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Fertilizers needed for alfalfa are similar to other crops. However, because it's often harvested multiple times per year, alfalfa is a challenge to maintain optimum fertility to ensure good yields of high quality forage.

Pounds of Nutrient Needed for Different Yield Goals (Tons/Acre)					
Nutrient	6 T/A	8 T/A	10 T/A	12 T/A	Lbs./Ton**
N*	360	480	600	720	60
P	31	42	52	62	5
K	240	320	400	480	40
Ca	192	256	320	384	32
Mg	40	53	66	79	7
S	24	32	40	48	4
Fe	2.3	3.0	3.8	4.6	0.38 (~5 oz.)
Mn	1.5	2.0	2.5	3.0	0.25 (4 oz.)
Cl	1.5	2.0	2.5	3.0	0.25 (4 oz.)
B	0.4	.5	.06	.07	0.06 (~1 oz.)
Zn	0.3	.04	0.5	0.6	0.05 (0.8 oz.)
Cu	0.12	0.16	0.2	0.24	0.02 (~0.3 oz.)
Mo	0.024	0.032	0.040	0.048	0.004 (~0.06 oz.)

* Nitrogen in the plant comes mostly from nitrogen fixation. However, some fertilizer Nitrogen may be needed to start plants off well in sandy soils or in soils with low fertility.

** Lbs. of each nutrient needed for each ton of forage produced.

Nutrient removal rates are high, so a soil test annually is needed to fix any deficiencies and get the new growth started off well. Replacing Nitrogen from air is not a problem—plenty of that. The problem is how to replace the other nutrients—the ones extracted from the soil by the growing crop. Yields average more than 3 tons per acre. The record is 10 tons (dryland) and 20 tons (irrigated). It's easy to see how a soil can become rapidly depleted in mineral nutrients over the course of years.

It's customary to maintain alfalfa stands for a number of years, so the problem of nutrient removal is carried over from one year to the next, compounding nutrient problems if nutrient levels in the soil are not managed properly. Mineral nutrient depletion in the soil can lead to yield declines and outright crop failures. Most nutrient deficiencies result in visible symptoms on the plant which may be diagnosed and remedied by application of the deficient nutrient. Some are easier to cure than others.

Phosphorus is a major nutrient that is used in large amounts. Deficiency often causes stunted growth, smaller leaves that may become yellowish at the margins. Severe cases cause a purpling of the leaves. Phosphorus deficiency is one of the chief causes of alfalfa malnutrition and probably the most difficult to cure.

The cure, of course, is to apply Phosphorus. The first difficulty lies in the chemistry of Phosphorus in soil. It can become "fixed"—made chemically unavailable to the crop by rapid chemical reaction with Calcium. High pH soils are notorious for this. Consequently, Phosphorus does not move much in the soil.

The second difficulty (related to the first) is getting enough Phosphorus to the roots in an established stand. It can be deep-banded, but addressing Phosphorus issues is much better done before planting.

Soil testing should predict the availability of all the nutrients needed during the season. These can be amended to the soil before planting, which is much easier and more efficient. Plant testing (leaf or petiole) should be done to get a jump on problems before they become visible.

Potassium deficiency is also a common yield reducer. Leaf symptoms follow a yellowing pattern from the leaf tips and margins and show a strong interveinal characteristic (leaf veins remain green) for a while. Small white spots also develop near leaf margins. Repairing Potassium shortages is a bit easier. Potassium is more soluble, so broadcast applications to the soil are much more effective.

Potassium is taken up into the plant by mass flow—it moves along with water movement into the plant. Irrigating (or applying before an expected rain event) can boost the distribution of the potassium through the soil and facilitate uptake by supplying water to stimulate root activity. Soil testing and supplementation of needed fertilizers will go far in preventing nutrient problems occurring during the growing season when yields and quality can suffer most. It is also advisable to do leaf or petiole testing during the season to ensure yield and quality are not reduced due to nutrient stress.

Sulfur is an important nutrient that is commonly deficient in sandy soils. It is a highly mobile nutrient that can be easily moved out of the root zone by leaching. Soil Sulfur is often low in other soil types as well. With the adoption of clean air policies, atmospheric deposition of Sulfur is virtually gone. Another source of Sulfur was as a contaminant in fertilizers and pesticides which newer manufacturing techniques have stopped as well.

For these reasons, close attention to crop Sulfur needs is important. Sulfur deficiency symptoms are often nondescript; that is, they can be confused with other nutrient deficiency symptoms. This can lead to a misdiagnosis. A general yellowing, especially at the leaf tips, and stunting are common, but the symptoms are often mistaken for Nitrogen or Iron deficiencies.

Ask The Plant[®] Testing

Leaf testing alfalfa should be done at least once per cut. Before reaching 10% bloom, when most alfalfa is harvested, this testing will provide valuable nutrient uptake checks to correct nutrient deficiencies **before** they can cause yield loss in the next cut. Once visual symptoms show up, yield and quality loss have already occurred.

Additionally, these tests will provide your veterinarian the basis for making livestock dietary supplements recommendations.

When the plants begin to flower, take 10-15 plants from each uniform area of the field. Problem areas should be sampled separately. Place the plant samples in paper bags, label and send with the *Submittal Form* available at **AskThePlant.com** website. Detailed information on plant sampling is also available at the site.

TPS Lab prides itself in rapid turnaround times on plant tissue analysis. After all, if you don't get your results in time to fix problems right now, how useful are they? TPSL[®] will have your results to you by E-Mail in 48 hours after the sample is received! Our goal is *your* success.



Phosphorus deficiency
Utah State University Extension



Potassium deficiency
Utah State University Extension



Sulfur deficiency
Montana State University