

Nitrogen Rates on Hard Red Spring Wheat

Purpose:

To look at optimum Nitrogen rate to achieve 1) Economic Yield and 2) Protein targets, while minimizing potential losses of nitrogen in the form of NO₂ gases which can contribute to Greenhouse Gases. With new higher yielding varieties, the current nitrogen recommendation may not be optimizing economic yield and /or achieving the protein level required obtaining the full protein premium.

Methods:

Kevin Ferguson, Osgoode and Bert Welton, Douglas cooperated on this project in 2005. The four nitrogen rates applied were 0, 33, 67 & 133 kg/ha (0, 30, 60 & 120 pounds actual nitrogen per acre (lbs/ac)) and replicated twice at Kevin Ferguson's site in 2005 and the three nitrogen rates at the Welton site were 41, 66 & 123 kg/ha (37, 74 & 111 lbs actual nitrogen). At John Nanne's site the rates were 0, 61, 87 and 112 Kg/ha (0, 55, 78 & 101 lbs/ac). The rates used at the Napanee site were 0, 56, 82, 107 kg/ha (0, 50, 74 & 97 lbs/ac).

Results:

Figure 1 – 2005 Grain Yield and Protein response to Nitrogen on Hard Red Spring Wheat, Osgoode, Ontario

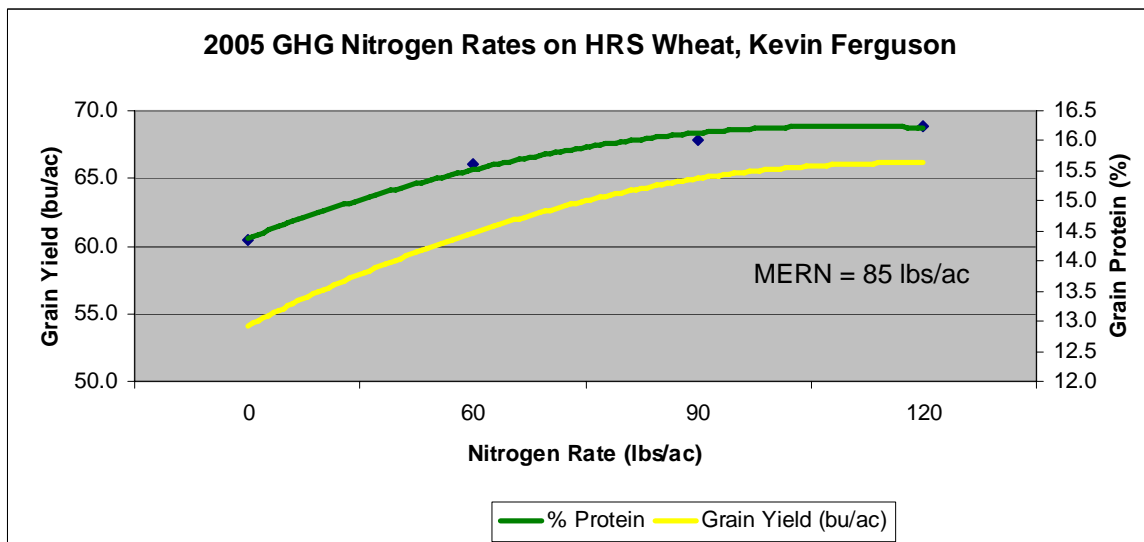


Figure 2 - 2005 Grain Yield and Protein response to Nitrogen on Hard Red Spring Wheat at Bert Welton, Douglas, Ontario

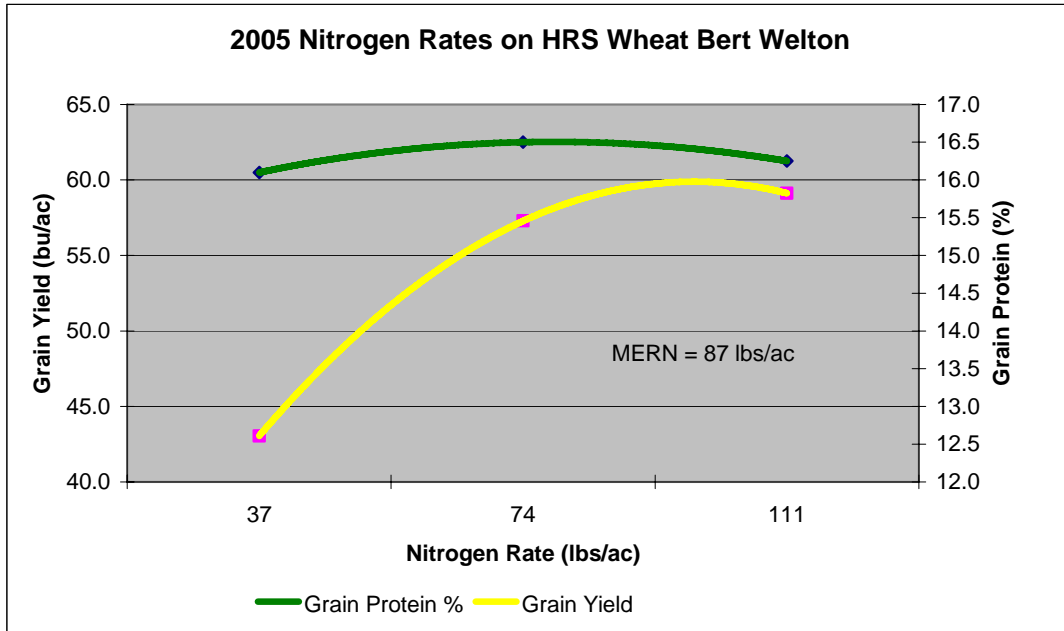


Figure 3 – 2004 Grain Yield and Protein response to Nitrogen on Hard Red Spring Wheat at John Nanne, Pakenham, Ontario

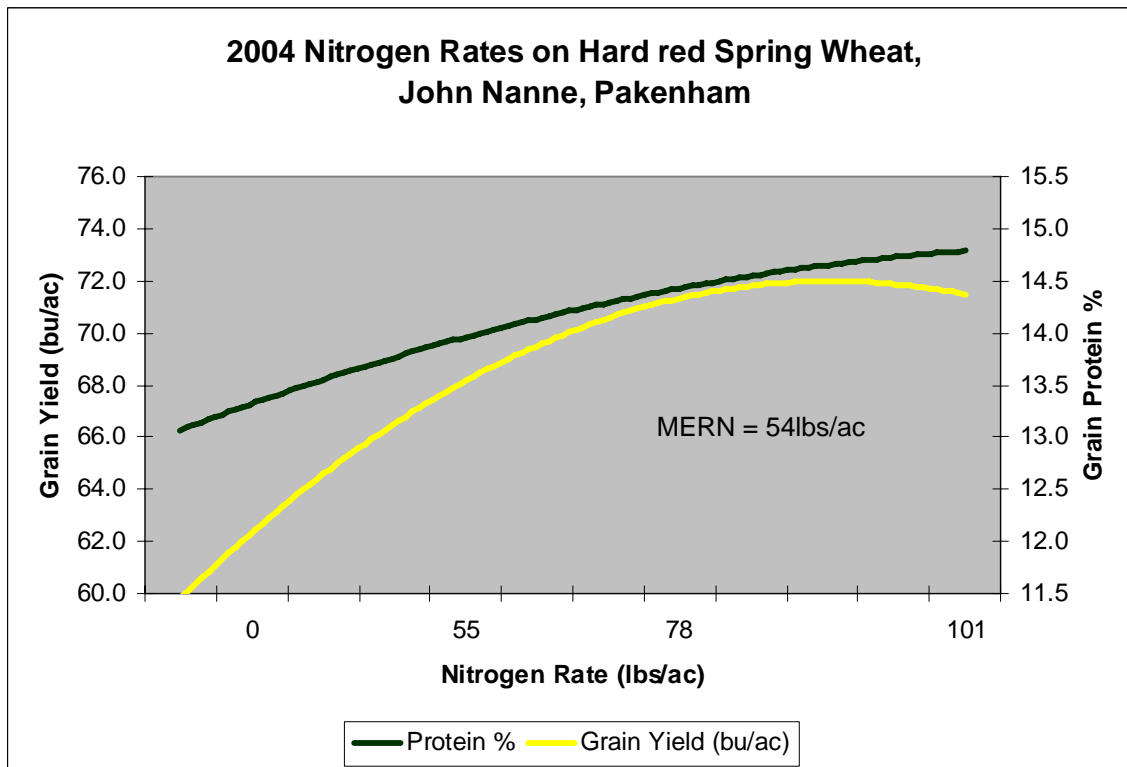
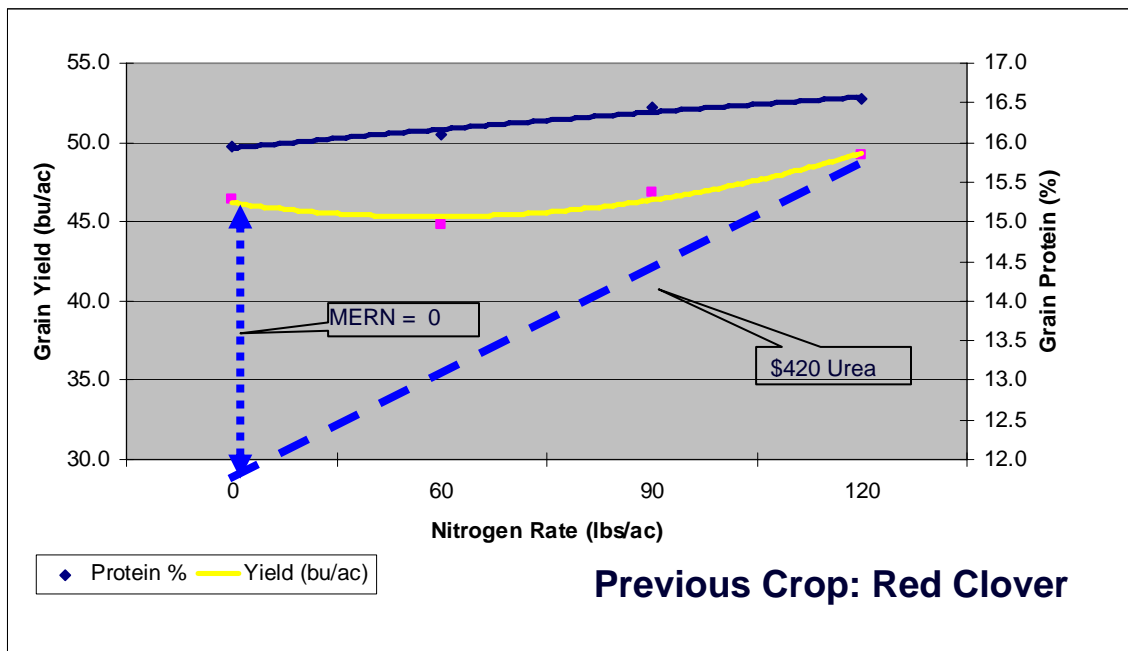


Figure 4 – 2005 Grain Yield and Protein response to Nitrogen on Hard Red Spring Wheat at the site near Napanee, Ontario



Summary:

In each graph, the top curve is the Grain Protein (%) and the lower curve is the Grain Yield (bushels/acre) response to the 4 nitrogen rates. The Most Economical Rate of Nitrogen (MERN) is the nitrogen rate at which economic return is greatest. Applying higher rates of nitrogen than MERN will not pay for the additional nitrogen cost. Based on wheat at \$180 per tonne and \$420 per tonne for urea, the MERN for 2005 is 85 lbs/ac at the Ferguson site. This result is similar to the yield response in the past two years of the project. In 2003 the MERN was 93 lbs/ac and in 2004 the MERN was 90 lbs/ac. Over the three years, the higher nitrogen cost would reduce the MERN by about 10 lbs/ac. Note that the Grain Protein was above the 12.5% maximum protein premium paid on Hard Red Spring (HRS) Wheat for nitrogen rates of 30lbs/ac or above., The Douglas site conducted another nitrogen site in 2005 (see Figure 2). The MERN at this site was 87 lbs/ac of Nitrogen, similar to the results at Ferguson Farms..

In 2004, the nitrogen rates were also applied at two different timings; 1) at planting and 2) at the Tillering (Zadok 28) Stage of the wheat crop. Split application nitrogen treatments were also applied at various rates, at these two stages. It appears that applying nitrogen at the Tillering stage (MERN = 85 lbs/ac) reduces nitrogen requirement relative to applying preplant (MERN = 90 lbs/ac). The MERN for the split application was the same, so splitting the nitrogen had no yield benefit and extra costs of a second trip across the field would have a negative economic impact.

John Nanne site (Figure 3) is a dairy farm where manure and/or legume forage crops are in the rotation. At this site in 2004 the MERN was likely lower because of the manure history on the field. A soil nitrogen (NO₃N) sample taken on 4 May 2004 at Nanne's site showed available soil nitrogen of 61 lbs/ac. The MERN was 54 lbs/ac. In 2005, at Napanee site, (Figure 4) the MERN was 0, that is there was no response to using nitrogen. The previous crop was a stand of red clover for a full year and the Book value nitrogen credit is 89 lbs/ac to the following crop. Where field history includes legumes or manure, a nitrogen credit of 27 to 36 kg/ha (30 to 40 lbs/ac) can be used to reduce the amount of fertilizer nitrogen required. A soil nitrogen sample taken in the early spring may not account for the full nitrogen amount available from the soil because of insufficient time, temperature and moisture to have lead to a full release of mineralizable soil nitrogen but it be can used as a starting point in deciding how much credit to give previous crops or manure applied to the field.

In all sites, the MERN for yield provided enough nitrogen to obtain the maximum current market protein premium of 12.5%.

Next Steps:

The yield, grain protein, soil type, soil nitrogen and weather data for the past 3 years of the project will have a detailed analysis performed by researchers at the University of Guelph and a final report prepared.

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Project Contacts:

Scott Banks, Kemptville OMAFRA Scott.Banks@omafra.gov.on.ca
Location of Project Final Report: