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A Few High Yield Soybean Thoughts

Variety Selection: Variety selection is key at any yield level, but, especially for high yielding soybeans. You need a variety with top end yield potential, good sudden death syndrome (SDS) tolerance, along with other defensive traits needed for your field. Maturity comes into play as well, but let's mention that with early planting….

Planting Date: It is no secret that the highest soybean yield potential comes with earlier planting. Two things that most folks don't realize with early planting, though, comes with maturity and lodging. The data suggests that planting a variety on the later side of your geographic maturities offers the most yield potential. Obviously, this can be trumped by yield potential, but the data leans to a high yielding later maturing variety planted early. Many folks also think that early planting will increase lodging concerns. Actually it can do the opposite. The slower accumulation of growing degree units shortens internode length. The worst lodging pressure usually happens with mid-May to early June beans. However, on highly productive fields, you still need to select a variety with good standability.

Seed Treatment: If you are planting early, you are planting into prime conditions for diseases like Pythium, fusarium, SDS, etc. A good seed treatment like Lumigen (which includes fungicide + insecticide) + ILeVO (for SDS) is a must to protect high yield potential.

Row Spacing: High yields can be attained in 30" rows, but in order to maximize light interception and yield potential row spacing <30" is best.

Soil Test: The only way to know how much money you can spend is to know how much is in the bank. Soil fertility is no different. The only way to know what your nutrient bank looks like is to soil test. If you haven't soil tested in the last four years, it is time to find out what is in the bank. If you are comparing to historical soil tests, then you need to sample at the same time of year to keep things consistent (i.e. fall vs. spring).

Fertility:

1. Step #1 for any fertility program, after soil testing, is to **fertilize to your actual yield goal**. Many times we fertilize to a lesser yield goal than we actually want. Set your fertility goal to what you actually want to raise.

2. There is a difference in the value of nutrients that are removed from the field at harvest and those that are taken up by the soybean plant throughout the season. You have to maintain high enough fertility values that the soybean plant has enough to take up throughout the season for max yields. The chart below shows the **uptake and removal of an 80 bu/a soybean crop.**

Nutrient Requirements for 80 bu/ac Soybeans

Gaspar & Conley, 2017

Total Uptake at Maturity (lbs/ac)										
N	P2O5	K2O	S	Mg	Ca	Fe	B	Cu	Mn	Zn
302	73	200	19	44	83	0.61	0.20	0.09	0.46	0.24

Total Removal with Grain (lbs/ac)										
N	P2O5	K2O	S	Mg	Ca	Fe	B	Cu	Mn	Zn
274	59	98	13	13	11	0.17	0.09	0.09	0.17	0.17

Fertility (cont.):

3. **Soil pH.** Maintaining optimal soil pH is key to providing optimal nutrient availability. If you have an extremely acid soil, liming it becomes the priority over fertilizing it because of the effect on nutrient availability. Many high yielding soybean growers set their pH target at 6.5-7.0, which is higher than most folks set it.

4. If you apply fertilizer every other year, try moving to an **annual application**. I realize fertilizer applications every year might be used as a costs savings for many operations, however, folks pushing for higher yields are not relying on a crop to "scavenge" the year after a fertilizer application. You might be surprised at the response to an annual application.

5. **Potassium.** If you have studied high yielding soybeans the last few years, you have heard that soybeans require a lot of potassium (K). You can see that in the table on the front page. Removal of K by soybean grain is 1.2-1.4 lbs. (depending on where you look) of K_2O per bushel. However, at peak in-season demand (R2-R3) the plant is taking in upwards of 5 lbs. of K_2O per acre per day. So, it takes a high K level to meet that demand. High yielding folks are generally pushing for 200-300+ ppm K soil test levels at the start of the season.

6. **Phosphorus.** Generally, we talk about potassium with soybeans, but phosphorus (P) is also extremely important. Recent research from Pioneer tissue samples on >80 bu/a yield locations has identified P leaf concentration at R1 as the most correlated nutrient to yield at that stage. Ensure that soil test P levels are at an optimum range. One thing to keep in mind, as you increase soil K levels, soil P levels will also have to be increased in some proportion.

5. **Sulfur.** Soybean plants require a significant amount of sulfur. However, in the past, there was little data to show a significant response. That has changed now. Dr. Shaun Casteel at Purdue shows +10-15 bu/a responses to sulfur on sandy soils, but he also shows advantages of 4-6 bu/a on heavier soils with 2.5-3% organic matter. With early planted soybeans going through cooler and wetter conditions the higher organic matter soils are not mineralizing sulfur. Applying a product like ammonium sulfate (AMS 21-0-0-24) at 100 lbs./a anywhere from just before planting to V3 can really help early planted soybeans. Later planted soybeans likely won't show a response on these soils. Elemental sulfur takes time and temperature to break down so there are no benefits in this situation.

5. **Season long nutrients.** Recent Pioneer tissue sampling research on >80 bu/a soybean locations reveals that soybeans require more of a "season long load" of many nutrients than corn. Especially of nutrients like N, P, K, and micronutrients like boron, zinc, and manganese. This might explain why we have seen responses to **in-season applications** of P and K. Some will supply micronutrients via foliar feeding. Keep in mind if you wait until R3 (fungicide application) to apply them, you might be a little late.

6. **Tissue testing.** Pick out a high yielding spot in a high yielding field and tissue sample it at R1, R3, R5, and compare it to our new sufficiency ranges (page 12, table 6 in the 2021 Agronomy Research Summary). It was developed from tissue samples collected all over the U.S. by Pioneer on locations 80+ bu/a and above.

Weed Control: This should be a given, but letting the weeds outgrow your beans to brag about the size of weeds you can kill does nothing but ruin herbicides and cost you yield. You need a good residual upfront followed by a timely post-emerge that effectively kills the weeds and provides another residual to push control further into the season.

Fungicide + Insecticide: Foliar fungicide + insecticide applications at R3 on soybeans have shown consistent yield benefits. Our data shows a +5.3 bu/a response to fungicide + insecticide combinations at R3. Be sure to use a two mode of action fungicide. Some high yield growers do multiple applications in season.

Timely Harvest: Significant yield is lost when soybeans dry below 13% moisture. Pioneer data from 2013-2017 showed a 7 bu/a yield loss by letting soybeans dry from 13% down to 10%. Timely harvest is key to maximizing yields.