

## Nitrogen Rates for Winter Wheat

### (Interim Report)

#### **Purpose:**

Many growers challenge the current thought process on nitrogen rates for winter wheat. In fact, many top growers consistently apply more nitrogen than current OMAFRA recommendations. Nitrogen rate recommendations on winter wheat are based on historic data from the 1970's and 1980's. With the evolution of much higher yielding varieties, these recommendations need to be re-evaluated. As well, with increased nitrogen costs, the need to minimize any potential environmental impacts and the current economic cost/price squeeze, it is necessary to re-assess nitrogen applications on winter wheat to target the Most Economic Rate of Nitrogen (MERN).

#### **Methods:**

41 field scale satellite trials were initiated from 2003 to 2005, to augment three intensive sites evaluating nitrogen rates, split applications, and timing of applications. Most satellite trials were two replicate, randomized, field length tests, with each nitrogen rate strip corresponding to the width of the nitrogen application equipment. Applications of nitrogen rates utilized whatever source the grower was using, at the normal timing of application for that farmer. Rates of 67, 100 and 135 kg/ha (60, 90, and 120 lb/ac) actual N were targeted, with some growers including 0, 34 (30), and/or 168 (150) kg/ha (lb/ac) rates.

#### **Results:**

Tables 1 to 3 summarize field results from the 2005 crop year, while tables 4 and 5 detail the three year data. Economic analyses were calculated using wheat at \$3.50/bu (\$129/t), and nitrogen at \$0.45/lb actual N (\$1.00/kg N). Results were very similar over all three years, although there was a trend towards slightly less response in the first year of the trial (2003).

The results, on an average basis, mirror a typical nitrogen response curve. The Most Economical Rate of Nitrogen (MERN) is approximately 90 kg/ha (80 lb/ac) despite the extremely high yields achieved in all three years of the project. This is exactly what current OMAFRA guidelines would recommend, based on 80 bu/ac yields (5.4 t/ha) and \$0.45/lb nitrogen (\$1.00/kg N). On average, current OMAFRA recommendations appear correct. Further analysis is required to investigate the sites which deviated from the average.

It is interesting to note that a grower is likely to lose less money by reducing the nitrogen application rate to 67 kg/ha (60 lb/ac), rather than increasing the N rate to 135 kg/ha (120 lb/ac) in an attempt to increase yields. As well, the net economic risk from either an increase or decrease of 34 kg/ha (30 lb/ac) is extremely small inside this nitrogen range. The average net loss from reducing nitrogen rates is less than \$6.00/acre, while the net loss from an increase in nitrogen rate is not more than \$8.00/acre. This is a much tighter range than what most growers would expect, and should help to give some level of confidence in maintaining nitrogen rates in a reasonable range.

**Table 1. 2005 Yield Summary**

# Trials	N Rate kg/ha (lb/ac)					
	67 (60)		100 (90)		134 (120)	
	Wheat Yield					
	t/ac	t/ha	t/ac	t/ha	t/ac	t/ha
27	76.8	5.16	82.3	5.53		
23	75.7	5.09	80.7	5.43	82.4	5.54
25			81.8	5.50	83.3	5.60

**Table 2. 2005 Economic Summary**

# Trials	N Rate kg/ha (lb/ac)		
	67 (60)	100 (90)	134 (120)
	Economic Return to N Application (\$/ac)		
27	268.74	274.56	
23	265.12	268.97	261.26
25		272.68	264.62

**Table 3. 2005 % Wins Summary**

# of Trials	N Rate kg/ha (lb/ac)		
	67 (60)	100 (90)	134 (120)
	% wins		
27	30	70	
23	48		52
25		68	32

**Table 4. 2003 -2005 Yield Summary**

# Trials	Nitrogen Rate kg/ha (lb/ac)					
	67 (60)		100 (90)		134 (120)	
	Wheat Yield					
	bu/ac	t/ha	bu/ac	t/ha	bu/ac	t/ha
41			84.8	5.70	86.6	5.82
38	78.3	5.26	83.7	5.63	85.6	5.75

**Table 5. 2003 - 2005 Economic Summary**

# Trials	N Rates kg/ha (lb/ac)		
	67 (60)	100 (90)	134 (120)
	Return after additional N cost (\$/ac)		
41		296.80	289.60
38	274.05	279.45	272.60

**Summary:**

These results support current OMAFRA recommendations as being accurate for predicting MERN on soft winter wheat fields in Ontario. On average, the MERN rate is 80 lb/acre (90 kg/ha), with 70% of fields showing this as the actual MERN. The economic impact of being 30 pounds/acre above or below the MERN rate is remarkably small. Growers are likely to lose less money by reducing nitrogen applications slightly below MERN, than by increasing these applications above MERN. These results are very positive, giving the potential to produce high yields of wheat, while minimizing any impacts on residual soil nitrate levels.

**Next Steps:**

Further analysis is required to identify statistical outliers, and analyze results by yield potential. These analyses will be available in the final report.

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