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Improve Your Forage Seeding Management

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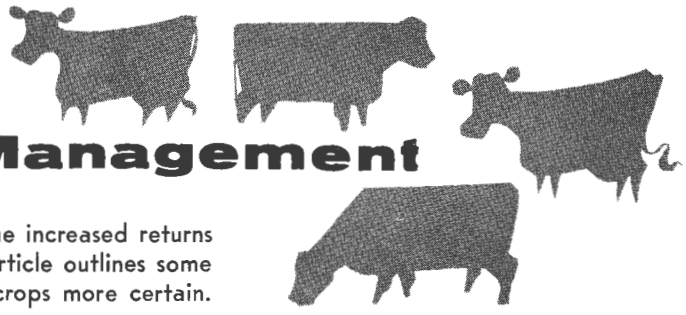

Research results again and again have pointed to the increased returns possible through better forage management. This article outlines some of the practices to make your success with forage crops more certain.

by J. M. Scholl and J. G. Wheat

TO OFFSET rising production costs and lower returns, there's plenty of emphasis today on efficient management in most phases of farming. But there's been less on-farm progress in improving forage seeding methods and management.

Many of the poor, low-yielding forage stands around the state are simply the result of not using the practices known to produce better results. Part of this may be due to the greater emphasis on the cash crops in the rotation—with the forage crop treated as a "fill-in" between the crops producing a direct cash income. Research at many of the state experiment stations, however, again and again has pointed to the increased returns possible through improved forage management.

The starting point, always, is high-quality seed of adapted varieties—planted at recommended seeding rates and mixtures in a fertile, well-prepared seedbed. In this article, let's look at other seeding and management practices that can make your success with forage crops much more certain.

What Companion Crops?

You've probably been seeding your forages with an oat companion crop. This still is the method preferred by many farm operators even though the profitableness of the oats for grain has been questioned by both farmers and farm economists.

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Oats grow rapidly. They provide quick cover and are of some benefit in weed and erosion control. Actually, oats act in direct competition with the legume seedlings rather than playing the role of a "nurse" crop. But if you need the oats as feed (grain or silage) and for the straw, the companion crop method of forage seeding establishment may be the best for getting some return in the seeding year.

There's a long-standing belief that there's a difference among oat varieties for companion crops—that early, short, stiff and less leafy varieties are the best. The reason is this: By heading time, oats are in direct competition with your legume and grass seedlings. Because of this, it's advisable to use early to midseason oat varieties with short, stiff straw. Use the tall, late varieties—which have a greater tendency to lodge—only when they're to be removed for silage or hay.

Other small grains are used as companion crops in some areas. Barley and flax are possible alternatives in northwestern Iowa.

Barley has broader leaves and tends to cut off light from the legume and grass seedlings more quickly and more completely than oats. Early varieties of barley with short, stiff straw seem best for a companion crop, while the tall, weak-strawed varieties seem less desirable. Barley, in general, has a slight advantage over oats since it matures slightly earlier and can be removed sooner when allowed to mature for grain.

Flax in some respects is an ideal companion crop for forage seedings. It lets more light reach the forage seedlings, and, because of its habit of growth, it doesn't form a smothering mat when lodged as do the cereal grains. But flax is a poor competitor with weeds. Flax doesn't shade the ground, and this tends to restrict its use to relatively weed-free fields.

Seeding Methods, Rates . . .

Your method and rate of seeding can have a bearing on the success of establishing the forage stand. Give preference to practices that reduce competition between the companion crop and the forage seedlings.

With broadcast plantings, a moderate decrease in your oat seeding rate often won't reduce this competition. Small grains generally have an ability to compensate for thinner stands by increased stooling. So your stand of oats may be just as great, even though you cut your seeding rate. About 2-3 bushels per acre will produce full stands of oats on most soils. Heavier rates are preferred on soils apt to crust.

A more effective way to reduce competition is by drilling your oats. Because of the more uniform depth of seed placement with drilling, at least ½ bushel less oat seed per acre is needed. Some studies at Iowa State have shown better legume stands with 7-inch oat drill rows, with the legume broadcast, than with both oats and legume broadcast. In these tests there was a tendency for oats drilled in 14-inch rows to resist lodging better than oats drilled in 7-inch rows. Under critical conditions, this could be important for both the oat crop and the forage seeding, though there's the possibility of increased weed

A typical field of lodged oats.

growth with the wider drill row spacings.

If you place the most emphasis on your forage seeding, the small differences in grain yield among the various seeding methods aren't important. Drilling (in 7-inch rows) has given about a 3-bushel-per-acre advantage over broadcasting. Drilling in 14-inch rows at the rate of 2 bushels per acre has produced about 4-5 bushels less per acre than 7-inch row spacing at a seeding rate of 3 bushels per acre. This is a small price if it means the difference between a good alfalfa stand and a mediocre or poor one.

Though drilling small grains has advantages over broadcasting, most small grains in Iowa are seeded broadcast. But, even with broadcasting, there's room for considerable improvement in seeding by this method.

For best results after broadcasting oats on the surface, the seed should be covered to a depth of 1-2 inches, usually by disking. The forage grass and legume seeds, on the other hand, are small, and many will be placed too deeply if covered by disking. Research results show that the best depth for the small forage seeds is ¼-½ inch on heavy soils and ½-1 inch on light soils. Use a corrugated roller or a spiketooth harrow to cover the forage seeds. The roller is first choice.

Many poor stands result from broadcasting and disking both oats and forages; many seeds are buried too deeply, and others remain uncovered. *It's well worth the time and effort to disk in the oats first and then seed and cover the forages in a separate operation.*

Fertilizer, Lodging . . .

Iowa soils generally are deficient in nitrogen and phosphorus. Corn in a rotation usually is fertilized, and the carryover or residual fertilizer usually is depended upon to meet the fertilizer requirements of the oats and forage crops. This often has been a successful program when the fertilizer has been applied at recommended rates. But it will frequently be necessary to top-dress established stands of legumes that are to remain for 2 years or longer. A reliable soil test is the best guide to fertilizer use.

The ability of oats to respond to nitrogen at the expense of the forage seedings has been shown many times. Lodging often follows nitrogen fertilization of oats, with consequent damage to the forage seeding unless the lodged growth is removed at once.

There's some evidence that small amounts (10-20 pounds per acre) of actual nitrogen will benefit forage seedings on sites where nitrogen levels are very low. Such sites aren't common, however, where recommended rates of fertilizer are used in the rotation.

Lodging is potentially one of the most serious problems with small grains. An anticipated high grain yield can easily be lost overnight in a wind-driven rain. Recent Iowa studies showed a loss of 25-35 percent in oat yields from lodging. Perhaps even more serious was a following loss in alalfa stands—three seedlings per square foot compared with 16 on plots where there had been no lodging.

The results of one such study are summarized in table 1. Attributed to lodging is a loss of 10 bushels per acre in oats and a thinning of the alfalfa stand. Differences in the alfalfa stands weren't great; the number of alfalfa plants was low on all plots. Thicker stands would likely be needed for maximum forage yields on good soils with adequate moisture. Also shown in this study was a tendency for alfalfa plant numbers to be reduced where the oats had responded to higher levels of nitrogen.

After Grain Harvest . . .

There's considerable evidence that new seedlings benefit from having grain stubble and weeds mowed. Remove straw soon after combining. Mow and remove weeds and stubble soon after grain harvest if they're heavy and provide enough shade to harm the seedlings underneath.

In terms of the number of alfalfa plants the following spring, there's generally some benefit in clipping new seedings in the fall (see table 1). Weeds are common in most fields after the oat harvest. Controlling them helps the forage seedlings compete successfully for light and moisture in the dry part of the summer.

Though results varied from year to year, studies in Wisconsin on stands and yields of red clover in the late 40's and early 50's showed that clipping in late August was sometimes very beneficial and never harmful. Cutting at September 15 or later, on the other hand, was injurious in 3 of 4 years and never increased yields. In some years, removal of the

TABLE 1. Effect of artificial lodging and fertilizer on an oat-alfalfa seeding, Ames.[a]

Treatments	Oat yield (bu./A.)	Alfalfa stand (plants/sq. ft.)		Hay yield (lbs./A.)[b]
		Fall clipped	Not clipped	
Not lodged				
0 lbs. nitrogen	61	5.1	4.0	3,940
36 lbs. nitrogen	69	4.8	3.6	3,710
72 lbs. nitrogen	70	4.6	3.9	3,890
108 lbs. nitrogen	75	4.6	4.0	3,270
AVERAGE	69	4.7	3.9	3,700
Lodged (June 18, 1958)				
0 lbs. nitrogen	54	3.3	2.6	3,570
36 lbs. nitrogen	59	2.9	2.5	3,410
72 lbs. nitrogen	61	1.9	1.9	3,400
108 lbs. nitrogen	62	1.9	1.8	3,340
AVERAGE	59	2.5	2.2	3,430

[a]Seedings made in 1958; plant counts and hay yields for 1959.
[b]Total of two cuttings, 1959.

clippings immediately after cutting reduced the amount of weeds and straw in the hay.

The results of Iowa studies with alfalfa have been similar. The harmful effects of leaving straw and clipped residue on the fields can often be observed. Shading in some years results in the killing of the alfalfa plants. Field mice populations are cyclic. But, in years of high numbers, severe damage occurs in fields where the mice can find enough food and shelter for overwintering. Plant diseases also can be more serious in damp areas under plant residues. Typical results from stubble management studies are shown in table 2.

TABLE 2. Yields of alfalfa hay as affected by management of the oat stubble.[a]

Management of stubble	Yield of hay[b] (lbs. per acre)
Mowed directly after combining	
Clippings removed	2,537
Clippings not removed	2,298
Not mowed after combining	
Stubble left standing	2,032

[a]Soil Conservation Experimental Farm, Shenandoah. Seedings made in 1958 and harvested once, June 27, 1959. Straw removed on all plots directly after combining.

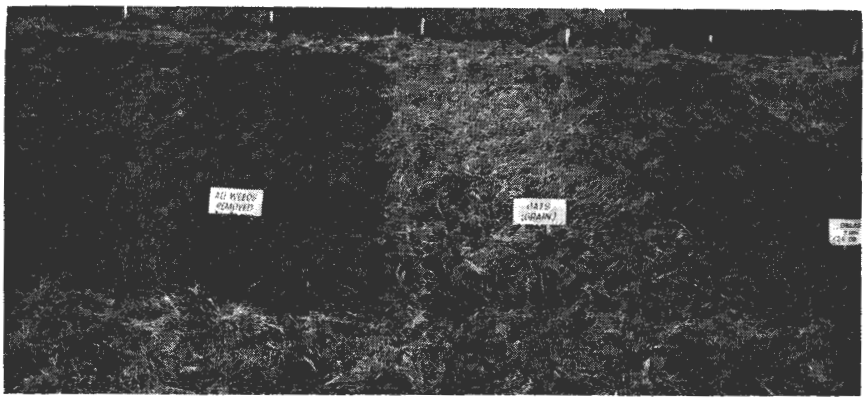
[b]At 12-percent moisture.

Volunteer Oats . . .

Volunteer oats sometimes add another hazard to the new legume-grass seeding. Usually some oats are shattered at harvest—particularly where there's lodging and where grain has been trampled near field edges. With favorable conditions, the shattered grain volunteers and may produce a dense cover in late summer. Small-grain volunteer growth often goes unnoticed in the field. But this rapid volunteer growth can "smother" forage seedlings unless removed by mowing or grazing.

Pasturing volunteer growth has some advantages over mowing. For one thing, you get some use of the surplus growth. But grazing should be controlled so that the new seeding isn't damaged by overgrazing or by packing the soil in wet weather.

New forage seedings should have 4-6 weeks of uninterrupted growth before the end of the growing season. This allows grazing in August and early September. After this, let the plants store food reserves in their roots for winter survival and for starting a vigorous spring growth.



A spring seeding of birdsfoot trefoil as photographed in October. Plot at left was seeded alone, and the weeds were removed by hand. Plot next to it at right was seeded with oats harvested for grain.

Weed Killers . . .

Interest in using chemicals to control weeds in new seedings has come with the development of a wide range of selective chemical weed killers. The most useful of these kill weedy grasses but are also toxic to small grains. So the benefits to the forage seeding must be expected to offset the value of the small grain which can't be used when these chemicals are applied.

We've done considerable work at Iowa State in using herbicides in establishing birdsfoot trefoil. It develops slowly as a seedling and requires more attention than other common legumes. Trefoil seedlings are poor competitors with weeds and companion crops. But they're tolerant of certain chemicals that control some of the more competitive weeds. For example, the kinds of results which have been obtained in using herbicides, as compared with a companion crop, in trefoil establishment are shown in table 3.

Notice that trefoil produced very little growth in the seeding year when competing with weeds or a companion crop. Hand-weeded plots produced six times as much growth in the seeding year and almost twice as much in the following year as did the plots that weren't hand-weeded. Yields of the treatments didn't differ greatly in the third year of this study.

Harvesting oats by a "pasture" management system has proven to be the best of the companion crop treatments for getting good stands and highest yields of trefoil. Companion crop yields are sacrificed

TABLE 3. Yields of birdsfoot trefoil in 1957 and 1958 as influenced by management of stands in the seeding year, 1957.[a]

	Yield of dry matter (lbs. per acre)		
	1957		1958
Management of new seeding	Trefoil	Oats	Trefoil
No companion crop:			
Not weeded	390	.....	3,840
Hand weeded	2,340	.....	6,530
With companion crop:			
Cut for grain	10	4,950	3,100
Cut for hay	70	4,670	3,940
Cut at 12-inch "pasture" stage, 2 cuts	190	1,130	4,470
Cut at 6-inch "pasture" stage, 3 cuts	380	810	4,500
Herbicide treatments:			
Dalapon, 2 lbs./A.	370	.....	4,790
" , 3 lbs./A.	480	.....	5,140
" , 4 lbs./A.	610	.....	5,330
" , 4 lbs. + ½ lb. 4(2,4-DB)/A.	1,280	.....	5,460
" , 4 lbs. + 1 lb. 4(2,4-DB)/A.	1,250	.....	5,500
" , 4 lbs. + 2 lbs. 4(2,4-DB)/A.	1,240	.....	5,510

[a]Seedings made April 13, 1957. Chemicals all applied May 22, 1957. All plots were harvested in July for yields and weed control in 1957 and for three hay harvests in 1958.

if you substitute grazing for hay or grain management. Usually, however, there are significant gains in forage stands in the seeding year and in forage production in the years to follow. It's often a case of getting satisfactory stands by grazing as compared with a poor stand or one that must be re-established by the other methods of management.

Dalapon, an effective grass killer, combines well with 4(2,-4-DB), a broadleaf weed killer. Seedings treated with this mixture produced satisfactory stands, but the plants weren't as large as in the plots which had been weeded by hand. Several other chemicals were included in the tests, but the two mentioned gave the best results.

Weed control is very important for a plant so sensitive to competition as is trefoil. The harmful effects of weed and companion crop competition can continue indefinitely where trefoil plant numbers have been greatly reduced.

It's usually desirable to grow trefoil and other legumes in combination with grass. Grasses can be seeded in late August or early September into fields where grass-killing chemicals have been used. The chemicals used in these studies became inactive in moist soil a few weeks after application. This combination of chemicals has been used successfully with alfalfa but has caused injury to red clover and ladino clover. Alfalfa establishment, however, is much more certain by conventional means than is the establishment of birdsfoot trefoil.

The results of chemical control of weed competition in new seedings have been very favorable. At present prices, the cost of chemicals at effective rates shouldn't exceed $5-$6 per acre. Costs would probably decline if the chemicals were widely used. Despite the promise shown, however, their use *cannot* be recommended at the present time for seedings that will be grazed during the year of planting. For this purpose, the federal Food and Drug Administration requires further proof that the residues from these materials won't be harmful to the grazing animals or to humans consuming the animal products.

Ten Pointers . . .

In general, your success with forage crops will be much more certain with the following seeding and management practices:

- Plant high-quality seed of adapted varieties at recommended seeding rates and mixtures in a well-prepared, fertile seedbed.

- If harvested for grain, early to midseason, stiff-strawed small-grain varieties are best for companion crops. Tall, late varieties will yield more than early varieties but should be harvested for hay or silage at the late-milk or soft-dough stage when used as companion crops for forage seedings.

- Small grains are valuable forage crops — producing high-quality hay and silage—when cut early and properly stored.

- Remove lodged growth soon after it goes down to prevent damage to the forage seeding.

- Control nitrogen fertilizer levels carefully to reduce the hazards of lodging.

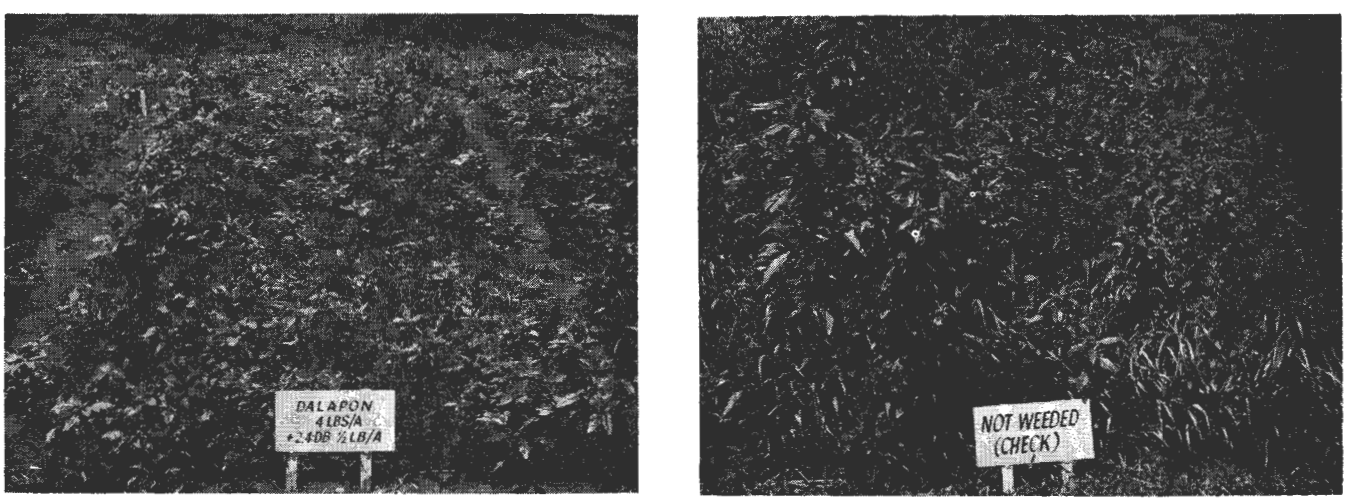
- Remove straw after combining.

- You can usually expect benefits from mowing and removing stubble and weeds after the grain harvest.

- If volunteer small grains appear, graze or mow them in late August or early September when weeds and volunteer grains pose the greatest threat to the forage stands.

- Allow the forage a "rest period" of about 6 weeks before the end of the growing season.

- Keep your eye on the chemical herbicide situation. Certain selective weed killers are very promising as aids in establishing forage seedings without companion crops. (At present, these chemicals cannot be generally recommended for forage seedings that may be grazed or harvested for hay during the year of establishment, and any widespread use of these chemicals is subject to approval by the federal Food and Drug Administration.)



LEFT: Birdsfoot trefoil seeded alone, with weeds controlled by a pre-emergence spray of Dalapon and 4(2,4-DB). RIGHT: Birdsfoot trefoil seeded alone, with no attempt to control weed growth.