–5 years of alfalfa production has a range of benefits to the succeeding crop. First, crops following alfalfa receive a “free” source of residual nitrogen from the nitrogen-fixing nodules in the alfalfa roots. Disease problems for alfalfa or for other crops (e.g., corn, cotton, wheat)

are also reduced by crop rotation. Improved soil tilth (the crumbliness or structure of the soil) is additionally benefited by years of alfalfa production. Growers of tomatoes or specialty crops frequently try to follow alfalfa because of the soil tilth or rotational benefits to the succeeding crop. If a grower plans to plant alfalfa in the same field again, rotation of 1 or 2 years with another crop is recommended to reduce potential pest and disease problems.

## Overseeding to Extend Stand Life

In years when the hay market is strong and rotational crops are not profitable, it may be desirable to overseed a depleted alfalfa stand to increase yields and extend stand life. Overseeding another forage species into a depleted alfalfa stand can significantly improve the yield and marketability of older or damaged alfalfa stands. However, the overseeded species and the harvest schedule must match the needs of the market, whether dairy, dry cow, or horse market, and be compatible with available harvesting equipment. Potential overseeded forage species include annual and perennial grasses and legumes (Fig. 15.2).

**FIGURE 15.2**

Oats overseeded into alfalfa is a short-term (one cut) option for older alfalfa stands.



## Establishing Overseeded Crops

All recommendations for successful stand establishment of forage crops apply equally or perhaps to a greater degree to the planting of overseeded crops into alfalfa (see Chapter 4, “Alfalfa Stand Establishment”). This includes good seedbed preparation, optimum planting date, selection of appropriate varieties, and good irrigation management.

Seedbed preparation, or evaluation of seedbed conditions, is very important for successful establishment of any crop overseeded into existing alfalfa stands. Usually, a minimum amount of tillage is required, but no-till seeding can be used under some conditions. The objective is to break up the soil surface in the top 1–3 inches with just enough tillage to kill weeds but with minimal damage to alfalfa crowns. Normally, one pass with a spring tooth

harrow or a light disking is all that is needed. If weed pressure is high or if the ground is hard, two passes may be needed. Before tillage, excessive weed growth can also be removed with herbicides (see Chapter 8, “Weed Management in Alfalfa”), but caution is advised because new seedlings may be affected by the herbicides (consult label for plant-back restrictions).

After seedbed preparation, planting can be accomplished by broadcasting or using a drill or no-till seeder, depending on seed size. The field may need to be rolled (using a ring-roller or other device) after broadcast planting to firm the seedbed, break clods, optimize soil–seed contact, and enhance germination. Overseeding can also be performed using a conventional grain drill without tillage, if the soil is sufficiently soft to allow penetration by the drill and to cover the seed, and if weed infestations are minimal.

Irrigation of overseeded forages is usually beneficial for promoting early germination, which leads to a uniform plant population and vigorous seedling stand. Failures of overseeded species are often due to insufficient water in the root zone of shallow-rooted seedlings and competition for water and light. Selection of seeding rates and planting times depends on location, circumstances, and the species being planted. Seeding rates and timings are provided in Table 15.3. Early fall irrigation of cool-season overseeded species helps the seedlings to become established and compete against winter weeds and diseases. Time of seeding has a potentially large effect on success of overseeding because different species have different optimum conditions for seedling development.

**TABLE 15.3**

Seeding dates and rates for crops overseeded into alfalfa

Crop	Sacramento– San Joaquin Valleys	Seeding rate	
		lb/acre	kg/ha
Cereals (oat, barley, wheat, triticale)	Oct–Jan	40–60	45–67
Annual ryegrass	Oct–Dec	4–8	4.5–9
Berseem clover	Oct–Dec	6–12	6.7–13.4
Bromegrass	Sept–Nov	20–30	22–33
“Kemal” festulolium	Sept–Nov	4–8	4.5–9
Orchardgrass	Sept–Nov	4–8	4.5–9
Perennial ryegrass	Sept–Dec	4–8	4.5–9
Red clover	Oct–Dec	8–12	9–13.4
Sudangrass	May–Jun	40–100	45–67
Tall fescue	Sept–Dec	4–8	4.5–9
Teff	May–June	4–8	4.5–9
Timothy	Not practiced	4	4.5–6.7

### Selecting the Right Species for Overseeding

The species selected for overseeding depends on how long growers want to keep their alfalfa stands. The species selected can affect yield, forage quality, and the suitability of the forage for the end market (see sidebar). Perennials are appropriate to increase the stand life for more than a year, whereas annuals would be used to extend the stand life for only 1 year or less. Legumes are high-quality forages that are suitable for the dairy market, whereas grasses are primarily appropriate for the horse hay or dry cow market. Overseeded forages may also increase the drying time of early spring harvests, especially those species that increase biomass. In addition, grasses overseeded into alfalfa will require nitrogen applications to maintain high yields, which may be costly. Although alfalfa fixes its own nitrogen, it does not generally produce enough to maximize grass yields in the mixture.

Overseeding grasses into alfalfa creates a forage mix that generally has lower nutritional value than alfalfa hay. However, grass–alfalfa mixtures generally provide sufficient energy

and protein for most pleasure horses, and demand for these mixtures by the horse market has been strong in recent years. These grass–alfalfa forages are also highly acceptable for dry cows, beef cattle, and other livestock. Typically, grass–alfalfa mixtures, especially mixtures with cereals, produce higher yields than legume–alfalfa mixtures.

Overseeding legumes into declining alfalfa stands creates a different forage product than does overseeding grasses. Most clovers are comparable to alfalfa in nutritional value and therefore may be better suited for lactating dairy animals. Tests have shown the crude protein and fiber content of several clovers are similar to dairy-quality alfalfa hay when cut at an appropriate stage. Clovers are not affected by the Egyptian alfalfa weevil and can withstand poorly drained, saturated soil conditions that are detrimental to alfalfa.

### Factors to consider when selecting the most appropriate species and cultivar for overseeding in alfalfa

- **Length of time.** Determine how long the field will be in production (annuals vs. perennials).
- **Market.** Consider forage quality and appearance for the dairy, horse, or other livestock market.
- **Yield.** Use variety trial results or local experience to determine the yield potential of the different species.
- **Quality.** Alfalfa and grasses differ significantly in quality, and there are differences between warm-season and cool-season grasses in quality.
- **Disease management.** Select species and cultivars that are known to withstand diseases.
- **Harvest compatibility.** Some forages (e.g., berseem or ryegrass) may need to be grazed or green-chopped in the early spring due to lengthened drying time.

## Overseeding Annual Grasses

Cool-season annual grasses make the greatest yield contributions to forage mixtures

early in the growing season and decline by midsummer. For this reason, using an annual grass is an appropriate choice if the alfalfa is to be removed after one or two cuttings in the late spring. Annual cool-season grass species used for overseeding include cereals such as wheat, barley, oat, triticale, and annual ryegrass. Sudangrass and teff are warm-season annual grasses to consider for seeding in spring and summer.

*Using an annual grass is an appropriate choice if the alfalfa is to be removed after one or two cuttings in the late spring.*

**Cereals:** Wheat (*Triticum aestivum* L. ssp. *aestivum*), barley (*Hordeum vulgare* L.), oat (*Avena sativa* L.), and triticale (*Triticum aestivum* × *Secale cereale*) grow best under cool temperatures and provide a single high-yielding spring forage cut, or, if harvested early, in one or two harvests. Oat is the most common cereal crop used for overseeding and has a well-established demand for horse or dry cow hay. Hooded (or beardless) barley, wheat, and triticale are also seeded into alfalfa, making excellent forage quality if harvested at the right time. Overseeded cereal forages are a high-yield, short-term option and appropriate for green-chop, haylage, and haying situations, and fit well with dairy and municipal waste applications. However, cereals can be very aggressive and often outcompete the remaining alfalfa, so stands are generally finished and renovated after the harvest is complete.

**Annual Ryegrass** (*Lolium multiflorum* Lam.).

Annual ryegrass (or Italian ryegrass) is a cool-season grass that is popular because of its high yield potential, high palatability, and ability to withstand wet, saturated soils and accept quantities of dairy wastewater. Alfalfa–ryegrass mixtures have gained popularity for the horse and dairy industries. Like cereal grains, annual ryegrass is also planted in the fall but provides multiple harvests in the spring through early summer, depending on the weather. Yields decline in midsummer. Ryegrass is often more palatable to grazing livestock than other grasses. Ryegrasses consist of both diploid and tetraploid annual ryegrass, and Italian-type varieties. These differ in yield potential, heading dates, and forage quality; the tetraploid types are generally higher yielding, and the Italian types somewhat higher in quality.

**Sudangrass** (*Sorghum bicolor* [L.] Moench).

Sudangrass and sorghum–sudangrass crosses are warm-season, high-yielding grasses that can be overseeded into alfalfa in late spring or summer. These grasses thrive under high temperatures and do poorly under cool conditions. Sudangrass has been seeded into alfalfa stands late in the spring when alfalfa has been damaged from winter flooding and it is too late to plant cool-season species. Sudangrass hay is typically not favored by the horse or dairy markets, so markets should be carefully investigated before planting sudangrass. Sorghum–sudangrass crosses and sorghum (milo) types can be overseeded, but are more appropriate for silage harvests than hay.

**Teff** (*Eragrostis tef*). Teff (also spelled tef), an old-world crop and staple grain of Ethiopia, is currently being investigated as a fine-stemmed annual grass forage that would be planted in late spring or early summer. For situations where stands have been damaged by winter flooding or other hazards, teff may be overseeded in May or June, with an expected two to three harvests before fall. Teff produces fine-stemmed grass forage that may be suitable for dry cows or horses.

**Overseeding Perennial Grasses**

Perennial grasses are desirable for overseeding into alfalfa when the goal is to extend the life of the alfalfa stand for more than 1 year.

Alfalfa–perennial grass mixtures are usually quite appropriate for the horse hay market (Fig. 15.3).

Compared with annuals, perennial grasses are slow to establish, and one season is usually required before the full yield potential is reached. However, once established, they survive for several years and predominate in weak areas of the alfalfa stand. The relative proportion of grass to alfalfa usually increases as the stand ages because grasses are typically more competitive than the alfalfa. Perennial grasses will also dominate open areas and provide significant competition with undesirable summer weeds.

Several perennial grass species have been evaluated for overseeding into alfalfa

*Perennial grasses are desirable for overseeding into alfalfa when the goal is to extend the life of the alfalfa stand for more than 1 year.*

**FIGURE 15.3**

Perennial grasses such as orchardgrass overseeded into alfalfa create a desirable mix for the horse market.



in California. These include bromegrass, orchardgrass, perennial ryegrass, and “Kemal” *festulolium* (tall fescue + ryegrass cross), tall fescue, and timothy. These are all classified as cool-season grasses and produce best in spring and fall. Fall seedings are almost always much more successful than spring seedings, and summer seedings should not be attempted. No single perennial grass is best suited for all field and climatic conditions, markets, and locations.

**Bromegrass** (*Bromus* spp. [the species of *Bromus* used for forages are various]) as an overseeded forage has generally been much less competitive with alfalfa than have other grasses; it can be difficult to establish, and yields are usually lower than for other perennial grasses. Bromegrasses are more common in pasture mixes and for grazing than for haying situations.

**Orchardgrass** (*Dactylis glomerata* L.) is highly valued by the horse hay market. This forage is best suited for overseeding in cooler regions of California, such as the Intermountain area and the northern San Joaquin and Sacramento Valleys. However, orchardgrass is not heat tolerant, so production will decline during summer.

**Perennial ryegrass** (*Lolium perenne* L.) and “Kemal” *festulolium* (a ryegrass + fescue cross) perform well during the first and last parts of the harvest season in the Central Valley of California. Perennial ryegrass does not perform as well in cooler regions and has not persisted well in some colder-climate areas because of winter injury. The market is fair for horses if endophyte-free varieties are planted (“endophytes” are fungi that live inside plants).

**Tall fescue** (*Festuca arundinacea* Schreb.) is easy to establish, and it has been the highest-yielding perennial grass in several tests in different areas of California. Recently, higher-quality tall fescue varieties have been developed that may improve marketability for the horse and dairy markets. Some fescue varieties are known to harbor endophytes, so be sure to plant only *endophyte-free* or novel-

endophyte tall fescue varieties. Endophytes in fescue varieties produce anti-nutritional compounds that may negatively affect the health of some classes of livestock, including horses. The tall fescue endophyte-free variety is likely one of our best heat-tolerant options. If an alfalfa-grass mixture is desired for only 1 or 2 years, tall fescue may be a good choice because of its rapid establishment and high yield potential, but be sure to know your market and find a buyer who would be interested in fescue forages.

**Timothy** (*Phleum pratense* L.) hay is highly valued by the horse market and has high market acceptability for exports. Because timothy is adapted only to environments where cool summer weather and moist soil conditions prevail, it is only successful in cooler growing regions of our state. Timothy generally is not suited for California’s hot Central Valley and desert climates. Stand establishment of timothy can be extremely slow and difficult in overseeding situations. Even under favorable growing conditions, timothy does not yield as well as many other perennial grasses when overseeded into alfalfa.

## Need for Nitrogen Management

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To maintain good yields, growers should fertilize their mixed alfalfa-grass stands to supply sufficient nitrogen for optimum yields. Although alfalfa fields contain residual nitrogen after several years of production, this residual nitrogen is often depleted by the first growth of a high-yielding overseeded grass crop. Growers should calculate supplying from 40 to 60 pounds of nitrogen per ton of forage yield (from soil residual and fertilizer sources) to satisfy the nitrogen requirements of most grasses. Nitrogen applications also improve the crude protein content of alfalfa-grass mixtures. Nitrogen can be supplied by manures or commercial fertilizers.



## Overseeding Annual Legumes

Overseeding legumes into declining alfalfa stands offers some advantages compared with overseeding grasses. Legumes have higher crude protein and lower fiber than grasses, making them suitable for the dairy market.

*Clover–alfalfa mixed hays also make excellent feed for beef cattle and sheep and a highly acceptable feed for horses.*

Clover–alfalfa mixed hays also make excellent feed for beef cattle and sheep and a highly acceptable feed for horses. Clovers tolerate wet soils, thus they generally perform better than alfalfa on heavier-textured soils prone to flooding. In addition, clovers are not

affected by alfalfa weevils or alfalfa caterpillars, reducing the need for chemical control in legume-overseeded stands.

A disadvantage of clovers is their inability to remain a bright green color in the bale. High moisture environments or rain during curing will cause a browning of the foliage, an undesirable appearance that limits sales in certain markets where color is important. However, forage quality is not often affected; the quality of these clovers often rivals that of alfalfa, and they are very palatable.

There are a number of annual legumes that can be sown into existing alfalfa fields, including arrowleaf clover (*Trifolium vesiculosum* Savi), crimson clover (*T. incarnatum* L.), various annual medics (*Medicago* spp.), Persian clover (*T. resupinatum* L.), and common vetch (*Vicia sativa* L.). However, for California, the highest-yielding and most immediately adaptable annual legume for overseeding appears to be berseem clover (*T. alexandrinum* L.).

**Berseem clover** (*Trifolium alexandrinum* L.) is a vigorous, upright annual clover that closely resembles alfalfa (Fig. 15.4). When overseeded into alfalfa, berseem clover can significantly increase yield for the first three to four harvests. Berseem–alfalfa forage is of excellent quality, is bloat resistant, and is received favor-

ably by the horse and dairy markets. Berseem also tolerates wet soil conditions. Yields of sole-cropped berseem have averaged about 6.8 tons per acre in UC Davis trials and up to 8.5 tons per acre in the Imperial Valley of California. Timing the first harvest of berseem clover to achieve high quality and to avoid rain damage has been more difficult in the northern San Joaquin Valley than in the south. Later harvests are not a problem when the climate warms and drying conditions improve, but yields are reduced during midsummer regrowths. Long-term trials have shown berseem to be slightly lower in crude protein but lower in fiber (higher in total digestible nutrients) than alfalfa at the same cutting schedule.

## Overseeding Perennial Legumes

Overseeding perennial clovers may extend the life of a depleted alfalfa stand for 2, 3, or more years. Although several clover species may be grown, we have found red clover to be the most productive high-quality perennial clover for overseeding into alfalfa for hay production in Mediterranean zones.

**Red Clover** (*Trifolium pratense* L.) is higher yielding than many of the other clovers and has an upright growth habit suitable for haymaking, unlike many other forage clovers. Because

**FIGURE 15.4**

Berseem clover overseeded into old alfalfa fields provides several cuts of high-quality legume forage.



it is known for its tolerance of poorly drained soils, it may perform better than alfalfa in areas of poor drainage, such as field ends or areas compacted by harvest equipment. However, red clover hay also cures more slowly than alfalfa and turns a more brownish color compared to alfalfa. This is sometimes a negative for marketing, even though the quality of red clover and alfalfa by analysis is often quite similar. Red clover is considered a cool-season legume and is not likely to be appropriate for Low Desert Regions; berseem clover (an annual), however, is very well adapted to desert conditions.

## Overseeding Alfalfa into Alfalfa

When an alfalfa stand falls below the minimum population for optimal production, it is often tempting to think that overseeding alfalfa into the existing stand may “thicken” and improve

*The majority of attempts at overseeding alfalfa into older alfalfa stands have resulted in a failure for seedlings to establish or weak seedlings, resulting in no yield benefit at the year’s end.*

productivity. To the contrary, the majority of attempts at overseeding alfalfa into older alfalfa stands have resulted in a failure for seedlings to establish or weak seedlings, resulting in no yield benefit at the year’s end. There have been situations where this practice has been successful, such as in young seedling fields, but the limitations of this practice typically outweigh the benefits. Overseeding alfalfa into established alfalfa has been a common practice in the Low

Desert Region (Imperial Valley) of California and Yuma, Arizona, where it has been more successful than elsewhere in the United States.

## Allelopathy, Autotoxicity, and Competition

Alfalfa secretes chemicals that may inhibit the germination and growth of alfalfa seedlings, a biological process known as allelopathy. Allelopathy is the effect of plant exudates (chemicals released from existing plants) on the germination and growth of young seedlings. Alfalfa allelochemicals can affect the germination of many species, including alfalfa itself. When alfalfa is planted into an existing alfalfa stand, the inhibition of the growth of the seedlings is known as autotoxicity.

In practice, autotoxicity cannot be separated from competition for light, nutrients, and water from the older plants or the diseases present in older stands. Some researchers have recommended that overseeding never be attempted because of autotoxicity. However, in our experience, autotoxicity may not be as important as other factors, particularly sub-optimum seedbeds, irrigation problems, and competition from existing alfalfa plants and weeds in reducing success of stand establishment into existing alfalfa stands. Competition may be especially important because existing plants are thousands of times greater in size than young seedlings and easily shade out young plants or rob moisture from the soil surface. Under optimum conditions for seeding, such as the late fall planting in the Imperial Valley, seedling germination and growth is often successful in existing stands, when competition and growth of the existing stands are minimized. However, these new stands may still ultimately fail, owing to several factors that should be carefully considered.

## Overseeding Alfalfa into Older Alfalfa Stands

There are many reasons why planting alfalfa into alfalfa is problematic, especially in older stands. When considering overseeding alfalfa into alfalfa, it is important to determine the original cause for the stand loss. This will improve our ability to predict the likelihood of success. When did plant losses begin? Were losses caused by temporary conditions or by

long-term problems? Factors that will affect stand losses include poor soil drainage, flooding, salt toxicity, aggressive cutting schedules, irrigation mismanagement, equipment traffic damage, rodents, diseases, or an impermeable subsurface soil layer. In new stands, failure may be due to poor seed quality or seed placement that is too deep or too shallow, poor seedbed preparation, disease, weeds, insect problems, or flooding.

If the cause of stand loss is temporary and can be corrected, overseeding alfalfa has a higher chance of success. However, if the problem causing the original stand loss is recurring, the probability of success will be much lower. A careful analysis of these issues may prevent the wasting of seed and money on a reseeding project. The most frequent outcome of overseeding alfalfa into existing older alfalfa is that young seedlings are ultimately killed by the same factor (typically poor drainage, traffic, or irrigation problems) that initially killed the stand.

### Replanting into a Young Alfalfa Stand

The problems of reseeding into a new stand or older alfalfa stands differ. Seedling stands with a population that falls below 10 plants per square foot during the first few weeks after emergence may be a good choice for overseeding. Early stand failure may be a temporary and correctable issue if the failure is caused by poor seed quality, seed placement that is too deep or too shallow, poor seedbed preparation, disease, weeds, insect problems, bad weather, or temporary flooding (Fig. 15.5).

Growers are often faced with the question of whether newly seeded fields can be improved by overseeding. When overseeding is timed so that existing alfalfa plants are still small—less than 6 inches tall—and adequate soil moisture is available for new seed germination, the success rate is usually high.

Successful overseeding practices include the use of a disc-type grain drill (or no-till drill) without tillage to place seed 0.50–0.75 inches deep, with minimal disturbance of existing plants. If broadcast seeding methods (by ground or air) are used, the seed should be

pressed into the soil with a smooth or ring-type roller. Use of a spring or spike-tooth harrow is not recommended because it will remove or damage young, tender plants.

Overseed when the existing plants are small because large alfalfa plants create greater competition with the emerging seedlings.

Although there is some competition and autotoxicity from the existing young alfalfa plants, this is not as great in young, thin stands compared with older, more mature, and fully established plants.

Common overseeding rates of alfalfa range from 10 to 20 pounds per acre. It is important to have adequate soil moisture when overseeding alfalfa to ensure rapid and uniform germination, similar to the requirements for a newly seeded alfalfa field. The most frequent error in reseeding projects is to fail to irrigate the crop for the young developing seedlings, not the established stands. This moisture can be from rainfall, sprinklers, or flood irrigation. Competition from existing plants can be severe if the crop is not well watered.

*Seedling stands with a population that falls below 10 plants per square foot during the first few weeks after emergence may be a good choice for overseeding.*

**FIGURE 15.5**

Reseeded alfalfa in a young seedling field damaged by winter rains.



Compatibility with and crop safety of herbicide treatments for overseeding alfalfa should be checked. If the existing crop has been sprayed, some alfalfa herbicides will damage the germinating seedlings. Review the herbicide history of the field and read the pesticide label before overseeding. Recently, growers have discovered that overseeding of Roundup Ready alfalfa varieties has been successful, utilizing glyphosate (Roundup) to clear up weeds during the overseeding establishment process. This technology may provide flexibility for overseeding because glyphosate is less restrictive than other herbicides with regard to timing of application, crop or weed stage, and soil residual issues.

## Planting Alfalfa After Alfalfa

When alfalfa stands are removed, growers may be tempted to follow alfalfa with another alfalfa planting, or “back-to-back” alfalfa. Crop rotation has many benefits (as cited above) and is

*Back-to-back alfalfa should not be attempted if good rotation options are available.*

one of the most important principles of crop production; thus, planting alfalfa after alfalfa is not recommended. However, in some regions where few crop rotation opportunities exist, the back-to-back alfalfa option becomes especially attractive, and, although not recommended, establishment can be

successful, depending on a range of factors, including soil preparation, the presence of disease, and allelopathy.

The above discussion of autotoxicity and allelopathy is relevant here, since allelochemicals can remain in the soils after several years of alfalfa production. These may be more prevalent if the foliage (versus the root) is plowed under. However, in a study at UC Davis, alfalfa was planted immediately, 1 week, 2 weeks, and 4 weeks after plowing and tilling a 3-year-old existing stand in the fall. Stand density was

reduced when alfalfa was planted immediately and at 1 week, but not affected at 2 weeks or 4 weeks, compared with fallow controls. Yields the following spring were not affected at any of the replanting times. Similar results were seen in an earlier Michigan study, whereas other studies have found more long-term negative effects of the previous alfalfa crop on the germinating seedlings. Thus, the need for crop rotation may differ, depending on climate and soil type.

Although it is always recommended to practice crop rotation as the first choice, here are the factors that might make back-to-back alfalfa more successful:

- Do not plow down foliage—only roots.
- Allow enough time from plowdown to planting (minimum of 2 weeks, but a longer time is desirable).
- Pre-irrigate soils after tillage during warm periods to encourage rapid breakdown of plant material and allelochemicals before planting.
- Correct soil problems (e.g., deep tillage, land leveling) that may impact subsequent stands.
- Prepare a good seedbed, suitable for optimum germination.
- Plant at an optimum time for the region (typically September–October in most San Joaquin, Sacramento, and desert regions, but earlier in higher-elevation regions) to allow development of healthy plants before winter conditions prevail. Optimizing time of planting is very important.

Back-to-back alfalfa should *not* be attempted if good rotation options are available, or under conditions where fields are known to have had severe disease or nematode infestations, or where soil conditions cannot be corrected during the reestablishment period. Growers should also consider the multiple benefits of crop rotations, including weed control, disease and nematode suppression, and other factors that collectively are called the “rotation effect.”



## Summary

Managing older or weakened alfalfa stands is one of the most challenging aspects of alfalfa production. It is difficult to assess the benefits versus the costs of maintaining or removing the stand, and growers can lose considerable income by continuing to harvest depleted stands. Stands below four to six plants per square foot, and stems below approximately 39 stems per square foot, are candidates for crop rotation or overseeding. Crop rotation is often the best decision if yields and value of the alfalfa have been greatly reduced and if other crops of equal or higher value are available for planting.

Overseeding with perennial or annual grasses or legumes to extend stand life has proved to be economically viable for growers who have developed horse or dry cow markets for their hay. Overseeding alfalfa into existing alfalfa stands can succeed in young stands but is usually unsuccessful in older stands. Growers should determine whether the cause for the original stand loss can be corrected or overcome. Planting back-to-back alfalfa is not usually recommended but can succeed if growers use management practices that mitigate the negative effects of previous stands on germination and growth.



## Additional Reading

Canevari, M., D.H. Putnam, W.T. Lanini, R.F. Long, S.B. Orloff, B.A. Reed, and R.N. Vargas. Overseeding and companion cropping in alfalfa. University of California Division of Agriculture and Natural Resources, Oakland. Publication 21594.



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