

# Factsheet: Developing Phosphorus Management Recommendations for Soybeans in Saskatchewan



## Objective:

Broadly, the objective of this project was to improve upon current P fertilizer recommendations for soybean production in Saskatchewan. More specific objectives were:

- 1) To evaluate the sensitivity of soybeans to seed-applied monoammonium phosphate for soybeans grown on 25-30 cm (10-12") row spacing.
- 2) To evaluate the overall response of soybeans to P fertilizer applications across a range of placement methods and environmental conditions and for individual sites as a function of residual soil P levels.
- 3) To compare crop response to contrasting placement options for granular monoammonium phosphate (seed-placed, side-banded and pre-seed broadcast)
- 4) To quantify P removal in the harvested seed in order to help soybean growers determine optimal P fertilizer rates for achieving their long-term soil fertility goals.

## Methodology:

Phosphorus (P) fertility trials with soybeans were initiated at four Saskatchewan locations in 2015 and continued through the next two seasons for a total of twelve site-years. These were located at Indian head, Scott, Melfort and Outlook. The treatments were three P rates (22, 45 or 90 kg P<sub>2</sub>O<sub>5</sub>/ha) and three placement methods (seed-placed, side-banded or pre-seed broadcast) plus a control where no P fertilizer was applied. These 10 treatments were arranged in a Randomized Complete Block Design (RCBD) with four replicates.

## Key Findings:

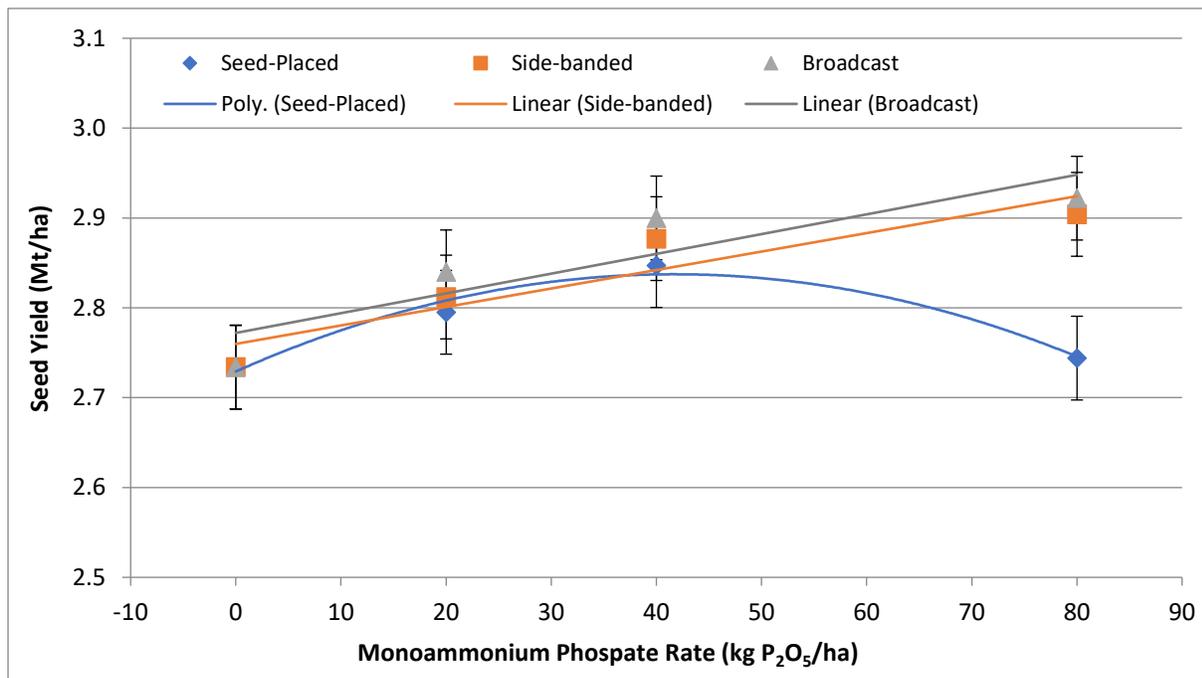
- Phosphorus rates: Appropriate rates depend on both the potential soybean yields that can be reasonably expected and the long-term fertility goals for the field in question.
- If the objective is to maintain soil P over the long-term, rates should be approximately equal to crop removal. Removal ranged from 16-55 kg P<sub>2</sub>O<sub>5</sub>/ha (14-49 lb/ac) with an overall average of 39 kg P<sub>2</sub>O<sub>5</sub>/ha (35 lb/ac).
- Safe rates of seed-applied phosphorus: While it was often minor, evidence of stand reduction with seed-placed P were detected approximately 50% of the time; however, the damage was generally only detected or large enough to be of concern at the highest rate.

The full report is available at [www.warc.ca](http://www.warc.ca). Financial support specific to this project was provided by the Saskatchewan Pulse Growers and the organizations who completed the work also receive unrestricted funding from the Saskatchewan Ministry of Agriculture Agri-ARM applied research program.

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- Responses to seed-placed P were never better than side-banded or broadcast P for any of the variables and, when averaged across all sites, yields were reduced at the highest rate of seed-placed P.
- These results suggest the current recommendation of no more than 10-20 kg P<sub>2</sub>O<sub>5</sub>/ha may be more conservative than necessary but side-banding is a preferable method for applying P, especially at high rates.
- While soybeans responded well to broadcast P, this is still not considered an ideal option from either a fertilizer efficiency or environmental perspective.
- Results suggest that significant yield responses to P fertilization are rare on a field-to-field basis but can occur with the greatest potential for response when yield potential is high and soil residual P is low.
- On average, slightly higher (~6%) yields may be expected with adequate P fertilization and using adequate rates is important to maintain soil fertility over the long term.



**Figure 1.** Phosphorus placement and rate effects on soybean seed yield averaged across 12 site-years in Saskatchewan.

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