Winter Wheat Forage Response to Pre-Plant Nitrogen Fertilizer

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Introduction:

Wheat (*Triticum aestivum* L.) is one of the most important crops in the Southern Great Plains and may be grown for forage only, grain only, or for both forage and grain, commonly referred to as dual-purpose (Redmon et al., 1995). Wheat pasture is considered as valuable source of high-quality forage during late fall or early spring, when there is no other good quality source of forage available in the region.

The application of nitrogen rates exceeding plant utilization represents an unnecessary cost for the wheat producer and can harm aquatic and terrestrial environments (Vidal et al. 1999). Raun and Johnson (1999) estimated N use efficiency (NUE) for cereal production to be 33%. Excessive plant-available nitrogen produces wheat plants that are more susceptible to lodging and disease. Insufficient N availability to wheat plants, however, results in low yields and significantly reduced profits compared to a properly fertilized crop.

The cost of nitrogen fertilizer is increasing day by day, so farmers are interested in producing more forage with less nitrogen. Determining the correct pre-plant nitrogen rate for dual-purpose wheat production could result in maximum wheat forage production with minimum fertility cost.

Objectives:

- Determine the effect of pre-plant nitrogen fertilizer on fall forage production by winter wheat.
- Identify the economic optimal fall nitrogen rate for wheat forage.

Figure1. Forage sample were collected by hand clipping from two adjacent rows.

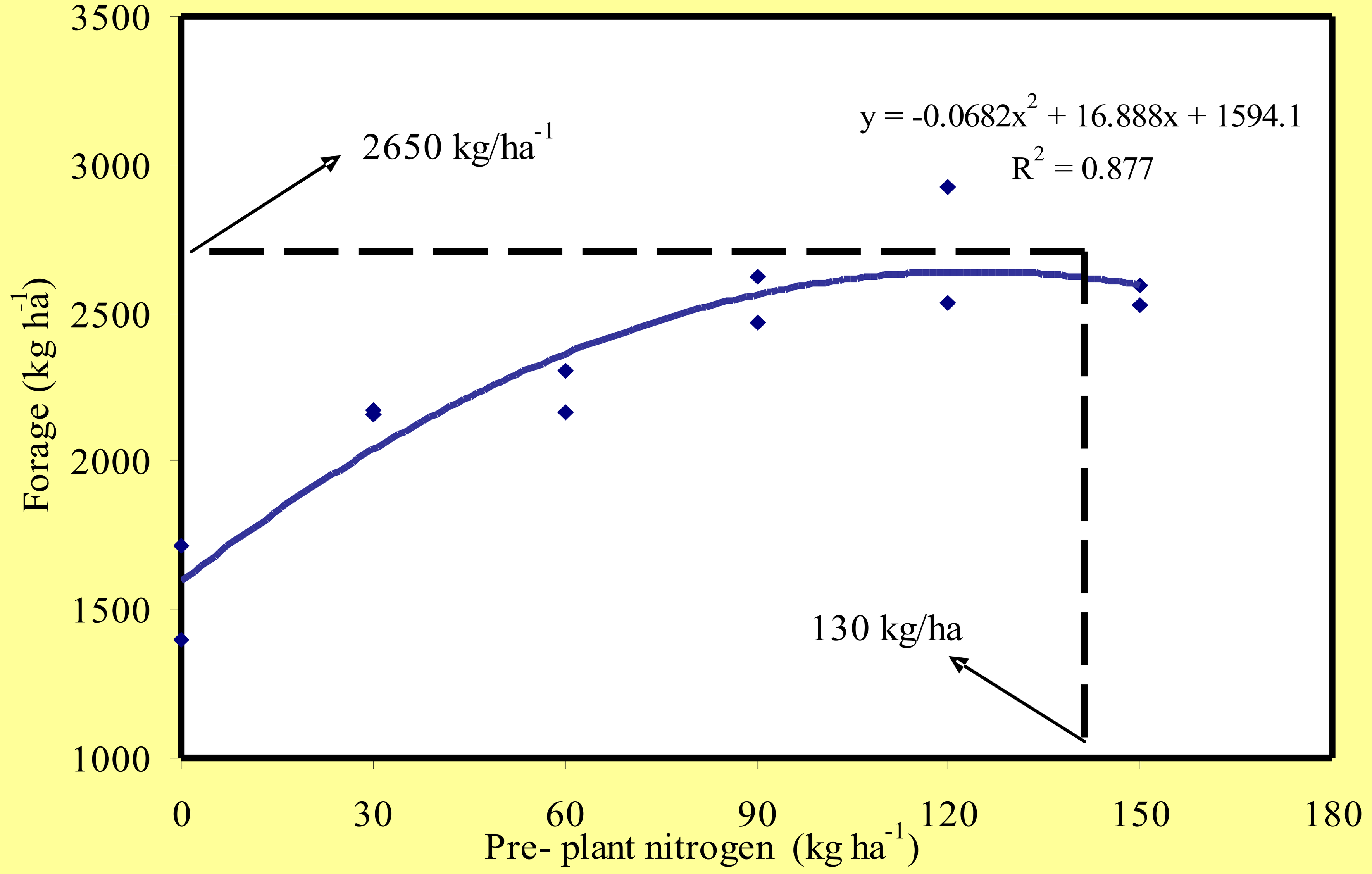
Materials and Methods:

- Four winter wheat cultivars (Jagger, Jagalene, 2174, and OK102) were sown at a rate of 90 kg ha^{-1} into a conventional seedbed within one week of September 15 each year of the experiment at Stillwater, Ok.
- Six levels of pre-plant N fertilizer (0, 30, 60, 90, 120, or 150 kg ha^{-1}) were applied in a split-block design with four replications.
- To quantify response of fall wheat forage to pre- plant N fertilizers, 1-m by 1-row forage samples were collected from each plot at 4-5 times during the wheat forage production season. (Figure 1.)
- Samples were dried at approximately 50° C for a period of 7-10 days and weighed.

Results:

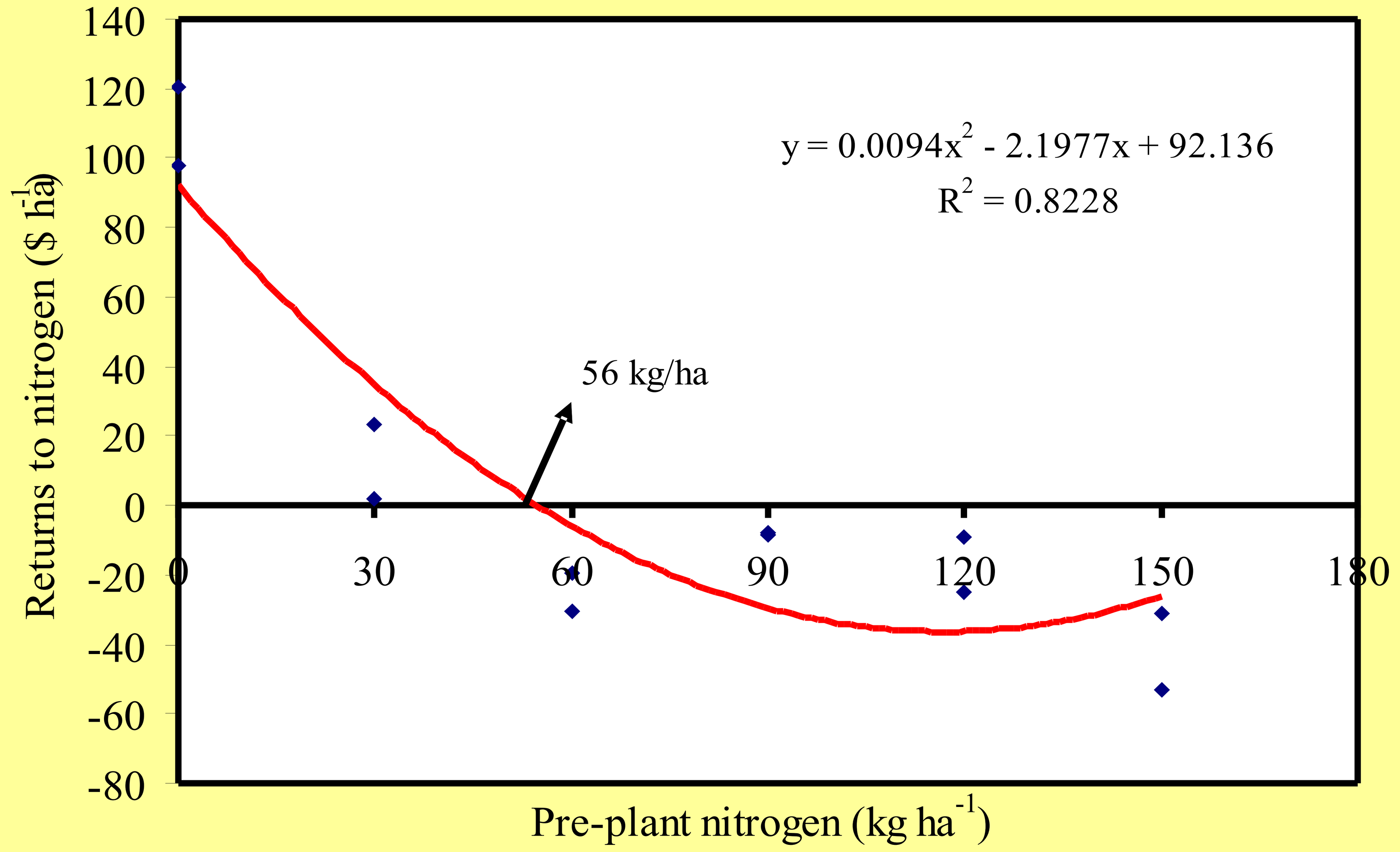
- The 0 kg ha^{-1} nitrogen fertilizer rate produced 1594 kg ha^{-1} of wheat forage indicating that high levels of residual nitrogen fertilizer were present
- Wheat forage responded positively to nitrogen fertilizer application up to 130 kg ha^{-1}.
- Agronomic optimal forage production was 2,650 kg ha^{-1}.

Response of Jagger wheat forage to pre-plant nitrogen fertilizer at Stillwater (12/2/2004 and 11/28/2006)



- Returns of $ 92 ha^{-1} were obtained with no nitrogen fertilizer..
- Economic optimal N-rate was 56 kg ha^{-1}.
- Negative returns to N fertilizer were observed for nitrogen fertilizer application greater than 56 kg ha^{-1}.

Net returns to nitrogen fertilizer as a function of pre-plant fertilizer rate



Conclusion :

Our data show that the agronomic optimal pre-plant nitrogen fertilizer rate for dual-purpose wheat was 130 kg ha^{-1}. The economic optimal rate, however, was much lower at 56 kg ha^{-1}.

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References:

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