

UNIVERSITY OF WYOMING

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Alfalfa Fertility and Manure Management in Wyoming

Soil Fertility Management for Alfalfa Production

Average nutrient removal by established alfalfa at harvest:

<u>Nutrient</u>	<u>Lbs/ton</u>
N	55
P ₂ O ₅	15
K ₂ O	60
Sulfur	5
Zinc	0.04
<u>Boron</u>	<u>0.05</u>

Nitrogen

- Fixes all the N it needs, even for following crop;
- Inoculation boosts fixation early on;
- 10-15 lbs at planting can speed establishment, but residual N should be enough;
- Added N reduces fixation and favors grasses, shortening stand life;

Phosphorus

- Most often deficient, especially in high-yield management;
- Many important functions, including stimulating nodule production and N fixation;
- Soil test crucial; symptoms difficult to detect;
 - Sample >6 months prior to planting: takes time;
 - Test soil at least every 2 or 3 years (see UW ext pub on sampling);
- Apply additional P to total about 10 lbs/ac/ton of expected yield;
- We recommend annual applications, but UNeb and USU claim best results from applications every other year on calcareous soils;
- On soils with pH 7 or less can apply 2-3 years worth. Only in SE and NE Wyoming: parts of Laramie, Weston, Crook, & Campbell Counties;
- Preplant applications should be banded for better root access; but broadcast just as effective on established stands: lots of near surface roots;
- On established stands apply in fall or early spring, but avoid soft soils;
 - Fall best for furrow irrigated stands;
- Source: choose by availability, ease of application, and price per unit P₂O₅;
 - Liquid can be easier to apply but costs more;
 - No yield difference between spraying and applying with irrigation;
- Split application beneficial for high-yield, long growing season (not Wyoming).

Potassium

- Can be deficient on sandy soils, irrigation with clean water low in K, and long-term, high yield production;
 - If need is determined annual applications are necessary since alfalfa will luxury consume and end up with very high K concentrations;
 - Several sources available; choose same as P.

Sulfur

- Occasionally deficient on sandy low OM soils with clean, low-S irrigation water;
 - Sulfate-sulfur soil test < 8 ppm indicate need;
 - Utah State recommends: 50 lbs SO₄-S as ammonium sulfate, potassium sulfate, or gypsum plus 100 lbs/ac of elemental S to correct deficiencies for 2 to 3 years.

Micronutrients

- Deficiencies sometimes occur: apply according to soil test recommendations;
- Liquid forms work well;
- Fe chlorosis can occur in early spring but often disappears with warmer temperatures.

Other fertilizer considerations

- Fertilize right after harvest, before regrowth, avoid fertilizer contact with wet foliage;
- Topdress after first cutting to improve regrowth; after last cutting to improve winter hardiness;
- Avoid soft soils in early spring, due to compaction and physical damage to root crowns;
- Split application if using > 500 lb/a to avoid salt damage;
- Base source choice on price per unit; they don't perform differently;
- Don't use foliar spray for mod-high rates of macro nutrients: cause salt damage and uptake is no better than soil application. Great for micronutrients though.

Applying manure to irrigated alfalfa & grass

- Excellent source of P, K and micronutrients if applied to avoid salt damage, but N favors grass & weeds, reduces fixation, and shortens stand life;
- Rates should not exceed 3000 to 5000 gal/ac liquid or 10 t/ac dry in any one application;
- Apply uniformly and break up large chunks;
- Three timing considerations:
 - Before Establishment: >6 months prior; avoid seed contact;
 - On established stands: ASAP after harvest, before regrowth to avoid salt damage, and on dry soil to avoid compaction and crown damage;
 - Before plow down for next crop: Recommend light application because, combined with N fixed by alfalfa, will create excess.
- Best to apply to grass stands or mixed grass-alfalfa because grass will respond dramatically; again, ASAP after harvest to avoid salt damage;
- Avoid ammonia losses by avoiding warm, windy days to apply;
- Application to alfalfa offers nutrient management advantages for livestock producers:
 - Wider window of opportunity than corn;
 - Can remove twice as much N as corn, but fixation still provides 20-25% of N, so apply at 75-85% of removal;
 - Can remove N down to 12 feet, much deeper than corn.