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P Boosts Wheat Forage Yields In West Texas

Researchers use irrigated vs. dryland conditions, as well as surface-applied P vs. deep-banded P in multi-site comparison trials.

Summary: In a dry climate typical of West Texas, where forage production represents a significant part of a crop's value, deep banding of P fertilizer can give substantial forage yield advantages. In years with wet fall weather the advantage of deep banding P is lost. Grain yield responses are not so closely associated with P placement. Under very dry conditions, significant grain and forage responses to deep placed P hare been observed. But in most production years, over multiple sites, little advantage in grain yield is associated with deep banding P.

Most of the wheat crop in western parts of Texas is grazed by lightweight stocker cattle. Amount and intensity of the crop used for forage varies with price of wheat grain and that of feeder cattle. However, estimates project that more than 70 percent of the Texas wheat crop is grazed in any given year. Grazing duration increases with increasing cattle prices, and with diminishing crop conditions. In most years, 40 percent of the Texas wheat crop is grazed out, with no grain harvested. This 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 crop production years, many producers generate more income from grazing than from grain production. Current P fertilizer recommendations and placement technology are derived from grain trials, with no reference to forage production.

Grain yield response to P fertility in low to medium P-content soils is widely documented, particularly in higher yield environments. In west Texas, P use has been somewhat poorly accepted by wheat farmers due to sporadic grain yield responses associated with prolonged periods of dry weather in the fall, which limits root development and activity in P enriched zones associated with conventional P placement technology. Several site years of P placement studies in west and west-central Texas suggest that deep banding P results in greatly superior forage yields in winter wheat when drought limits root activity near the soil surface. The superior forage response documented in these studies to deep banded P does not universally equate to a proportionally greater grain yield response when compared to conventional P incorporation.

Table 1. Wheat forage response to deep-banded P vs. surface-incorporated P in low rainfall plots, Miller, et al., Texas A&M.

Placement	Runnels '87 - '88	Baylor '93 - '94	Wichita '94 - '95
	- - - - - - - - - - -	lbs/A	- - - - - - - - - - -
Deep-banded	2,583	2,552	2,357
Surface incorporated	1,595	1,248	1,238

Table 2. Wheat forage response to deep-banded P vs. surface-incorporated P in high rainfall plots, Miller, et al., Texas A&M.

Placement	Baylor '94-'95	Abilene '94-'95
	- - - - lbs/A - - - -	
Deep-banded	4,295	3,898
Surface incorporated	3,757	4,770

Dryland wheat forage

Relative to the response of wheat forage to P placement in dryland trials we ran, weather during the early growing season was of great importance.

Table 3. Wheat grain response to low rainfall plots (Wichita) vs. high rainfall plots (Abilene) Miller, et al., Texas A&M.

Placement	Wichita '94-'95	Abilene '94-'95
	- - - - lbs/A - - - -	
Deep-banded	16.4	34.0
Surface incorporated	5.1	48.5

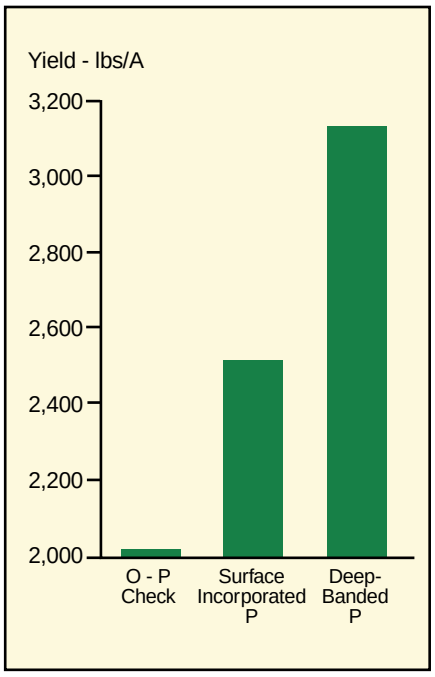

Figure 1. Average response of dryland wheat forage to P fertilization and placement over five sites in Texas, Miller, et al., Texas A&M University, 1987-95.

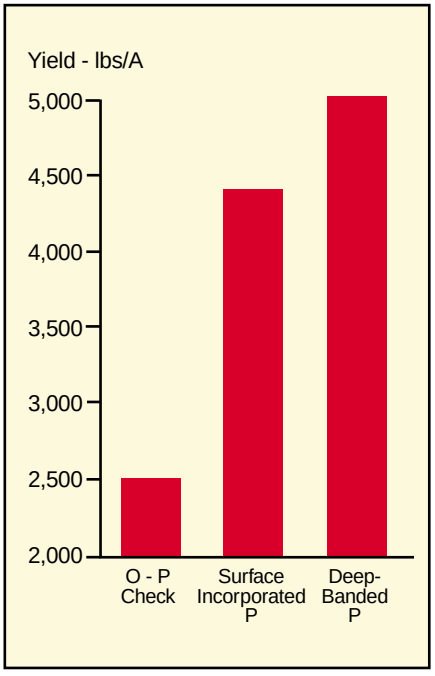

Figure 2. Average response of irrigated wheat forage to P fertilization and placement at Etter, Texas, Miller, et al., Texas A&M University, 1992-94.

Of five trials (Figure 1), the Runnels, Baylor (1994), and Wichita sites experienced very dry fall weather. Deep-banded P plots produced significantly greater total forage yield at each site. In these three plots (Table 1), an average of 84 percent or 1,137 lbs/A more dry weight forage was harvested from deep-banded P than from those plots treated with surface-incorporated P (which yielded the same as the no-P check).

In the Baylor ‘95 and Abilene trials, dryland plots had unusually high rainfall during the fall and early winter. Forage response at the Baylor site to deep-placed P, while still significantly higher in 1995, was only 14 percent or 538 lbs/A greater than the surface-incorporated treatment (Table 2). At the Abilene site, the surface P treatment yielded significantly more than deep-banded P, and both placement techniques caused very large forage responses compared to no-P checks. In a five-site-year comparison, forage grown with deep-banded P was 24 percent greater than surface-incorporated P, and 55 percent greater than no-P checks.

Irrigated wheat forage

In irrigated wheat trials (Figure 2) in the northern high plains of Etter, Texas, forage response to P placement was much the same as in dryland wheat. In the ‘92-’93 and ‘94-’95 crops, forage yield response to deep-banded P was 46 and 20 percent greater than surface-incorporated P, respectively. In a high-rainfall year (‘91 -‘92). forage yield on the deep-banded P treatment was 17 percent less than surface-incorporated P. 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.

Early forage yield

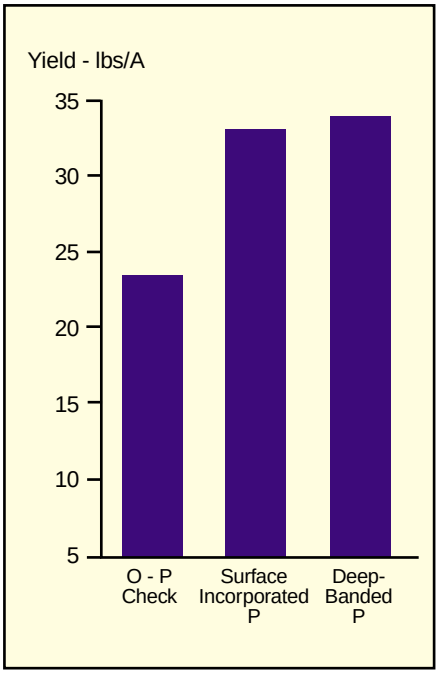

Figure 3. Average response of dryland wheat grain to P fertilization and placement over five sites in Texas, Miller, et al., Texas A&M University, 1987-95.

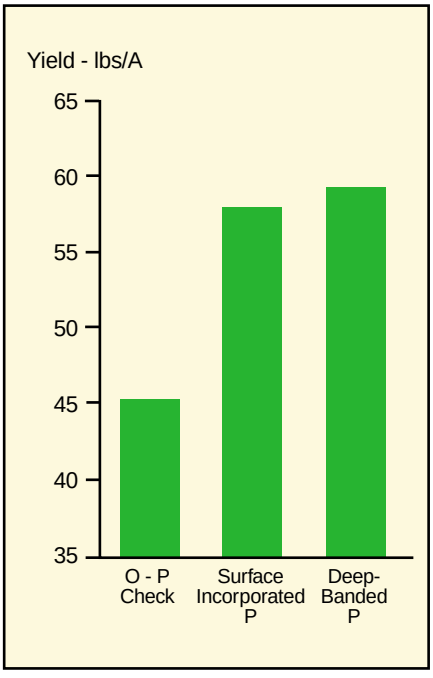

Figure 4. Average response of irrigated wheat grain to P fertilization and placement at Etter, Texas, Miller, et al., Texas A&M University, 1992-94.

Total forage yield doesn't disclose the potential impact on farmer/stocker operations. The majority of wheat farmers uses crops for overwintering stocker cattle on high-quality forage, removing livestock near growing point differentiation, and managing the crop for the remainder of the season as a grain crop. In this scenario, early forage yield of pre-jointing forage production is a more important number. In five of seven studies, early forage yields (pre-jointing) were taken. Summarizing across these five studies, deep-banded P response was significantly better in four cases than surface incorporation, averaging 37 percent greater forage yield than surface incorporation, and 128 percent more than the no-P check.

Dryland wheat grain

Grain yield response to P application method was less consistent than forage yield response. In five dryland site comparisons, deep-banded P yielded significantly more than surface incorporation only one time. Under unusually dry weather at Wichita, grain yield was significantly improved (more than 11 bu/A) by deep placement, while the reverse was true in very favorable rainfall conditions at Abilene where surface-incorporated P yielded more (14.5 bu/A) than deep-banded P (Table 3).

Little difference was noted at three other sites. Across five sites, no significant difference in grain yield was noted due to P placement, although either technique resulted in grain yields 10 bu/A higher than no-P check (Figure 3).

Irrigated wheat grain

In the three-year study at Etter, grain yield with deep-banded P was significantly greater than with surface-incorporated P in 1993. No significant difference was noted in the other two years of the study. Either placement technique resulted in average grain yields more than 13 bu/A greater than the no-P check (Figure 4).

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