Forage Establishment

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The foundation of a forage management program begins with establishing a good, vigorous stand of adapted grasses and legumes. The potential yield of dryland and irrigated forage crops depends on the quality of the building blocks and how well they are fit together.

Building a firm foundation requires careful planning or new forage seedings may fail. Primary building blocks include:

(1) Selection of high-quality seed
(2) Use of adapted grasses and legumes
(3) Proper seedbed preparation
(4) Management of companion crop
(5) Correct seeding date
(6) Proper planting depth
(7) Correct planting method
(8) Adequate soil fertility
(9) Proper management of new plantings

What Grass or Legume to Seed

Numerous grass and legume species and varieties are available for dryland and irrigated hay and pasture. In general, the forage species or varieties selected will depend on the intended use, area of adaptation, productivity potential, season of use if seeded for pasture (see NDSU Circular R-559) and soil conditions, i.e., periodically flooded or saline-alkaline soils (see NDSU Circular R-584).

Try to keep seed mixtures simple since resulting stands are easier to manage than stands from complex mixtures. Forage species included in mixtures should have similar growth patterns and palatability. This provides more uniform pasture grazing, better stand survival and a higher hay quality when harvested at the proper growth stage. One possible exception to this might be native seed mixtures where a mixture of cool- and warm-season species provides a longer grazing season.

Suggested hay and pasture seed mixtures are listed in Tables 1 (dryland) and 2 (irrigated). Smooth bromegrass or brome performs well on good moisture soils throughout the state. Little difference in yield and stand persistence has been noted between northern and southern strains of brome in North Dakota. Standard crested wheatgrass has performed well on droughty soils in central and western North Dakota, especially for early season grazing to defer use of native ranges. Fairway crested wheatgrass is considered more drought tolerant than standard, but standard is preferred for pasture.

Table 1. Dryland hay and pasture seed mixtures.

Area of State

Species	West	Central	East
	--- Pounds PLS[1]/acre ---		
Hay -			
Alfalfa			
Direct seeded	6-8	8	8-12
Companion crop	6	6	6-8
Alfalfa-grass			
Alfalfa	3	3	4
Crested wheatgrass	3	0-3[2]	
Slender wheatgrass[3]	2	2	
Smooth bromegrass		0-3[2]	4
Total	**6-8**	**6-8**	**8-12**
Pasture -			
Alfalfa[4]	1	1	1-2
Crested wheatgrass	5	0-5[2]	
Slender wheatgrass	2	2	
Smooth bromegrass		0-5[2]	7
Total	**8**	**8**	**8-9**

[1] PLS stands for pure live seed.

[2] Select either brome or crested wheatgrass for mixture.

[3] Intermediate or pubescent wheatgrass at 3.5 lb/a can be substituted for slender wheatgrass.

[4] Pasture-type alfalfa suggested.

Table 2. Irrigated pasture and hay seed mixtures.

Species	Pasture or Hay[1]		
	Hay	Mix 1	Mix 2
	--- Pounds PLS[2]/acre ---		
Alfalfa		4	4
Direct seeded	10-12		
Companion crop	8		
Smooth bromegrass		10	3
Orchardgrass			2
Reed canarygrass or creeping foxtail		1	1
Total	**XX**	**15**	**10**

[1] Reed canarygrass or creeping foxtail included if field has low areas where water accumulates. If used for pasture, graze in four or five-pasture rotation and take necessary precautions against bloat.

[2] PLS stands for pure live seed.

Slender, intermediate and/or pubescent wheatgrass should be included in most dryland grass seed mixtures. They are considered "insurance" grasses because their seeds germinate quickly and produce vigorous, fast-growing seedlings that provide considerable forage while other grasses and legumes are becoming established. These grasses are poor competitors in forage stands and will tend to disappear with time, especially under grazing conditions. Some newer cultivars of intermediate wheatgrass have improved stand persistence.

Russian wildrye is a special use grass that can be managed more intensively for grazing if seeded in pure stands. Its high nutrient-retaining quality allows early spring and summer growth to be saved for late summer and fall grazing. Russian wildrye seedlings cannot compete well with weeds or a companion crop, so if soil conditions permit, seed without a companion crop. It is not suitable for hay production.

Warm-season grasses generally are used for pasture only. They should be considered only when marginal cropland in

among existing range parcels is being revegetated and additional warm-season pasture is needed. Warm-season grasses are generally more difficult and take longer to establish compared with cool-season grasses, but once established, some like switchgrass are more productive if managed correctly. Always be sure that warm-season grasses are adapted to the area since most varieties are adapted to very specific geographic areas.

Adding alfalfa to a grass seed mixture usually increases forage production and forage quality. When seeding grass-alfalfa mixtures, try to obtain final stands containing about 60 to 70% grass and 30 to 40% alfalfa for pasture. Pure dense stands of alfalfa rotated to new fields every three to five years will provide a greater hay yield than grass-alfalfa mixtures, especially where adequate precipitation is available for two or three harvests. If a grass-alfalfa mixture is used for hay, highest yields will be obtained when the initial stand contains 50% or more alfalfa. Bloat may be a problem when grazing grass-alfalfa mixtures, especially alfalfa regrowth, so careful livestock management is required. Bloat preventives containing poloxalene, if consumed according to recommendations, eliminate bloat in cattle grazing alfalfa. Alfalfa varieties that possess the creeping-rooted characteristic and those selected under grazing pressure are suggested for grass-legume mixtures to be used for pastures.

Irrigated pasture Mix No. 2 (Table 2) suggests using orchardgrass, a cool-season perennial with a distinct bunch-type growth habit that forms an open sod. Orchardgrass begins growth early in the spring, recovers rapidly following grazing and has a more uniform seasonal distribution of growth than smooth bromegrass. However, available varieties generally lack adequate winterhardiness to be planted as the only grass under irrigation in North Dakota. Orchardgrass and tall fescue should not be used on dryland due to their limited winterhardiness. Reed canarygrass or creeping foxtail is included for areas that tend to flood.

Adjust Actual Seeding Rates Based on PLS

Basing seeding rates on pounds of pure live seed (PLS) assumes every seed is viable and capable of producing an established plant. A seed lot with 100% germination and 100% purity has a PLS index of 1.0. The rate of seeding or the actual pounds of bagged seed planted must be adjusted upward for seed lots with a PLS index of less than 1.0. Seeding rates of legumes frequently are not adjusted if PLS is greater than 90%.

To determine the adjusted seeding rate for each species or seedlot of a given germination and purity percentage (given on seed tag), follow the steps below:

$$\text{Step 1:}\quad \frac{(\%\ \text{germination} \times \%\ \text{purity})}{10{,}000} = \text{PLS index}$$

$$\text{Step 2:}\quad \frac{\text{PLS seeding rate}}{\text{PLS index}} = \text{lb bagged seed/acre}$$

If hard seed (seed that is viable but has an impervious seed coat) content of legumes is greater than 20%, scarification should be considered. Scarification is the nicking of the seed coat to allow moisture to penetrate. Most alfalfa seed grown in the Pacific Northwest has less than 15% hard seed, but locally grown seed may have up to 50% hard seed depending on the environmental conditions.

Seeding Rates

Recommended seeding rate for dryland alfalfa established with a companion crop is 6 to 10 lb/acre with slightly higher rates in eastern than western North Dakota (Table 1). A rate of 8 to 10 lb/acre should be used when alfalfa is seeded without a companion crop. Alfalfa plant density experiments conducted at Fargo, indicate that as few as five to nine plants per square foot (plants/ft^2) uniformly spaced in the field produced near maximum forage yields the year after seeding (Table 3). Even one plant/ft^2 produced 80% of maximum yield in the first and second harvest year. Forage quality (acid-detergent fiber, crude protein and in vitro dry matter digestibility) was similar among plant densities in the first and third harvest years, indicating that maturity, not plant density, was the major factor affecting forage quality. Each pound of alfalfa

seed sown should result in about 4.5 seeds/ft^2 placed in the field. With good seeding technique, properly prepared seedbeds and reasonable moisture, 50 to 60% seedling emergence can be expected. Therefore, 5 to 8 lb/acre seeding rates should be placing 22 to 36 seeds/ft^2 and emerging from 12 to 22 seedlings/ft^2. Twenty seedlings/ft^2 is a good target for a fully productive stand.

Table 3. Average forage yield of four dryland alfalfas established at eight equal-distant plant densities at Fargo in 1980 to 1983.

Plant Density		Forage Yield by Year[3]			
1980[1]	1983[2]	1980	1981	1982	1983
-- Plants/ft^2 --		---- Tons dry matter/acre ----			
1	0.8	1.7	4.4	3.3	4.3
2	1.3	2.2	4.9	3.7	5.1
3	1.5	2.4	5.0	3.7	4.9
4	1.7	2.7	5.1	3.8	5.6
5	1.7	2.9	5.2	3.8	5.7
9	1.9	3.4	5.3	3.9	6.0
34	2.3	4.1	5.3	4.0	6.1
45	2.5	4.2	5.4	4.1	6.1
LSD 0.05	0.3	0.3	0.3	0.3	0.4

[1] An 8 and 20 lb/acre seeding rate was used to establish 34 and 45 plants/ft^2 treatments, respectively.

[2] Plant density during August 1983.

[3] Harvests taken were 2, 3, 3 and 4/year in 1980, 1981, 1982 and 1983, respectively.

Grass seeding rate recommendations generally are based on about 20 seeds/ft^2. The mixtures suggested in Table 1 range from 20 to 30 seeds/ft^2. However, recent seeding rate experiments at Prosper and Carrington indicate that lower seeding rates may be possible when first-year productivity is not needed and excellent establishment techniques are used (Table 4). Spring 1988 stands following an early fall 1987 seeding had greater than three plants/ft^2 when seeded at five seeds/ft^2. Forage yields in the first year after seeding increased with increasing plant density up to about 15 seeds/ft^2 seeding rates at both locations. Forage yields at Prosper were not affected by the seeding rate in the second year of production, but forage yields at Carrington increased with increasing seeding rate up to 20 seeds/ft^2. The primary difference between locations was that by the second year the stands at Carrington had not developed adequately to compete with the weeds at lower seeding rates, but they had at Prosper. No difference in response to seeding rate was found between the bunchgrass tall wheatgrass and rhizomatous grasses like bromegrass and intermediate wheatgrass.

Table 4. Average spring plant density and forage yield of four grasses [1] seeded during fall 1987 at Prosper and Carrington, N.D.

		Forage Yield	
Seeding Rate	**Spring Stand**	**1988**	**1989**
Seeds/ft^2	Seedlings/ft^2	Tons/acre	
	Carrington		
5	3.9	0.8	0.8
10	7.3	1.1	0.9
15	7.6	1.3	1.0
20	10.7	1.2	1.3
30	13.7	1.5	1.3
40	16.3	1.6	1.3
LSD 0.05	2.3	0.4	0.2
	Prosper		
5	3.1	1.4	3.1
10	5.1	1.6	3.4
15	6.5	1.7	3.2

20	7.4	1.7	3.2
30	9.5	1.8	3.3
40	11.9	1.9	3.4
LSD 0.05	1.0	0.4	NS

[1] Grass species were bromegrass, and intermediate, tall and western wheatgrass.

Seedbed Preparation

A firm seedbed (Figure 1) is essential for grass and legume establishment. A well-packed seedbed will permit a shallow, precise seeding depth and allow the seed to be placed in close contact with moist soil.

> *Pack seedbed firm enough so that tracks made by a person walking across it are hardly visible.*
>
> **Figure 1.** (5KB b&w illustration)

Methods of seedbed preparation depend on individual situations but tillage is usually necessary. Demonstration grass and legume plantings have shown that coarse-textured (sandy) soils require packing prior to seeding to obtain satisfactory stands. Seedbeds packed twice with a press drill prior to seeding had better stands than those packed only once. Medium-textured soils may require packing, depending upon the amount of soil disturbance during seedbed preparation.

No-till alfalfa establishment is a viable alternative to tilled seedbeds. Early spring seedings, about the time small grains are first seeded, into clean small-grain stubble have been very successful when subsequent weed growth is controlled with postemergent herbicides. The firm seedbed permits precise seeding depth even with normal double-disc-opener drills. Also, the lack of tillage preserves soil moisture for seed germination and early growth, allowing successful stand establishment even in dry years like 1988. Be sure to remove the straw or use a good straw chopper in fields where no-till seedings are planned.

Field observations of spring and late fall plantings indicate that the prior crop has an influence on successful stand establishment when seeding directly into crop stubble. Sudan-grass stubble was found to provide the best grass stands, followed by sorghum, millet, oats, barley, wheat and flax stubbles.

Companion Crops

Companion crops such as flax, wheat, oats and barley are often used with new grass and legume seedings. The decision whether or not to use a companion crop should be based on soil moisture, availability of irrigation water, and need for soil erosion and weed control. Flax is the least competitive of the companion crops. Wheat is a good companion crop if it does not lodge. Early maturing oats for grain or oats removed for hay or silage are also satisfactory. Barley often lodges in areas where moisture is plentiful and where soils are highly fertile. However, barley has been shown to be the highest-quality forage and may make the best small-grain companion crop if harvested for forage in the boot or very early heading stage. Generally, legumes establish better than grasses when seeded with a companion crop.

Companion Crops on Dryland

Normal seeding rates of small-grain companion crops may compete severely with grass and legume seedlings for soil moisture, sunlight and nutrients. Seeding the companion crop in 18- to 21-inch row spacings at the normal drill setting may be desirable in the drier sections of North Dakota. Solid seedings of oats at two-thirds the normal seeding rate or a normal seeding rate of flax may be used in eastern North Dakota or on sites where soil moisture is adequate throughout the growing season. Companion crops are desirable on sites where soil erosion and weed growth may be a problem. If grass seeding equipment is not available, seed the companion crop first, then, seed the forage crop in the opposite direction. If weeds can be controlled, grass and legume establishment will be more successful in dry years if seeded without a companion crop.

Companion Crops with Irrigation

Under irrigation, companion crops are usually planted with new grass and legume seedings in the spring. Planting the companion crop at rates similar to those suggested for dryland may be desirable if limited irrigation water is available. Research in North Dakota indicates that one bushel per acre of oats or barley can be seeded with perennial forage crops without a substantial loss of grain yield or future forage production, provided adequate irrigation water is available. Do not use companion crops with fall seedings unless soil erosion is a major problem. High rates of nitrogen fertilizer plus high companion crop seeding rates will reduce forage yields the following year. Adjust the seeding rate of companion crop and fertilizer application rate to avoid heavy growth and lodging.

Seeding Dates

The best seeding date depends on the area of the state, soil moisture and whether grasses or legumes are being seeded.

Perennial grasses may be seeded when established plants are beginning to grow in open fields (not protected areas) and continue as long as surface soil moisture is available to germinate seed. Grasses generally require eight to 14 days for germination.

Spring planting of legumes may start when established stands begin to grow well in open fields. Legumes may be planted as late as mid July to early August without a companion crop, provided conditions favor immediate germination. Legumes require five to seven days for germination, but require six to eight weeks or more before a killing frost to develop a plant that can survive the winter.

The following guidelines for spring, early fall and late fall forage seeding will be helpful.

Spring Planting

Planting forage crops in good clean stubble without a companion crop has been very successful; however, one crop year is lost with grasses. Early spring seeding of alfalfa generally allows two harvests during the seeding year with normal rainfall. The stubble protects the new seedlings from blowing soil without competing for available soil moisture. Plantings on clean-tilled land with a companion crop will be successful, provided soil moisture is not limiting. On soils subject to wind erosion, plant the companion crop first, then, after the companion crop is up and controlling erosion, seed the grass or legume in the opposite direction. If oats is used as the companion, it may be removed early as hay or silage to eliminate competition or alternatively, sprayed out by using a grass herbicide. Wheat and flax usually are harvested for grain, but they should be removed early if conditions turn dry.

> *Loose straw, especially if in a heavy swath or compacted near the soil surface, should be removed from new plantings within two or three days or grass and legume seedlings may die. Use of straw chopper-spreader or straw catcher is desirable to avoid swaths on new seedings.*

Early Fall Planting On Summerfallow and Stubble Land

Early fall (August 10 to September 10) planting of grass on firmly packed summerfallow is one of the best times to seed grass under dry-land conditions. Planting grass in clean, well-packed crop stubble following an early grain harvest provides an effective seedbed, provided early fall rainfall or irrigation water is available to promote rapid seed germination and seedling establishment. With adequate moisture available, the grass seedlings make rapid fall growth and provide productive stands the following season. Plant protective strips of flax on summerfallow for erosion control, moisture conservation and to trap snow to protect the grass seedlings. Do not plant legumes after August 15 on dryland. They generally will not grow large enough to survive the winter unless a late killing frost occurs. Early spring planting of legumes appears to produce better stands than late fall seedings on dryland. Establishment of irrigated alfalfa stands has been successful when planted the first week of August at Oakes.

Late Fall (Dormant) Plantings

Successful plantings have been made by seeding in late fall just before freeze-up in fields where corn, sudangrass or sorghum has been cut for silage. Two rows cut high, 24 to 30 inches, and left every 30 to 40 feet protect against soil drifting and holds snow on the field. Planting in clean small-grain stubble also provides a good seedbed, but volunteer plants can be a problem if thick.

Dormant seedings work better with grasses than legumes. Most grasses germinate slower than legumes so there is less risk of fall germination. Alfalfa had complete stand failure in four of six years when seeded after November 1 (dormant seeding) at Fargo. However, results from western North Dakota on sandy soils have been excellent with dormant seedings of legumes. The reason for these different results is unclear, but it might be wise not to use dormant seedings for pure alfalfa. Dormant seeding of grasses and possibly grass-alfalfa mixtures would be recommended.

Seeding Depth

Improper planting depth is the cause of many grass and legume seeding failures. A shallow seeding depth is important in establishing grasses and legumes. Large-seeded grasses like intermediate and crested wheatgrass should be planted 0.35 to 0.65 inches deep on medium to heavy textured soils. It may be desirable to plant at 0.75 to 1.25 inches on sandy soils due to rapid drying of the surface. The shallower depths are recommended for small-seeded grasses and legumes. "Broadcast" seedings of legumes may be successful in early spring provided surface soil moisture is plentiful for about a week. Be sure to lightly harrow broadcast seedings to improve establishment. Grass should always be seeded into the soil and followed by press wheels.

Seeding Methods

A press drill with grass seed attachment equipped with a seed agitator is satisfactory for seeding grasses and legumes provided a firm seedbed is prepared. If the seedbed is not firm enough to regulate seeding depth, the grass or legume seed should not go down the double-disc opener. Never seed a grass or legume in the same double-disc opener as the companion crop since seeding depth is much greater for the companion crop. If seed spouts are placed to drop seed behind disc openers and in front of press wheels, be sure to follow the seeding with one or two light harrowings to incorporate seed and firm the seedbed, but be careful that the seed is not buried too deep.

Special grass drills with depth control bands (Figure 2) are available from a number of Natural Resources Conservation Service districts throughout the state. Use of such equipment is highly recommended to ensure proper seeding depth.

Figure 2. Depth band. (4KB b&w illustration)

Drills without grass seed attachments may have difficulty seeding light or chaffy grass seeds. Grasses such as smooth bromegrass and creeping foxtail tend to bridge in drill boxes even with seed agitators, resulting in uneven seeding or skips. Mixing the required grass and legume seed with 80 lb/acre of medium-ground barley or corn grain has been shown to provide the most uniform seed distribution. However, 20 pounds of coarse-ground barley or corn grain and 100 pounds of grass seed will adequately prevent drill box bridging. Horticultural-grade vermiculite mixed with seed also has been used successfully to prevent bridging.

In a mixture containing seeds of different sizes, test weight and surface texture, such as alfalfa versus smooth bromegrass, seeds may separate even with an agitator in the drill box. This can be overcome by placing a limited quantity of seed in the drill box and periodically hand mixing or stirring the seed. Seed mixed with medium-ground grain also will help to reduce seed separation.

Soil Fertility

A well-planned fertility program is necessary to maintain high forage yields under dryland and irrigated production systems. Take an inventory of your soil fertility needs — **SOIL TEST**.

Results of taking soil tests before seeding and following the first, second and third years of production indicated that if only one soil test was planned during the life of an irrigated alfalfa stand, it was best to sample the fall following the first production year.

Nitrogen and phosphorus are the primary nutrients limiting forage production in North Dakota. However, plant response to

additional phosphorus is usually small. Nutrient requirements for stand establishment are different than the fertility needs for maintaining productivity of established stands.

Stand Establishment

Seeds can germinate without fertilization. However, once the small amount of nutrients in the seed is used, the young seedlings depend entirely on soil nutrients for their development.

Nitrogen generally is **not** needed for successful stand establishment under dryland or irrigation. Moderate to high levels of applied nitrogen at seeding promote the growth of weeds and the companion crop, which may provide too much competition for the new forage seedling, especially on dryland. Legumes properly inoculated before planting normally do not require nitrogen fertilization. However, when seeding legumes or grasses in late summer or early fall following a small-grain crop, be sure to apply 10 to 15 pounds of nitrogen per acre. In this situation, soil nitrogen has been depleted by the small-grain crop or tied up in residue decomposition.

Phosphorus encourages root development. A well-developed root system helps protect seedlings from winter injury and produce vigorous stands the following spring.

Potassium generally is high in North Dakota soils. A soil test will determine the level in your soil. Potassium shortage has occurred on some very sandy soils but rarely on fine-textured soils.

Recommended rates of phosphorus and potassium for establishing grass stands are listed in Table 5. Nitrogen may be applied at 10 lb/acre on dryland and 20 to 30 lb/acre under irrigation if needed by the companion crop. Do not apply more than 10 lb/acre of nitrogen plus potassium in the row with grass seed or germination injury may occur.

Alfalfa is sensitive to soil pH and performs best at pH levels greater than 6.5. Alfalfa grown on soils with pH less than 6.0 must be limed in order to obtain good stands and maintain productivity. Recently, large areas in central and western North Dakota have been found to have areas that have pH levels less than 6.5. Landscape-based sampling will aid in identifying these areas that must be limed.

Limestone applications should be incorporated prior to seeding for best results. Fineness of limestone grade is important because fine particles neutralize acidity faster than coarse particles. Generally, pelletized limestone sources are no more effective weight/weight than fine limestone. For a soil with a cation exchange capacity greater than 20, one ton of limestone will increase pH about 0.3 pH units.

Established Stands

Established stands of grass have responded primarily to nitrogen fertilization. However, nitrogen applications (Table 6) at recommended rates on dryland and irrigated grass may require an application of phosphorus (Table 5) to maintain nutrient balance and high forage production.

Table 5. Phosphorus and potassium recommendations for new grass seedings and established stands[1].

Soil Test Rating	P_2O_5	K_2O
	Pounds/acre	
Low	20	80
Medium	15	45
High	10	20
Very high	0	0

[1] Broadcast or drill row applied.

Table 6. Annual nitrogen recommendations for established tame grass pasture and hayland.

Acre	Dryland[1]	Irrigated[2]
	Pounds nitrogen/acre	
Red River Valley	90-100	150
East central	70-90	150
West central	50-70	150
West	40-50	150

[1] Broadcast in late fall or early spring. Spring application recommended on sandy soils. Lower nitrogen rates for soils with low productivity and lower rainfall areas.

[2] Apply up to one-half of the nitrogen in early spring and the remainder between grazing rotations and/or during irrigation water application throughout the growing season.

Response of pure stands of alfalfa to phosphorus and potassium has been variable throughout North Dakota. The greatest potential for increasing forage yields with fertilizer is on soils testing low in these nutrients. Leave an unfertilized check strip in the fertilized field to determine the response of alfalfa to fertilization. Fertilization experiments in North Dakota indicate that modest phosphorus and potassium applications on soils testing medium to high can be justified on the basis of maintaining long-term soil fertility. **REMEMBER** — A soil test provides an inventory of your soil nutrient status.

Alfalfa and grass-alfalfa mixtures containing 30% or more alfalfa are fertilized to maintain alfalfa in the stand. Phosphorus, if limiting production, increases the ability of the alfalfa plant to maintain itself in the mixture. Potassium may be limiting on some sandy soils. Nitrogen increases grass yields, but high rates may increase grass growth and eliminate alfalfa from the mixture. If alfalfa in grass-alfalfa mixtures drops below 20 to 25% of the forage, then fertilize the stand with nitrogen to maintain productivity. Phosphorus and potassium recommendations for dryland and irrigated alfalfa and grass-alfalfa mixtures are given in Table 7.

Table 7. Recommended phosphorus and potassium application rates for alfalfa and grass-alfalfa mixtures containing 30% or more alfalfa based on soil test rating and yield goal.

	P				K			
Yield Goal	L	M	H	VH	L	M	H	VH
tons/acre	P_2O_5 lb/acre				K_2O lb/acre			
2	35	25	0	0	100	65	0	0
3	55	35	0	0	140	95	0	0
4	75	50	0	0	195	130	0	0
5	90	60	0	0	240	160	0	0
6	105	70	35	0	285	190	40	0
7	130	85	40	0	340	225	70	0

Management After Seeding

Keep a close watch on new seedlings. A soil crust may form before seedlings emerge. A light irrigation or surface roughening will aid seedling emergence. A rotary hoe pulled backwards has been effective in breaking up a surface crust. Surface residues help prevent surface drying, break the force of raindrops and reduce soil puddling, thereby holding more moisture near the surface and reducing surface crusting problems. Irrigated seedings may require frequent light irrigations to keep soil moist in the seedling root zone.

Growth of weeds may cause loss of new seedlings in spring plantings where companion crops are not used. Mow the weeds only if they offer severe competition to the new forage seedlings. Pure grass seedings can be mowed short without much injury to the seedlings. Legume seedlings are injured severely by close mowing for weed control. Mowing for weed control should be done when daytime temperatures are cool. Weed control also may be obtained with the proper use of herbicides. See the current year's Weed Control Guide (Circular W-253) for the various options available for establishing legumes and grasses with or without companion crops.

Alfalfa planted the first of May without a companion crop will produce a harvestable crop in nine to 10 weeks. Under good

growing conditions, two seeding-year harvests are common and three may be possible in some years (Table 8). In drier years, regrowth following the first harvest will be limited, resulting in only one harvest, with average forage yields of 1.0 to 1.25 tons/acre at Fargo. Harvest new seedings before August 20 to allow adequate time for crown development and food storage or delay harvest until 20 to 30% bloom and harvest in late September or early October. Stands harvested before August 20 will permit a third harvest in good moisture years like 1995 and 1998 after the above-ground growth has been killed by frost. Spring-planted grasses or grass-legume mixtures may also be grazed moderately in late fall of the seeding year.

Table 8. Alfalfa forage yield in seeding year, 1995.

Location	Varietal Entries	Forage Yield 2-cuts	Forage Yield 3-cuts
	No.	tons/acre	tons/acre
Carrington[1]	13	2.6	3.4
Fargo	14	2.8	3.6

[1]Carrington is irrigated, Fargo is dryland.

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