SMART II Initiative for Soybeans

(*The "Kitchen Sink" study*)

(Interim Report)

Purpose:

With higher commodity prices soybean growers are seeking solutions to overcome the limitations on soybean yields. Current agronomic recommendations in Ontario are based on research with relatively narrow objectives that focus on simple effects of a few factors at a time. Management needs to consider additive and synergistic effects on yield and profitability. This project will study possible additive effects of inputs on different varieties as well as the effects of later maturing bean varieties. A "kitchen sink" approach was applied at the field scale level to assess the impacts of multiple inputs on soybean yields. This treatment package was also broken down into its individual components and applied on 8 different varieties on small plots by the University of Guelph.

Methods:

Field scale treatments included:

1. Variety A (Adapted) – Untreated
2. Variety A (Adapted) – *Kitchen Sink
3. Variety B (+200 CHU) – Untreated
4. Variety B (+200 CHU) – *Kitchen Sink

***Kitchen Sink** treatment consisted of Cruiser Maxx seed treatment, Hi Coat inoculant, a higher seeding rate (250,000 seeds/acre), 50 lbs/acre of nitrogen in the form of ESN and ammonium sulphate, 3 gallons/acre of 2-20-18 liquid applied in furrow, Quilt foliar fungicide, 6L of SRN (slow release nitrogen) and 2L of 3-16-16 foliar fertilizer. +200 CHU refers to a variety that is 200 Crop Heat Units (CHU's) longer than recommended for the given area.

Results:

The spring of 2011 was cold and wet, which delayed planting by about 2 weeks. These trials were planted in late May or early June. In many years this would have been enough to significantly decrease yields. However, the August-October period of the growing season was outstanding, and resulted in above average yields.

In 2012, the spring conditions were almost the opposite of 2011, the weather was warm and dry for the early portion of the season. Early planting took place for these trials and all were seeded before the end of May. In many areas conditions were dry for an extended period of time, which typically reduces yield potential. Once again, however, the August-October period of the growing season was forgiving and significant yields were realized in many areas of the province.

Choosing a longer maturing soybean variety provided 2.4 bu/ac more yield. The "kitchen sink" approach added another 3.8 bu/ac. The cost of the kitchen sink approach in this

study was about $140 per acre. The parallel small plot trials conducted by the U of G showed a response of up to 10 bu/ac with some varieties. Further study will be needed to understand these variety interactions. Extending the heat unit range by growing a variety that was 200 CHU longer than recommended was an effective way of increasing yields without added input costs.

Figure 1 & 2: These pictures show plant growth differences between the Kitchen Sink treatment (left side of each picture) versus untreated beans (right side of each picture) in two SMART II Trials. The picture on the left was taken in a field near Caledonia, Ontario, while the picture on the right was taken in a field near Delhi, Ontario.

Table1 shows the yield averages for each treatment while Table 2 reports the results of the seed analysis.

Table 1. Field Scale Trial Results (2011-2012)

Treatment	Average Yield Across All Sites (10 sites) (bu/ac)
Adapted (Untreated)	50.0
Adapted (Kitchen Sink)	54.4
+200 CHU (Untreated)	52.4
+200 CHU (Kitchen Sink)	56.2

The adapted beans had slightly better oil content and the +200 CHU beans had higher protein levels. The seed size was slightly higher for the longer day bean varieties and the kitchen sink treatment. This could explain some of the increased yield.

There was no impact on seed germination as a result of the Kitchen Sink treatment being applied. The difference in germination between adapted and the longer day beans was the result of variety differences as opposed to a “real” difference in vigor between shorter and longer day beans.

Table 2. Summary of Seed Analysis Results from 2011-2012 SMART II Project

Measurement	SMART II Treatment			
	Adapted (Untreated)	Adapted (Kitchen Sink)	+200 CHU (Untreated)	+200 CHU (Kitchen Sink)
Moisture	13.0%	13.2%	13.0%	13.0%
Oil	21.3	21.4	20.8	20.7
Protein	40.0	39.9	40.7	40.6
100 Seed Wt(g)	15.5	15.9	15.8	16.0
Seed Germ.	88.4%	88.7%	94.5%	93.9%
Visual	1.3	1.3	1.3	1.3

Summary:

1) An average yield gain of 4.4 bu/ac for adapted varieties and a gain of 3.8 bu/ac for longer maturing varieties were realized when seed treatments, nitrogen fertilizer, a higher seeding rate, foliar fungicides and foliar fertilizer were applied together in 2011-12. This approach was not economically profitable.
2) An average yield gain of 2.4 bu/ac was realized when a variety that was 200 CHU's longer than recommended was planted. This strategy is a viable way to increase soybean yields for fields not intended for winter wheat production.
3) Seed size, oil content, and protein were impacted marginally by these management strategies.
4) Seed germination was not affected by the Kitchen Sink treatment.

Next Steps:

The project is entering the final year for this phase of the study. The findings will be used as part of an ongoing study to help Ontario grower's maximize their yields when growing soybeans. More data must be collected to understand variety interactions.

Acknowledgements:

We would like to thank the cooperators who lent their time and land to the project. We would also like to thank the Grain Farmers of Ontario as well as Syngenta who have been major sponsors of this project. The access to tractors for these field projects from John Deere is greatly appreciated.

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