Management Key In Efficient, Profitable Alfalfa Production

Nutrient needs and profitability must be balanced with environmental stewardship.

While profitable alfalfa production is the objective of any grower, today's farmers must also be aware of how their production practices affect the environment—both short- and long-term. The level at which growers manage their fertilizers and fertility *can* influence the environment.

Balancing nutrient needs with other management practices sets the stage for efficient alfalfa production. A partial listing of those practices that impact on nutrient-use efficiency includes:

- liming
- equipment operation
- timeliness
- tillage
- rotation
- varieties
- water management
- seed quality
- planting date
- pest control.

All of these decisions on input use can be made in a way that protects and even enhances the environment while meeting the need for profitability. Additional help can be found by contacting your extension agent, local fertilizer dealer, or crop consultant.

In this discussion we'll review some of the problems or symptoms that occur in alfalfa production, then describe proven management practices that growers have relied upon to correct them. We'll also cite an example of how proper use of inputs can optimize profits.

Weak, thinning stands

Thick, vigorous alfalfa stands are essential to obtain high yields and quality alfalfa. Research has shown that potassium (K) is the most important nutrient in maintaining productive alfalfa stands.

Figure 1 shows how an alfalfa stand deprived of adequate potash becomes thin. Under low K conditions, alfalfa plants lose vigor and are unable to compete with weeds and grasses. Frequent clipping schedules demanded by maximum economic yield (MEY) producers cannot be met. Consequently, plants die and the stand remaining is weak and unprofitable.

Other conditions contributing to thin alfalfa stands include:

- soil acidity
- low soil phosphorus levels
- poorly adapted varieties
- insects
- diseases
- improper cutting schedules.

Figure 1. Weak, thinning alfalfa stands.

Alfalfa stands that start to thin and are slow to regrow after clipping can cut farmers' profits by:

- lowering hay yields
- producing less total digestible nutrient (TDN)
- requiring outlays to purchase feed
- necessitating expenditures to reestablish stands.

The antidote is an adequate K program that helps alfalfa build food storage levels in roots and then helps translocate these reserves when the plant needs them for regrowth. Ample food reserves are essential for faster regrowth after harvest to meet the demands of frequent cuttings. Adequate food reserves in the roots are also an important factor in protecting the plant against winter kill.

As you plan your alfalfa fertilizer program, be sure that K is not a limiting factor. A good rule of thumb on soils requiring K is to use 50 to 60 lbs of K_2O for every ton of alfalfa hay you expect to harvest. The rewards are a stronger, more vigorous, longer-lived stand with high yield and good quality potential.

Chlorosis

This typical K deficiency symptom of alfalfa is easily recognized. It consists of small chlorotic spots (Figure 2) clustered near the margins of older leaves. As the severity of the deficiency intensifies, the number of chlorotic spots increases and individual spots become indistinguishable. The symptom first appears on older leaves. This classical symptom is widely

Figure 2. Chlorotic spots clustered near margins of older leaves.

Figure 3. White chlorosis at the margin of leaf and localized toward tip.

recognized wherever alfalfa is grown.

A second kind of K deficiency symptom observed in western states is a white chlorosis. It appears at the margin of the leaf and is localized toward the tip (Figure 3). As the severity increases, the chlorosis expands toward the leaf base. The boundary line between normal and affected leaf tissue is sharp and irregular.

The two deficiency symptoms are distinctly different. They are not found on the same plant, but on individual plants growing in the same area. Plants showing no symptoms at all can also be found in this area. The soils are typically low in available K and do not have excessive salt or sodium (Na).

Chlorotic margin symptom is also associated with a high tissue content of Na. Apparently when K is low, which results in less competition between K and other cations for plant uptake, some plants will take up large quantities of Na. The chlorotic margin symptom may be either an actual Na toxicity or simply salt burn. Genetic diversity of alfalfa may be the fundamental reason individual plants exhibit different symptoms, even though growing side by side.

A carefully managed fertilizer pro-gram will avoid this problem. Proper applications of potassium will eliminate chlorosis. Plant tissue K contents will be increased and excess Na in the tissue decreased. The end result will be:

- increased yield
- more protein content
- less disease
- increased stand life.

Soil testing is a useful tool in identifying potential deficiencies of K that can lead to chlorosis. Heavy initial K applications may be required to restore the K levels of a depleted soil. Eventually, lower rates to maintain desirable fertility levels should suffice.

Hidden hunger

Phosphorus-deficient alfalfa is difficult to spot. The plants do not show obvious symptoms. Yet loss of yield can be dramatic. A grower may not even be aware there is a problem.

Plants deficient in P often appear water-stressed. Leaves tend toward dark green or even purplish and are smaller than normal. Leaflets are cupped upward. Plants are stunted, but appear more upright than normal with fewer stems per crown.

Figure 4 shows P-deficient alfalfa. Note the weeds invading the deficient field due to thinner stand and less plant vigor. Leaves are smaller, although coloration appears near normal.

Because phosphorus moves very little in the soil, it is important to maintain an available supply in the

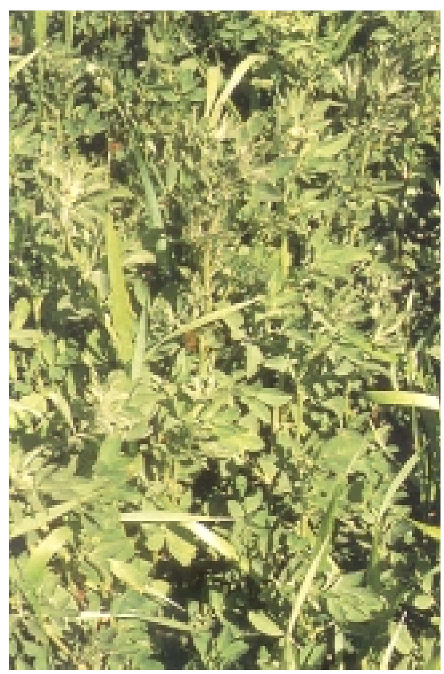

Figure 4. Phosphorus deficiency in alfalfa. Note weeds invading deficient field due to thinner stand and less plant vigor.

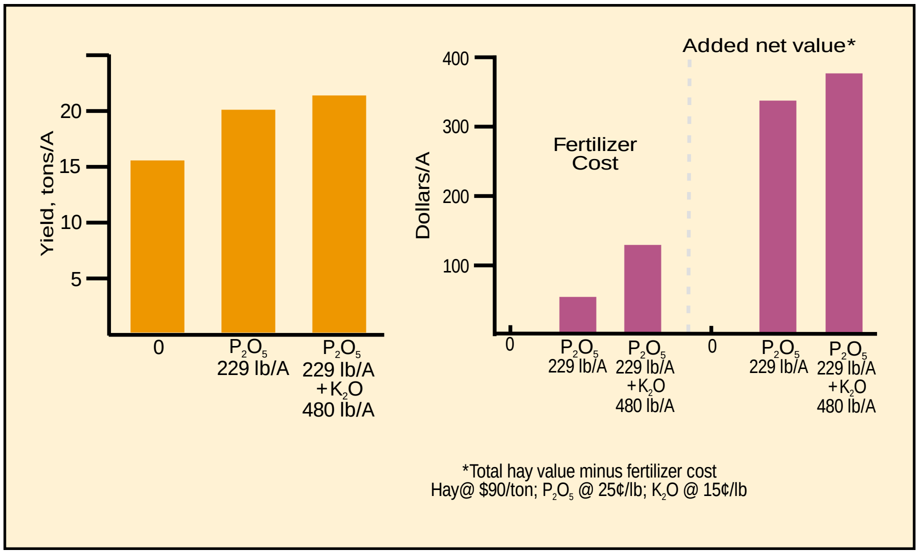

Figure 5. Net return from investment in P and K applied on alfalfa; three-year Utah study.

effective root zone throughout the growing season. Each ton of hay removes 15 lbs of P_2O_5. Shortages of P are more likely to occur during:

- early growth when rooting is limited
- cool periods when P uptake is less
- drought, when some of the root zone is dry.

Ideally, soil testing of P should be performed prior to planting so the P can be incorporated into the soil when applied. Established stands can be top-dressed with good results, although initial plant response may be delayed if deficiency is severe.

The benefits of proper P fertilization are the same as those of K.

Yellowing

Yellowing of the top leaves is one sure sign of boron deficiency in alfalfa. Other symptoms include death of the growing tip and a bushy appearance. Boron is involved in cell division, pollination, and cell wall synthesis in alfalfa plants. When deficient, the plant's growing points shut down. Death is inevitable if the deficiency persists.

By its nature, boron is used up quickly by plants. It leaches through coarse soils. Studies have shown that of total boron in the soil, only .05 to 2.5 percent is available to plants. Boron deficiency can occur in times of drought. It is also sensitive to pH, with increased frequency of deficiency above pH 7.

Where crop requirement is high, such as in the case of alfalfa, and soil tests on boron are low or very low, recommended rate of boron application per acre is 2 or 3 pounds.

Bottom line

At one study site in Utah, the benefits of proper fertilization of alfalfa were shown in hard dollars and cents (Figure 5). Both potassium and phosphorus were used in this three-year project. Symptoms of both P and K deficiencies were present in these fields but were not dramatic and could have been easily overlooked by a busy grower.

Returns from this study were impressive indeed. An investment of $57.25 in P brought a net return of $338.75! But total profit per acre was highest with a combination of needed P and K. Had it been put on the market over the three years of the study, 100 acres of alfalfa would have netted $37,475 from a combination of P and K, compared to $33,875 with P alone (Figure 5).

The bottom line? Balanced nutrition and proper management of all other inputs will assure maximum nutrient-use efficiency and offer opportunities for significantly more profit in the production of alfalfa!

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