MANAGEMENT OF DEPLETED ALFALFA STANDS

Steve B. Orloff[1]

Abstract: Deciding what to do with a depleted stand can be a complex decision in production areas with few profitable rotation crops. This decision should be based on an assessment of the productivity of the existing stand, using either production records or stand or stem density evaluations. When stand density has thinned sufficiently so that productivity or quality have declined and the stand is no longer profitable, a decision must be made regarding the fate of the stand. Management options include removing the stand and planting another crop, interseeding an annual or perennial forage species, or overseeding with alfalfa. Overseeding after the second to the last cutting of the year shows promise for increasing the alfalfa density in isolated areas of the field were the stand is poor.

Key Words: stand evaluation, interseeding, forage grasses, overseeding, auto toxicity, crop rotation

Introduction

Determining the proper management practice for older depleted alfalfa stands can be difficult. Should a thinning stand be removed, or could it be profitably harvested for another year or two? Or, is there anything that can be done to improve yield and prolong stand life? These are not important questions for many areas of California because more profitable rotation crops, such as cotton, and high-value vegetables, dictate alfalfa stand life. A 4- to 5-year stand life is all that is desired in these areas. However, for much of the Intermountain Region, alfalfa is the cash crop—rotation crops (primarily grain) are not as profitable as alfalfa. Therefore, growers wish to maximize stand life so that fields spend more time in alfalfa and less time in unprofitable rotation crops. With a long stand life, establishment costs can be spread over more years.

Evaluating a Stand

The first step in deciding the proper management practice for thin stands involves an accurate assessment of the productivity of the existing stand. Thorough production records and an understanding of the costs of production enable a grower to make an economic evaluation of different stand management options. A stand should be removed when its productivity has declined to such a degree that net profits would be greater if the alfalfa was removed and a new crop established. Oftentimes growers don't have sufficient field-by-field records to track the productivity of individual fields and another method is needed to evaluate the current or anticipated productivity of a stand. Also, weather factors contribute to seasonal differences in yield and make establishing a trend with production records difficult.

Methods have been developed to estimate the productivity of alfalfa stands. The most commonly used method is to count alfalfa crowns to determine the number of plants per square foot. It is generally agreed that once the plant population falls below three to five plants per

[1] Corresponding Author: Steve B. Orloff, Farm Advisor, University of California Cooperative Extension, 1655 S. Main St., Yreka, CA 96097

square foot, yield declines to such a degree that the stand should be replaced. However, a problem inherent with using stand counts to estimate productivity is that all crowns are counted equally. But, as everyone knows, a small weakened plant is not nearly as productive as a large, healthy plant. Therefore, stand count data can be misleading depending on the size and vigor of alfalfa plants. Because of this shortcoming, an alternative to stand counts has been developed by Dan Undersander, Extension Alfalfa Specialist in Wisconsin. His research has shown that stem count is a much more accurate method of estimating the yield potential of an alfalfa field than plant count. Stems are counted in the spring or fall when they are 6 to 10 inches tall. If the number of stems is over 55 per square foot, the stem density is not limiting yield (table 1). If there are fewer than 40 stems per square foot, consider replacing the stand. Although these values were developed under Wisconsin conditions, they can probably be used successfully for intermountain alfalfa fields.

Table 1. Stem density recommendations.

Stems/sq. ft.	Result
>55	Stem density is not limiting yield
40–55	Some yield reduction expected
<40	Consider replacing stand

Source: D. Undersander *et al.* Alfalfa stand assessment: Is this stand good enough to keep?

Factors other than productivity must be considered when deciding the proper management strategy for a stand. Pest pressure, such as disease, weeds, or rodents, may require that a stand be replaced before its production level indicates it is necessary. Rotation requirements, total acreage and type of forage desired, and the anticipated strength of the alfalfa market should also be taken into account when deciding the fate of an existing alfalfa stand.

Management Options

Once it has been determined that the productivity of a stand has declined to a level where action is necessary, stand removal is only one of the options. Alternatives to removing the stand and rotating to another crop include interseeding an annual forage species, interseeding a perennial forage species, and overseeding with alfalfa to thicken a thin stand.

Interseeding with an Annual Forage Species

It has become a relatively common practice to interseed annual grasses into depleted alfalfa stands. Oats are most commonly used; awnless (beardless) barley and wheat are used occasionally. The planting date for interseeding is typically late fall to early winter or late winter to early spring. The date depends on the production area and the annual forage species selected. Fields are harrowed prior to seeding to control emerged weeds and to prepare a suitable seedbed for interseeding. When cereal grasses are used, they can be broadcast or drilled, but drilling is more common. The cereal seeding rate typically varies from 50 to 75 pounds per acre (higher seeding rate is used with thinner alfalfa stands).

Many alfalfa purists question the idea of interseeding cereals into a thin stand of alfalfa: Why contaminate a high-quality forage like alfalfa with lower quality cereal hay? While this question is valid, there are several advantages associated with interseeding. Interseeded stands seldom need to be treated with an insecticide to control alfalfa weevil. If cultivation is properly timed, weeds are rarely a problem in interseeded fields. First-cutting yields are typically at least one ton higher than yields of older stands that have not been interseeded. Although the quality of

the hay from mixed grass-alfalfa stands is not acceptable for lactating dairy cows, it is well suited for other classes of livestock, such as beef cattle and horses. In areas with a well-developed horse hay market, the price differential between pure alfalfa and alfalfa-grass mixtures can be relatively small. Because of the reasons mentioned above, interseeding cereals into alfalfa can be economical. Research is currently under way to identify annual forages that can be interseeded into alfalfa (such as berseem clover) whose quality is comparable to alfalfa.

One of the problems with interseeding most annuals into alfalfa is that these plants do not recover after cutting. Therefore, they only increase first-cutting yields. Yields of subsequent cuttings may actually be reduced slightly compared with stands of pure alfalfa. For this reason, many growers choose to take only one or two cuttings from the field before removing the stand. An alternative that may extend the productive life of a stand as much as three years is to interseed perennials.

Interseeding with a Perennial Forage Species

There is increased interest in interseeding perennial grasses into depleted alfalfa stands. Perennial legumes, such as red clover and ladino clover, are also being investigated. Clover-alfalfa hay has higher forage quality than grass-alfalfa, but limited experience to date suggests that clover may not be able to compete as well with alfalfa as the grass species; therefore, it would be less productive.

Several perennial grasses have been evaluated for interseeding into alfalfa. These include tall fescue, perennial ryegrass, kemal festulolium (ryegrass x tall fescue cross), orchardgrass, Matua grass, and timothy. Researchers have indicated that ryegrass is the preferred species for interplanting in the Central Valley of California. However, under intermountain and high-desert conditions, ryegrass can be excessively competitive and choke out the alfalfa. Also, ryegrass does not persist well in some intermountain locations. Tall fescue is even more aggressive than ryegrass. It is so competitive after a few seasons, few alfalfa plants remain. The best adapted grass for intermountain conditions is orchardgrass. It is high yielding, yet not excessively competitive.

Seeding practices for perennial grasses are very similar to annuals, except seeding rate is lower and seeding depth is shallower because perennial grass seed is smaller. A disadvantage of perennial grasses compared with annual grasses, is the difficulty in establishing perennial grasses. Perennial grasses are generally smaller, weaker seedlings than cereal grasses and they are less competitive with alfalfa (this is particularly true with timothy). For this reason, seed perennial grasses before the alfalfa stand becomes too thin. This gives grasses an opportunity to become established before the alfalfa stand thins to such a degree that yield declines. An alternative to seeding in anticipation of a thin stand is to seed oats along with a perennial grass into an already thin stand. A low oat seeding rate, less than 50 pounds oats per acre, must be used or establishment of the perennial grass may be sacrificed.

There are several advantages to seeding perennial grasses into alfalfa rather than an annual cereal. The most obvious advantage is that perennial grasses will extend stand life for several years—fields are usually removed when the alfalfa density declines and grass composes the majority of the mixture. In experimental plots, yields are typically at least one ton higher in interseeded plots than untreated plots (tables 2 and 4). Chemical weed control is usually

unnecessary in interseeded fields because interseeded stands compete well with weeds. Lastly, market demand and price for perennial grass (primarily orchardgrass)-alfalfa mixed hay is usually higher than for oat-alfalfa or barley-alfalfa hay. Orchardgrass-alfalfa hay is now widely accepted and is desired by many feed stores catering to the pleasure-horse market. The price for orchardgrass-alfalfa hay is often only slightly less than that of "dairy-quality" hay.

Table 2. Seasonal forage yield following grass interplanting into established alfalfa. Lanini and Orloff, Lancaster, CA, 1993.

	Forage Yield (tons/A)		
Treatment	1992	1993	Total
		9.33	
		8.27	
		6.62	
		7.13	
		7.06	
		7.09	

Table 3. Proportion of forage composed of weeds following interplanting into alfalfa. Lanini and Orloff, Lancaster, CA.

	Percentage Weeds		
Treatment	1992	1993	Average
Tall fescue	4.5	0.0	2.2
Orchardgrass	2.9	2.0	2.4
Annual ryegrass	6.5	20.8	13.6
Kemal festulolium	1.6	2.5	2.0
Paraquat	16.0	27.0	21.5
Untreated	13.1	24.5	18.8
LSD 0.05	4.6	0.9	

Table 4. First-cutting yields of an alfalfa field the third year after interplanting. Butte Valley, CA, 1994.

Treatment	Forage Yield[1] (tons/A)
Tall fescue	2.77
Orchardgrass	2.64
Perennial ryegrass	1.30
Timothy	2.14
Untreated	1.94
LSD 0.05	0.84

1 Approximately 30 percent of the total forage yield of the untreated plots was weeds, whereas, the interseeded plots had almost no weeds present.

Overseeding

Thickening a sparse stand by overseeding with alfalfa has not been a recommended practice. It is considered risky; failures have been widespread and successes have been rare. In most cases, growers who attempted this practice were pleased with seedling emergence. Initial evaluations often suggested the practice was successful. However, after returning at a later date to reevaluate the stand, growers were disappointed with seedling survival. Seedling plants seem to gradually disappear and, except for the very open areas that have considerable distance between established plants, only the original stand remains a few months after planting. Several reasons may explain the disappearance of seedlings. Pests such as diseases and nematodes build in established stands and attack seedling plants. Alfalfa has been found to be autotoxic—it releases chemical compounds that inhibit the establishment of other alfalfa plants. Although pests and autotoxicity may contribute to overseeding failures, the primary cause is most likely due to competition. Seedlings are unable to compete with established plants for water, nutrients, and light.

Timing may explain some of the overseeding failures. Traditionally, overseeding is done in spring or fall. With spring overseeding, seedlings may emerge just as established plants break dormancy. The established plants soon overtop seedlings. Sunlight does not penetrate the canopy and reach the seedlings until the field is cut, usually 2 to 3 months after overseeding. By that time seedlings have become extremely weak and may have died. The weakened seedlings are often unable to survive the dry soil conditions that occur after the field has been cut until it is irrigated again.

Fall overseeding is done after the last harvest of the season. This is usually later than the optimum planting time. Temperatures are cool and seedlings develop very slowly. They may be too small to survive the winter and, if they do survive the winter, they have to contend with competition from established plants in spring.

An alternative timing for overseeding is after the second to the last cutting of the season. The field is irrigated as you would a seedling alfalfa field—light frequent irrigations. Seedlings emerge and develop under the canopy of the established plants. The field is typically cut 1 month after seeding (in contrast to 2 to 3 months for a spring seeding). The seedlings may be the height of the cutter bar when the last cutting is made and, therefore, the seedlings are not damaged significantly when the field is cut. Established plants usually go dormant soon after the last cutting, while seedlings continue to grow and develop. Plants are well established by spring and are able to compete with the original stand.

The effectiveness of overseeding after the second to the last cutting is currently being studied in Siskiyou County, California and Nevada. Although initial results of overseeding at this time show potential, it should not be considered a substitute for removing a stand and rotating to a different crop before replanting alfalfa. There are numerous benefits to crop rotation; it disrupts disease cycles, may be useful for controlling weeds, rodents, and insects, and may improve nutrient availability. Overseeding may be useful to thicken fields when only a portion of the field has a poor stand or when stands have thinned prematurely due to drought. However, if stands have thinned as a result of ponding water or another such problem, overseeding will not be successful until the problem that initially caused the poor stand is alleviated.

Conclusion

Evaluate older stands to avoid production losses that result in reduced income. Stands can be evaluated by observing production trends or using estimations of stand density, plant or stem counts. When evaluations indicate that action is necessary, stands should be removed or stand life extended by interseeding with an annual or perennial forage species. Overseeding weak portions of the field shows promise for extending stand life, but further research is needed before this practice can be recommended.

References

Chamblee, D. S., and M. Collins. 1988. Relationships with other species in a mixture. In A. A. Hanson, D. K. Barnes, and R. R. Hill, Jr. (eds.). Alfalfa and alfalfa improvement, 439–61. American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America. Madison, Wisconsin. Number 29.

Orloff, S. B. 1993. Grass interseeding into established alfalfa. Proceedings, 12th Annual Nevada Regional Alfalfa Symposium, 93–8. February 17–18. Sparks, NV.

Undersander, D., C. Grau, D. Coscrove, J. Doll, and N. Martin. 1994. Alfalfa stand assessment: Is this stand good enough to keep? Madison, WI: Cooperative Extension Publications, University of Wisconsin–Extension. Publication A3620.