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Which crop inputs and management practices contribute most to profitability? At the *Getting it Right* soybean meeting, farmers were encouraged to critically assess profit and probability when thinking about products and practices for soybean production. Profit takes into account an expected yield response and the cost to implement it. A yield response is generally an average of multiple observations, which can vary by little or a lot, making probability important. Probability is expressed for you to understand how likely you are to see a positive response. Here is an example:

- The average yield response to fungicide on soybean in Manitoba is 1.2 bu/ac
- This average is based on 21 observations, which range from -0.4 to +3.2 bu/ac
- The cost of application is \$20/ac
- The probability of seeing a yield response that exceeds the cost of application is three out of 21

This article will outline eight important management areas for soybeans that warrant attention (or not) in order to maximize profitability.

1. SEEDING RATE

When determining the most economical seeding rate for soybeans, my philosophy is “begin with the end in mind.” In other words, you need to think about how many actual plants you want in the field before you figure out your seeding rate. Based on \$10 soybeans and a seed unit cost of \$65 (includes seed and inoculant), the most economical target plant population is 140,000 live plants per acre. How do you get there? On-farm studies have determined that the average seed survival is 71% for air seeders and 81% for planters. Taking this into account, we suggest a seeding rate of 200–210,000 seeds/ac for air seeders and 170–180,000 seeds/ac for planters. To customize this to your farm, use the MPSG Bean app, available free for download in the App store.

2. INOCULATION

Double inoculation is an absolute must for first and second time soybean fields. Inoculant studies conducted in 2014 and 2015 showed an average yield increase of 10 bu/ac for inoculant treatments over the untreated control at sites with no history of soybean. At those sites, we also compared inoculant rates and formulations (see the study results on page 44.)

But do we always need to “double inoculate”? Sure it is “cheap insurance” for first and second time fields, but with granular inoculant costing \$10–15/ac, this double inoculation strategy may not be necessary for mature soybean fields. To address this question, we conducted on-farm trials comparing double vs. single inoculation on 25 fields in eastern Manitoba from 2013–2015. All fields had at least a two-year history of soybean. In this study, double inoculation was seed-applied liquid plus in-furrow granular OR seed-applied liquid plus liquid in-furrow. Economic analyses are conducted individually to reflect the differences in cost of liquid and granular inoculant. Overall, a significant yield response to double inoculation occurred in two out of 25 sites (8% of the time) and the average yield response across all sites

“Seed survival” refers to the percentage of seeds planted in the ground that actually germinate, emerge and contribute to an established plant stand. To calculate “seed survival”, you need two numbers; seeding rate and plant stand.

Ex. Seeding rate = 1.5 units/ac or 210,000 seeds/ac

Plant stand measured = 150,000 plants/ac

Seed survival = $(150,000 / 210,000) \times 100 = 71\%$

Seed survival is affected by germination and seed quality but especially equipment, handling and soil conditions etc. It is unique to farm and field. You should always assess your plant stand to get an idea of the seed survival you are achieving.

was 0 bu/ac. The two sites that showed a significant yield response were both in 2013 and were non-GM soybeans. This robust data set indicates that single inoculation is more economical for fields with a frequent history of

“Double inoculation” is a term used by agronomists to describe the use of two types of inoculant, either two formulations (liquid, powder, granular) or two placement techniques (seed applied, in-furrow). Most often it is the combination of a seed-applied liquid inoculant and an in-furrow granular inoculant, but it can also mean seed-applied liquid and liquid in-furrow. “Double inoculation” is used as insurance to ensure rhizobium survival and successful nodulation of soybean plants.

“Single inoculation” refers to the use of a one inoculant only, usually seed-applied liquid.

soybean. If certain fields on your farm meet the following requirements, single inoculation will likely provide you with a higher economic return:

- At least two previous soybean crops
- Previous soybean crops were well-nodulated
- Last soybean crop within four years
- No significant flooding or drought

3. SEED TREATMENT

Options for soybean seed treatment include bare seed, fungicide only, or fungicide + insecticide. While seed treatment can be an important tool, new research is showing that it is not always an economical input for soybeans. Unlike flea beetles to canola, soybeans do not have an insect pest that is threatening on an annual basis, making the effect of seed treatment difficult to measure and predict. In 2015, ten on-farm trials were conducted comparing treated vs. untreated soybean seed; the results are shown in Figure 1. The seed treatments tested were CruiserMaxx Vibrance and Evergol+StressShield. A significant yield increase from using a seed treatment occurred in four out of 10 trials (40% of the time). There was no specific factor that correlated to the four responsive sites, again making it difficult to predict when a seed treatment should be used. We would have expected increased crop establishment with the use of a seed treatment but this was not the case; crop establishment was the same between treated and untreated. Other factors

continued ▶



Figure 1. Yield response of treated versus untreated soybean seed across 10 eastern Manitoba on-farm trials in 2015.

6. VARIETY SELECTION

This is the easiest way to increase profitability, particularly for soybeans where we have so many varieties on the market. As farmers and agronomists, we need to learn how to use the *Variety Evaluation Guide* to our advantage and filter out those with the highest yield potential and best agronomic characteristics. There were 57 Roundup Ready soybean varieties tested in Manitoba in 2015, with yield potential varying by 5–20 bu/ac within each maturity zone. Take some time to learn how to use the guide!

At the *Getting it Right* soybean meeting, we also discussed management areas that require “less attention” – these were “extra” fertilizer and fungicide applications. Based on multiple field demonstrations and two on-farm studies, we have not seen a yield response to additional nitrogen in Manitoba soybeans. On-farm fungicide trial results were discussed earlier in this article.

Remember, profit and probabilities are dynamic! Don’t expect Table 1 to be the same in six months or two years from now. Profit is calculated according to market prices of soybeans and crop inputs. Probability can also fluctuate as new research is conducted and datasets become larger. For example, at \$14 soybeans, suddenly fungicide and seed treatment become more attractive. Or alternatively, as you continue to grow soybeans on the same piece of land, the response to inoculant will be reduced. ■

such as seeding date, stubble type and seed treatment brand also varied. This study will be repeated in 2016. Generally speaking, seed treatments should be considered in fields with a history of wireworms, frequent soybean in rotation or when planting into cool, wet soil conditions. Use our *Seed Treatment Risk Assessment Guide* to assess each soybean field, available online at www.manitobapulse.ca.

4. WEED CONTROL

Timely weed control is often underestimated and can increase profitability without extra money spent. Soybeans are weak competitors with weeds (like flax) due to very slow early season growth. Based on Ontario data, the “critical weed-free” period for soybeans is known to be from emergence to the third trifoliolate, which in Manitoba lasts to about July 1. Keeping the crop clean for this duration of time requires a well-thought out herbicide strategy. Crop scouting should take place weekly beginning at seeding to monitor weed height and density. North Dakota studies have shown that if weed removal is delayed to when weeds are 2–8" high, yield loss can range from 2–4 bu/ac. Think about how well your weed control has been in previous soybean crops – have you had trouble finding your soybeans among the weeds? Then you likely need to be out there earlier. Are you always able to get on the field when you need to? If not, consider a pre-emergent herbicide with residual activity.

5. NARROW ROWS

Research data from Manitoba and most other growing regions (North Dakota, Iowa) is quite consistent and points

towards a yield gain for soybeans planted in narrow rows (<15"). After all, narrow rows do a better job utilizing the free farming input – sunlight! The yield gain has been said to increase as we move northward in order to promote rapid canopy closure in our shorter growing regions. From 2011–2013, 20 site-years of research were conducted throughout Manitoba comparing narrow and wide rows in soybeans. Narrow rows always yielded the same or higher than wide rows. Yield differences were more pronounced when row spacing was 8–12" compared to 27–30", ranging from 1.5 to 11 bu/ac. Yields were more similar when comparing 8–12" to 16–24" rows. Looking at Table 1, you may wonder why the profit for narrow rows is only \$5/ac? Generally speaking, when using an air seeder system, you need a higher seeding rate due to lower seed survival compared to when using a planter. Thus, the increased seed cost can offset a yield gain with narrow rows, resulting in similar economics. Factors related to equipment that influence seed survival include handling, metering, depth control et cetera.

Table 1. Profitable soybean production practices for 2016.

Practice	Yield Response	Profit (\$10 soybeans)	Probability of positive response
1. Inoculation	+ 10 bu/ac	+ \$80/ac	High
2. Timely weed control	+ 2 bu/ac	+ \$20/ac	High
3. Variety selection	+ 2 bu/ac	+ \$20/ac	High
4. Narrow rows	+ 2 bu/ac	+ \$5/ac	Medium
5. Seed treatment	+ 1 bu/ac	- \$3 /ac	Medium
6. “High” seeding rate	0 bu/ac	- \$15/ac	Low
7. Fungicide	+ 1.2 bu/ac	- \$13/ac	Low
8. Extra nitrogen	0 bu/ac	- \$15/ac	Low