by Drs. Travis Miller and Brent Bean

P Fertility And Placement Enhance Wheat Forage Yields

Texas scientists emphasize the importance of adequate P in a wheat/beef grazing system.

Summary: *Wheat forage for beef production represents a significant part of crop value in west Texas, Oklahoma, and western Kansas. Adequate P is a key to forage production in these wheat grazing/ grain production systems. Deep banding of N and P can enhance nutrient availability under both dryland and irrigated conditions. Positional availability of N and P is enhanced with deep handing but added advantages may also result from reduced P fixation by high calcium soils of the region.*

Most of the wheat crop in western Texas is grazed by lightweight stocker cattle. In most years, 40 percent of the Texas wheat crop is grazed out, with no grain harvested. That extrapolates into about 4.5 million acres of wheat grazed in a given year with at least 2.4 million acres entirely used as forage. In marginal (dry) crop production years, wheat producers can generate more income from grazing than from grain production.

Grain yield response to P fertility in low to medium P soils is widely documented. In west Texas, P use has not been widely accepted by wheat farmers largely due to sporadic grain yield responses associated with prolonged periods of dry fall weather. Root development and activity are limited in the P-enriched zones close to the soil surface associated with conventional P placement technology. Several site years of P placement studies in west and west-central Texas emphasize that deep-banding P results in superior forage yields in winter wheat, particularly when moisture stress limits root activity near the soil surface. Superior forage response to deep-banded P in these studies did not universally equate to a proportionally greater grain yield response when compared to conventional P incorporation. In 50 percent of the trials, wheat fertilized with deep-banded P yielded significantly more grain than surface-incorporated P or unfertilized check. In wet years, little advantage was attributed to deep-banded P over conventional incorporation technology. Other research in the Great Plains has shown advantages of deep banding for wheat grain yields.

Forage response

Dryland. Weather during the early growing season can be crucial relative to wheat forage response to P placement. Of five dryland wheat trials (Figure 1), three (Runnels, Baylor-Year

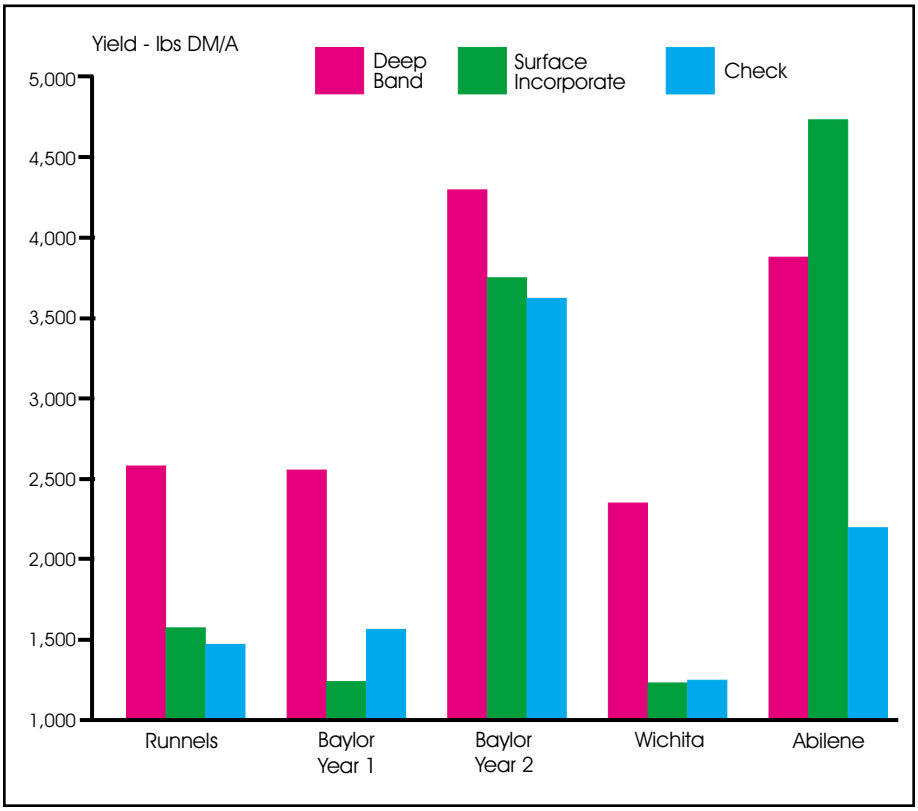

Figure 1. Response of dryland forage to P fertilizer application and placement, Miller, et al., Texas A & M University.

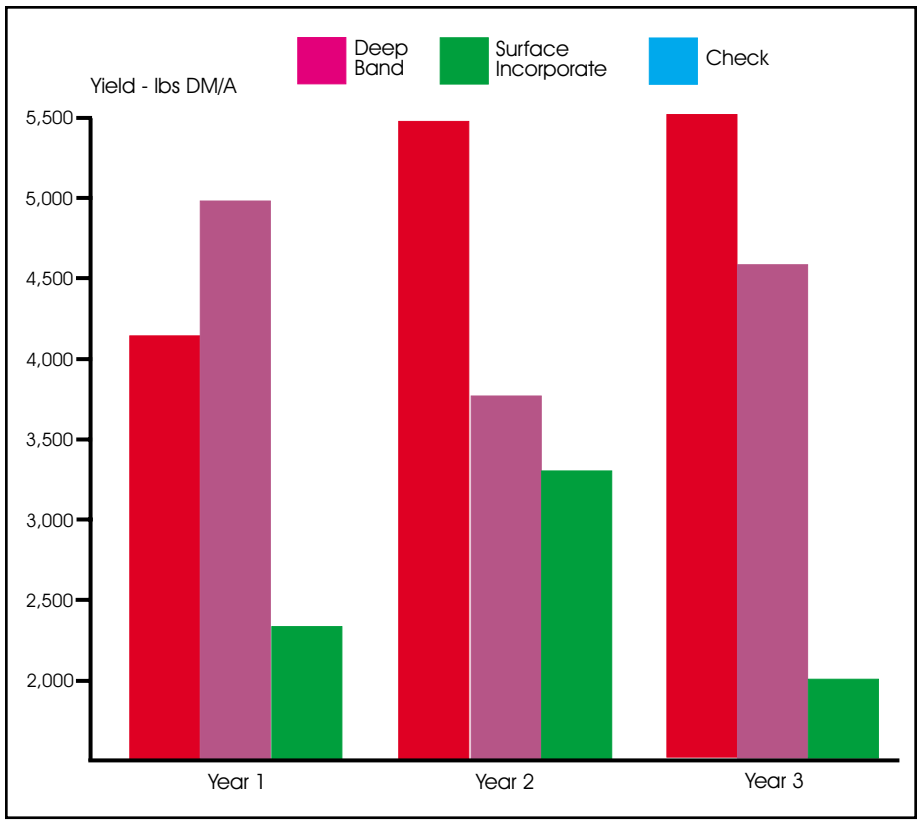

Figure 2. Response of irrgated wheat forage to P fertilizer application and placement, Miller, et al., Texas A & M University.

1, and Wichita) experienced very dry fall weather. Deep-banded P plots produced significantly greater total forage yield at each of these three sites. An average of 84 percent or 1,137 lbs/A more dry weight forage was harvested from deep-banded P plots than from wheat treated with surface incorporated P, which yielded essentially the same as the no-P check.

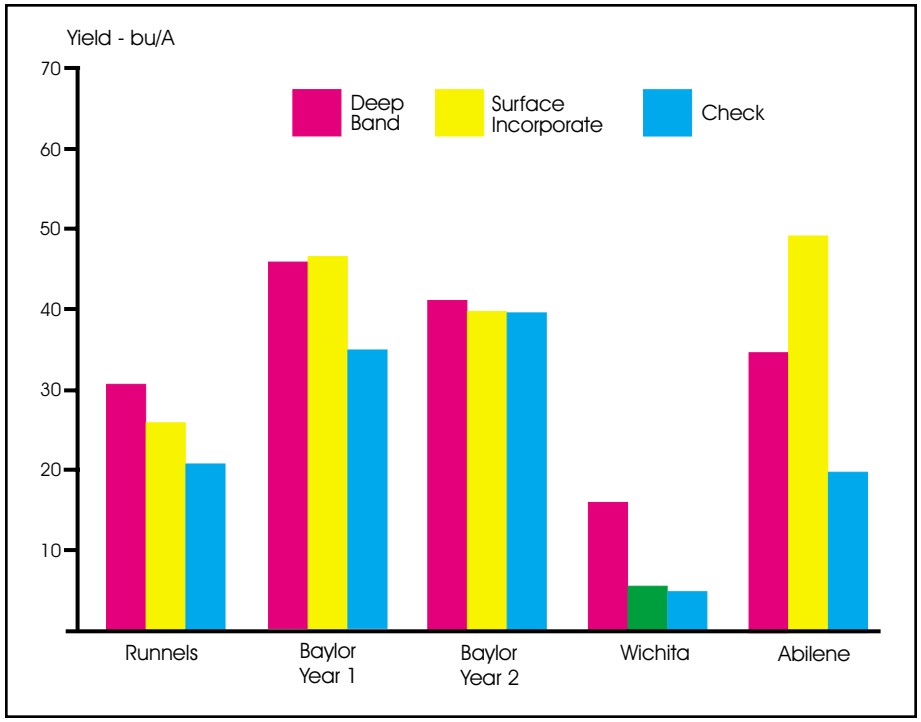

Figure 3. Response of dryland wheat grain yield to P fertilizer application and placement, Miller, et al., Texas A & M University.

In the Baylor-Year 2 and Abilene trials, plots had unusually high rainfall during the fall and early winter. Forage response to deep-banded P at the Baylor site, while still significantly higher, was only 14 percent or 538 lbs/A greater than surface-incorporated P. At Abilene, the surface P treatment yielded significantly more than deep-banded P, but both placement techniques caused very large forage responses when compared to no-P checks.

The 5-site year summary indicated that wheat forage production with deep-banded P was 24 percent greater than surface-incorporated P, and 55 percent greater than no-P checks.

Irrigated. Wheat forage response to P placement was much the same as dryland wheat. In years 2 and 3 of the studies, forage yield response to deep-banded P was 46 and 20 percent greater, respectively, than surface-incorporated P, while in the high rainfall during Year 1, forage yield on deep-banded P was 17 percent less than surface-incorporated P (Figure 2). Over the three-year study, deep-banded P averaged 15 percent greater forage yield than surface-incorporated P treatments and 99 percent greater yield than no-P check plots.

Pre -jointing. The majority of wheat farmers use the crop for overwintering stocker cattle on high quality forage, removing livestock near growing point differentiation, and managing the crop for the remainder of the season for grain. In this scenario, early forage yield of pre-jointing forage production is a more important number. Of five studies, deep-banded P response was significantly better than surface incorporation in four, averaging 37

percent greater forage yield than surface incorporation, and 128 percent greater than the no-P checks.

Grain response

Dryland grain yield response to P application method in these studies was less consistent than forage yield response. In five site years, deep-banded P yielded significantly more than surface-incorporated P only one time. Under unusually dry weather at Wichita, deep placement improved yield by more than 11 bu/A (Figure 3). With favorable rainfall the reverse was the case. At Abilene, surface-incorporated P yielded 14.5 bu/A more than deep-banded P. Little difference was observed at the three other sites. Across all five sites, no significant difference in grain yield was observed owing to P placement, although either placement technique produced an average grain yield of about 10 bu/A higher than no-P checks.

Irrigated. In the three-year irrigated study, grain yield with deep-banded P was significantly greater than with surface -incorporated P in Year 2, but no significant difference was noted in the other two years of the study. Either placement technique produced average grain yields 13 bu/A greater than no-P check.

Methodology

Fertilizer. Phosphorus source in each trial, except Abilene, was fluid ammonium polyphosphate (10-34-0). At the Abilene site, 11-52-0 (MAP) was the P source. UAN was the N source in all studies except Abilene, where ammonia was used.

Placement. Deep-banded N-P was applied with a chisel applicator. Surface-applied P was incorporated with a disk or field cultivator. In six of the studies, interval between chisels was 10 inches. In two irrigated studies, interval between chisels was 15 inches. Depth of bands was approximately 8 inches.

Plot design was a randomized complete block with either 3 or 4 replications.

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