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Returns Mixed On Wheat Pasture Response To N and Maintenance P in Wheat/Stocker Systems

Even though yields were increased nearly 6 bu/A, a rough analysis shows returns were only marginally profitable.

Application of a maintenance level of phosphorus (P) to a soil high in P and previously used for a successful wheat grazing study did not positively impact production levels in a dual-use, wheat/stocker production system. Forage yields to December 15, 2003 did not differ among treatments and averaged only 189 lbs/A of dry matter due to severe moisture stress. No significant differences in forage production were observed during the grazing period under these conditions. Nitrogen (N) fertilization over 60 lbs/A did not significantly increase forage yields by April 22 (heading date). Grain yields increased with increasing N rates, and topdressed N further increased grain yields on an average of approximately 6 bu/A, except at the highest preplant N rate of 120 lbs/A. With only a 6 bu/A grain yield increase and limited grazing, a rough economic analysis showed that returns were only marginally profitable. Across all treatments, the conventional-till treatment out yielded no-till by 10 percent or 3.5 bu/A, possibly due to less soil compaction under the conventional-till system. Abnormally dry conditions prevailed from planting through mid-winter.

Proper fertilizer management in small grain production is key to profitability, since cost of material and application are major economic inputs. Phosphorus (P) and nitrogen (N) fertilizers are key inputs to successful wheat production. Considerably less research has been conducted in dual-use, wheat/stocker operations. Introducing an animal component increases the complexity of fertilizer management in order to maximize forage, grain yield/quality, and beef yields.

Phosphorus. Recently completed studies by the Texas Agricultural Experiment Station at Vernon have shown that P fertilizer increased early forage yields 55 percent from planting to March 1 and 35 percent over the entire grazing season. Beef gains per acre were increased 34 percent during the entire season, since pastures fertilized with P could support higher stocking rates due to increased forage production. Surface-applied P was as good as deep-placed P in increasing forage yields and subsequent beef production.

Nitrogen. Another key input to all wheat production is N fertilizer, but information on N fertility response of wheat in a no-till grazing system does not exist. Since N is an expensive input in wheat production, a study was initiated in 2003 to evaluate and compare N fertilizer requirements in a no-till, wheat/stocker production system with that from a conventional-till wheat/stocker system.

Objectives of this dual-use wheat/stocker production system study were to 1) determine the effects of N fertility management on forage, forage protein, grain yield, and grain quality in no-till and conventional-till systems, 2) determine the influence of residual P on forage, beef, and grain yields, and 3) evaluate the effect of 20 lbs/A of P2O5 as a "maintenance" P application on forage, beef, and grain production. Results were compared with pastures receiving N only.

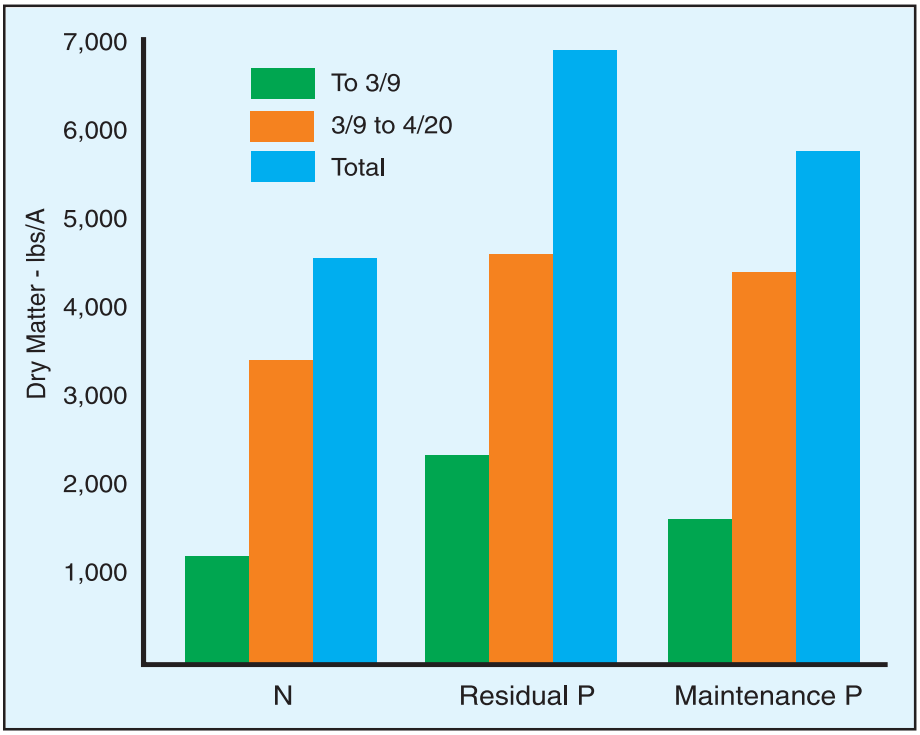

Figure 1. Forage production from Lockett wheat with and without maintenance P, 2003-04.

Residual P

Forage production. The fall and early winter growing period was extremely dry, producing little forage until February 2004 when rainfall increased. There were no significant differences among treatments during this course of the study (Figure 1)

Cattle gains from December 11, 2003 to February 27, 2004 (pull-off date in a grain plus grain system) were not significantly different among treatments. Average daily gains were somewhat below average for this period at 1.9 lbs/day.

From February 27 to May 24 (indicating a graze-out system), gain per head and gain per acre were substantially greater than those earlier gains due in part to an increase in forage from favorable rainfall. Gain per acre (Figure 2) and number of head days in the residual P treatment were significantly higher than in the N-only treatment, but there was no significant difference where maintenance P was applied. Average daily gains increased to 3.2 lbs/day, indicating favorable grazing conditions.

Between the residual P and N-only treatment there was a significant difference in gain per acre and number of head days, but no significant difference between the two P treatments. Gain per head was not significantly different among treatments and reflects good stocker management, since the number of animals was adjusted to reflect a given forage allowance per animal unit.

Grain yields were not significantly different among treatments, ranging from 33 to 36 bu/A, and somewhat surprisingly good considering the poor early-season growth due to drought.

Our conclusion from the first year of this study is that maintenance P did not enhance forage and cattle gains over that from residual P, and therefore did not positively impact economic returns of the dual-use, wheat/stocker production system.

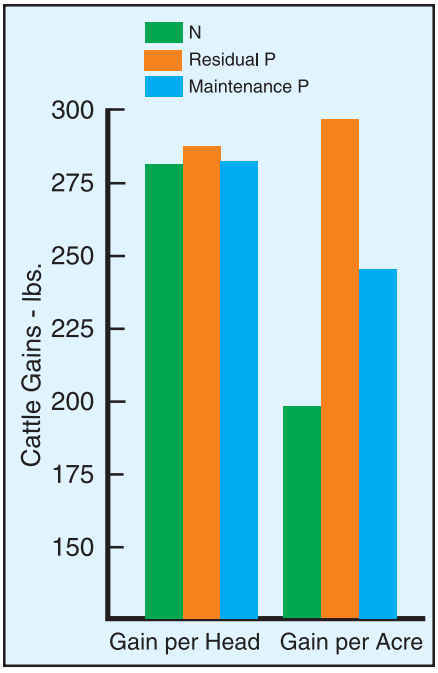

Figure 2. Cattle gains during February 24 to May 24 from Lockett wheat with and without maintenance P, 2003-04.

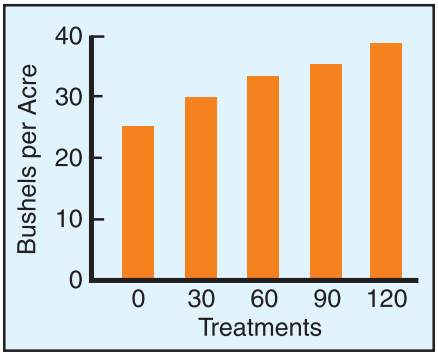

Figure 3. Wheat yield response to N fertilizer in dual-use systems, 2003-04.

Nitrogen

Since growing conditions were poor during the fall and winter, N effects on forage production were not well defined. Forage yields to December 15, 2003 did not differ among treatments and averaged only 189 lbs/A of dry matter. No significant differences in forage production were observed during the grazing period. When cattle were removed on February 27, 2004, forage availability averaged only 75 lbs/A of dry matter across all treatments. Therefore, soil moisture and not N was the limiting factor in early forage production. There were no significant differences in forage production in ungrazed plots at the time of pull-off among N rates, although all N rates (30 lbs/A and above) significantly increased yield above the no-N treatment. Conventional-till and topdressed N significantly increased forage yields by February 27 over no-till and no-N topdress, respectively.

However, at 50 percent heading on April 22, 2004, forage yield in the no-till plots was significantly higher than in the conventional-till plots by 285 lbs/A. Topdressing did not enhance forage yield by April 22. Generally, N fertilization over 60 lbs/A did not significantly increase forage yields by April 22. As expected, N application increased grain yields with increasing N rates (Figure 3).

Topdressed N increased grain yields on an average of 5.7 bu/A, except at the highest preplant N rate of 120 lbs/A. Overall, the conventional-till treatment out-yielded no-till by 3.5 bu/A.

As with residual P, even though yields were increased nearly 6 bu/A with N applications, a rough economic analysis shows that increasing N rate, including topdressing N at 45 lbs/A, was only marginally profitable under moisture-limiting conditions in 2004 (return from increased yield minus cost of fertilizer plus its application).

Tillage effects

Tillage systems affected soil compaction and soil moisture. There was significantly less compaction in the 0- to 6-inch soil surface layer under conventional-till but generally greater soil moisture in the spring under no-till.

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