

## Starter Fertilizers for Corn Revisited: 2009 Summary

### Purpose:

It has been long recognized that proper use of starter fertilizers can increase corn yields and net profits. Numerous options with regard to choice of product, placement and rate of starter fertilizers exist, with these choices having impacts on profits because of either the size of yield response and/or cost of application. Furthermore, the quantity of nitrogen (N) applied as part of a starter fertilizer program may be influenced by timing of bulk fertilizer application (i.e. pre-plant or side-dress). A multi-year study was initiated in 2008 designed to evaluate yield and economic response of corn to various starter fertilizer products, placement options and rates when bulk N fertilizer was either applied pre-plant or side-dress. This report summarizes results from 2008 and 2009 for starter fertilizer treatments that were common across the various sites.

### Methods:

Four sites were established in 2008 and 10 in 2009. Only 3 sites in 2008 have replicated yield data. In 2009 4 of the 10 sites had starter fertilizer treatments, which are presented in Table 1, that were in common with those included in the 2008 trials. Soils on these sites were loam, silt-loam or silty clay-loam. Soil test P and K levels in the surface 6" are presented at the bottom of Table 1.

At 4 of the trials (Elora 2008, Ancaster 2008, Elora 2009, Bornholm 2009), different timing of N application (e.g. pre-plant or side-dress) were included to evaluate the impact that timing of N application may have on starter fertilizer response. The experimental design at these sites was a strip block design with 2 or 3 replicates. Starter fertilizer treatments which varied in product, placement (in-furrow vs. 2" by 2" band) and rate were randomly assigned to each replicate. Each replicate was split into 2 strips (i.e. front vs. back) to which 150 lb-N/ac of bulk N fertilizer was applied as either a pre-plant or side-dress application. Pre-plant bulk N was applied as broadcast urea which was incorporated and side-dress N was applied as 28% which was knifed mid-row when corn was at the 6-8 leaf stage.

The remainder of the sites summarized in this report just evaluated starter fertilizer response and the bulk N was applied side-dress as UAN that was knifed mid-row when corn was at the 6-8 leaf stage. The experimental design at these sites was a RCBD with 2 or 3 replicates.

Break even yield response is calculated for each of the starter fertilizers and is included in Table 1. The break even yield represents the grain corn yield response, after drying, required to cover the product cost of the starter fertilizer. The assumptions are: after drying corn price of \$3.50/bu; Alpine 6-24-6 at \$3.80/US gal.; 10-34-0 at \$3.80/US gal., UAN (28%) at \$1.68/US gal.; MAP at \$0.26/lb; and 5-20-20 at \$0.20/lb. The break even yield calculation does not consider equipment or time costs associated with starter fertilizer application.

## Results:

Timing of bulk N fertilizer application did not significantly affect corn yield response to starter fertilizer at the Ancaster 2008, Elora 2008, Elora 2009 and Bornholm 2009 sites. Therefore, yield response to starter fertilizer, summarized at these sites were averaged across N timing treatments.

Two of the 6 2009 sites not summarized in this interim report had low corn yields because they did not reach maturity prior to end of season. The starter fertilizer treatments that were included in the other 4 2009 sites support the general conclusions derived from the 7 sites that are summarized in Table 1.

Generally, using 6-24-6 as a seed placed starter produced yields that were either similar or greater than those produced using ammonium polyphosphate (10-34-0). Similarly, applying a starter that contains N, P and K, such as 5-20-20, in a 2" by 2" band produced yields that were either similar or greater than those produced when MAP and/or UAN was applied in a 2" x 2" band. Generally, sites which had large yield responses to starter fertilizer had soil K levels that were below 80 ppm. Therefore, it appears that use of starter fertilizers to supplement fertility on soils with low P levels should contain K as well if soil K levels are also low. Two of the sites (Alma 2009 & Ancaster 2009) did not have large yield responses to starter fertilizer in spite of relatively low soil test K levels.

Generally on sites with larger observed yield responses to starter (greater than 15 bu/ac), yield response associated with applying 5 US gal/ac of 6-24-6 with the seed was about half of the yield response observed with applying 200 lb/ac of 5-20-20 in a 2" x 2" band (Table 1).

Based on winter 2010 retail prices and expected after drying corn prices the break even corn yield response to starter is about 6 bu/ac for 5 US gal/ac of Alpine 6-24-66, 5 US gal/ac of 10-34-0, or 75 lb/ac/ac of MAP and about 12 bu/ac for 200 lb/ac of 5-20-20 (Table 1). For the trials summarized in this report, starter fertilizers that contained K were more likely to produce yield responses that exceeded the break even yield when compared to starter fertilizers that contained only P and/or N. This occurred for both in-furrow and 2" x 2" starter placements.

Table 1. Corn yield response to various starter fertilizers across 7 field trials conducted in 2008 and 2009.

Starter Treatment	Break Even+	Alma 2008	Elora 2008	Ancaster 2008	Alma 2009	Elora 2009	Ancaster 2009	Bornholm 2009
	----- bu/ac -----							
No Starter		187	188	156	179	168	169	125
10-34-0 @ 5 gal/ac; IF	5.4	195	195	174	179	169	163	116
6-24-6 @ 5 gal/ac; IF	5.4	201	204	170	181	177	181	128
UAN @ 10 gal/ac; 2x2	4.8	194	193	157	178	170	176	123
MAP @ 75 lb/ac; 2x2	5.6	192	198	179	180	165	175	114
MAP @ 75 lb/ac plus UAN @ 10 gal/ac; 2x2	10.4	193	199	184	171	163	178	114
5-20-20 @ 200 lb/ac; 2x2	11.4	NI	220	179	183	184	175	150
LSD (10%) ++		8.6	8.6	11.2	ns	8.0	ns	13.5
Soil Test P:K (ppm)		60:100	11:62	14:57	35:77	8:68	16:77	18:80
<p>+ Break even yield response is the bushels per acre required to cover the starter fertilizer treatment. These calculations are based on the following pricing assumptions: net corn price after drying of \$3.50/bu; Alpine 6-24-6 at \$3.80/US gal.; 10-34-0 at \$3.80/US Gal.; MAP at \$0.26/lb; UAN (28%) at \$1.68/US Gal.; and 5-20-20 at \$0.20/lb. The break even yield response calculation only considered cost of product and did not include costs associated with equipment or timing.</p> <p>++ LSD in the smallest yield difference required between starter treatments for a less than 10% chance that the observed yield difference was not due to effects other than the starter treatments.</p> <p><b>IF</b> - In furrow application of fertilizer.</p> <p><b>NI</b> - Starter treatment not included in trial.</p>								

### Summary:

The first 2 years of this study demonstrated that a wide range in yield responses and profits can be obtained based on choice and rate of starter fertilizers applied. The study to date has shown that on fields with medium to medium low soil P and K tests that profitable yield responses are more likely to occur when N, P and K based starters are applied when compared to starters that contain only N and P. The results of this study clearly suggest that for soils with less than adequate P and K levels that K should be included in the starter fertilizer regardless of position of application (i.e. in-furrow or in a 2" x 2" band). The study to date also clearly suggests that larger yield responses can be obtained by applying N, P & K dry fertilizer based starters in 2" x 2" bands when compared to in-furrow applications on soils with less than adequate P and K fertility. However, substantial (profitable) yield responses are also possible on less than adequate P and K fertility soils if the only starter option is to apply in furrow N, P and K based starter fertilizers.

**Next Steps:**

This is the second year of a 3 year project. Similar field trials are to be conducted in the 2010 cropping year.

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