

The Fundamentals of Profitable Forage Production

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With harvest complete, winter is a great time to review what worked and what didn't on your alfalfa acres so you can make changes and tweak plans next season. Every year there are new challenges, and this year offered plenty. Let's review some agronomic fundamentals to help you stay on track to meet or exceed your production goals and make confident planning decisions.

What to Consider When Seeding Spring Alfalfa

Benefits of Alfalfa in Cropping System. Alfalfa is the ultimate super-collector for obtaining and holding nutrients and carbon in the soil profile due to its deep and extensive root system. This root system also makes it ideal for highly erodible land. Data show this extensive root feature may significantly add a yield bump to the consecutive crop with overall improvements in soil health.

Including alfalfa in your crop rotations allows you to "grow" your own nitrogen (N). Aside from producing tons of forage for several years, alfalfa leaves a substantial amount of N in the soil when fields are rotated to another crop. Alfalfa is the only crop that can produce all the N requirements for a wheat crop. Depending on yield goals, alfalfa may provide nearly all the N required for corn; if manure is also applied, no additional N is needed for corn.

Nitrogen credits from root biomass continue to increase in well-established alfalfa. The greater the stand density and total root biomass, the higher the N available in the soil to benefit subsequent crops. Don't wait until your alfalfa is in poor condition and low-yielding to rotate it out. Fields terminated sooner offer additional acres for manure applications this fall or winter if your nutrient plan allows.

If you do the math, the N from alfalfa in rotation is worth big money. Depending on costs next year, N could be \$1/unit, so even a modest credit from alfalfa could equate to \geq \$100/ac in value. It's important to note, alfalfa must be established for at least two years to produce N credits. No other legume crop even comes close to producing and leaving this much "salvage value" behind for following crops like corn or wheat.

Alfalfa is a non-host to corn rootworms (CRW). By rotating to alfalfa, CRW populations can be significantly reduced. When larvae emerge, they have nothing to feed on and will die, therefore, breaking this insect life cycle.

Soil Testing. Soil variation within a field can be significant. Regular soil testing provides a detailed inventory of nutrients on your farm. Taking accurate soil tests allows you to see specific needs throughout a field to ensure fertilizer will be applied where it is needed most. For the most accurate fertilizer placement, consider using variable-rate technology to make your fertilizer and lime applications.

When conducting a soil test, it's important to know your goals for the crop and crop removal rates. Be aware of nutrient benchmarks for good alfalfa field fertility (right). Keep in mind, excess fertility may not show any yield response.

Lime. Fall is the best time to apply lime. Ideally, lime should be applied one year before seeding alfalfa. If needed in your region and soil, lime helps neutralize soil acidity by increasing pH levels; this helps ensure higher rhizobium activity, more nutrient availability, and higher alfalfa yields.

Herbicide Carryover Risks. Be aware of which herbicides are applied to corn, soybean, or wheat prior to seeding alfalfa to avoid herbicide carryover next season.

Stand Density	ALFALFA LEGUME CREDITS					
	Regrowth after last cutting		Medium/Fine Soils		Sandy Soils	
	>8"	<8"	>8"	<8"	>8"	<8"
	-lb N/ac-					
Good, >4 plt/ft ²	190	150	140	100		
Fair, 1.5-4 plt/ft ²	160	120	110	70		
Poor, <1.5 plt/ft ²	130	90	80	40		

*Note, these credits are for alfalfa that has been established for at least two years.

Source: UWEX, Dan Undersander, Agronomy 2005.

Soil test recommendations before seeding alfalfa:

- pH: 6.8-7.2
- Phosphorus: 15-20 ppm
- Potassium: 150-200 ppm
- Boron: 1-2 lbs annually after establishment
- Sulfur: 20-25 lbs annually

Checklist for Preventing Herbicide Carryover in Alfalfa:

Do:

1. Review previous herbicide applications and the rotational crop considerations.
2. Review all active ingredients in the premixes, not just brand name.
3. Read and follow the label directions including footnotes.
4. Plan ahead and develop a herbicide plan that includes alfalfa production.
5. Always plan for the unexpected if winter damage occurs.

Don't:

1. Rely on increased rainfall to decrease herbicide carryover.
2. Expect a reduced application rate to decrease herbicide residual time.
3. Apply herbicides later than specified on the label, as this may increase residual risks.
4. Assume tillage will eliminate herbicide residual activity.

Fertility. Manure applied prior to alfalfa seeding is an excellent supplement to fertilizer. Manure provides several recycled nutrients, especially phosphorous (P). While manure can be a good long-term P source, it does not provide adequate potassium (K) long term for high-yield alfalfa. Once the K in manure is depleted, it should be replaced at a rate of 50 lbs/ton dry matter (DM) harvested. Manure on established alfalfa generally reduces yields and is not recommended.

What to Consider for Alfalfa Stands Remaining in Production

Fall Fertilizer Application. Fall is perfect to soil test and review, replace, and correct nutrients needed for next year's yield goals. Potassium, P, and sulfur (S) applications are important for high-yield and high-quality alfalfa. First-crop alfalfa growth is often difficult to fertilize in wet soil in spring, and wheel tracks can damage plants.

Potash applications should be split; ideally apply after first cutting and after third or fourth cutting to provide "fuel" for winter survival. Alfalfa needs ~50 lbs K/DM ton of forage removed. Apply boron (B) annually with K.

Sulfur should be applied in fall as gypsum or elemental S at 5-6 lbs/DM ton of expected forage yield. Sulfur is an important nutrient alfalfa needs to make protein.

Comparing the ratio of fertilizer prices to the cost of purchased DM is also important. Purchased hay, corn or soybean meal is expensive. Likewise, fixed costs like land, machinery, and labor are expensive, and remain the same regardless of yield. Cutting back on your fertility will only return yield reductions. Stay focused through these challenges, start with good soil tests, and develop a plan for applying the correct amount of fertilizer needed.

Growing a successful alfalfa crop requires careful management, but if you follow these guidelines, you'll be on a strong track for success next year.

Pounds of nutrient removed per ton of alfalfa produced, DM basis.

nutrient	DM removed (lbs/ton)
phosphorus (P)	6
phosphate (P ₂ O ₅)	14
potassium (K)	48
potash (K ₂ O)	58
calcium (Ca)	30
magnesium (Mg)	6
sulfur (S)	6
boron (B)	0.08
manganese (Mn)	0.12
iron (Fe)	0.33
zinc (Zn)	0.05
copper (Cu)	0.01
molybdenum (Mo)	0.002

Source: Alfalfa Management Guide by American Society of Agronomy.