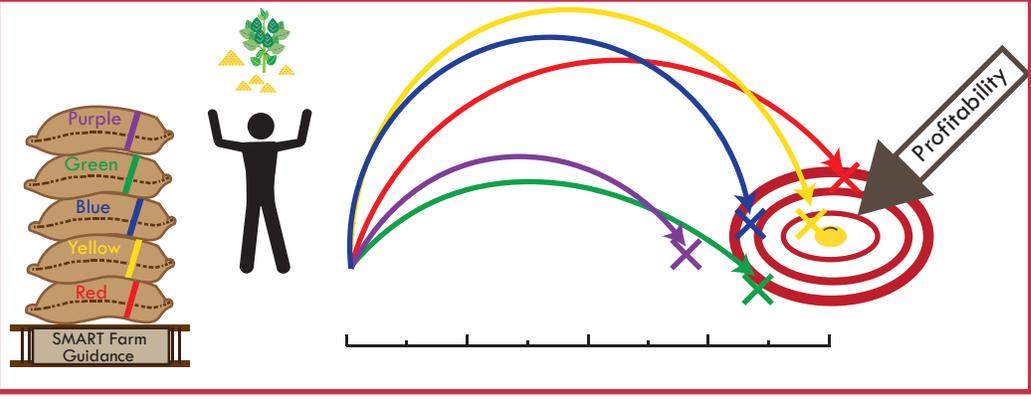
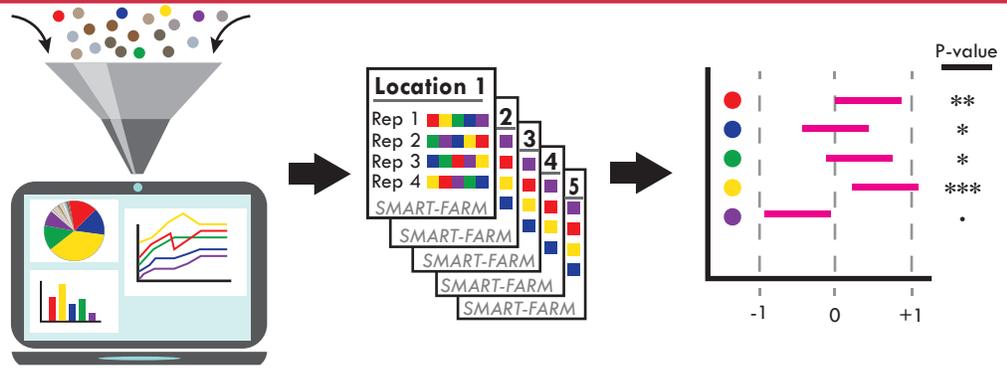


## The Challenge: Traditional soybean guidance misses the mark

Historically, guidance on soybean production in Sub-Saharan Africa (SSA) has suffered from mixed, anecdotal evidence. In the absence of clear messaging on proper field management, soybean yields are inconsistent. This leads to economic losses, frustrated farmers, and a reduced motivation to grow soybean in future seasons.

## Bringing formality to the farm

To address this fundamental gap in knowledge the Soybean Innovation Lab (SIL) established a Soybean Management with Appropriate Research and Technology (SMART) Farm to replace anecdote and ad hoc guidance with formal, evidence-based guidance, and then scale out that information to the greater network of agronomists and technicians engaged in soybean development in SSA.



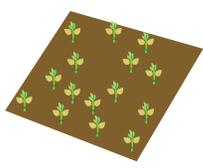
## SMART Farms: Providing unique field recommendations for increased profitability

The SMART Farms have been addressing the agronomic needs of African soybean growers since 2014. Leveraging this body of knowledge, the SMART Farms generate soybean management solutions that help maximize the profitability of a grower's specific field.

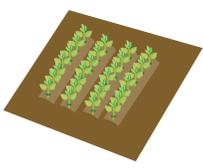
## Bundles – The Agronomic Solution



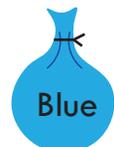
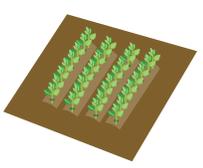
- Various growing practices
- Saved seed
- No additional inputs



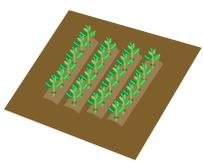
- Best management practices
- Certified seed



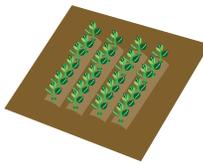
- Best management practices
- Certified seed
- +1 additional input



- Best management practices
- Certified seed
- +2 additional inputs



- Best management practices
- Certified seed
- +3 additional inputs

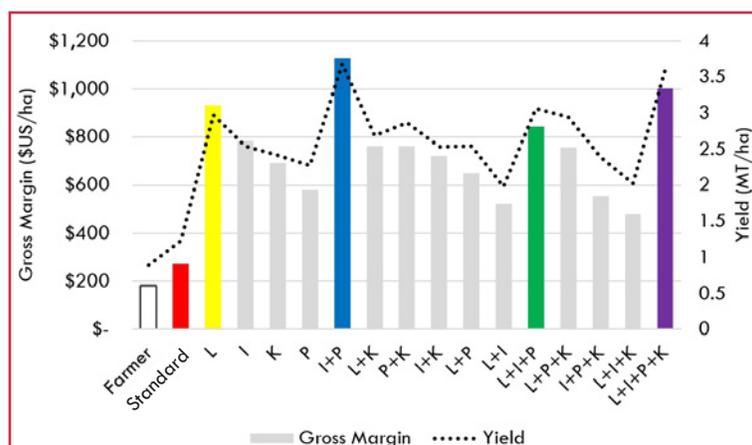


- Best management practices
- Certified seed
- +4 additional inputs



Soybean is an input intensive crop. Agricultural inputs such as lime (L), inoculum (I), phosphorus (P) and potassium (K) contribute to increases in soybean yield. However, the combination of specific field conditions and a farmer's limited cash funds may make using all four inputs either unnecessary or financially impractical. **SIL uses the term "Bundle" to describe the combination of inputs and practices best suited for a specific location.** The Red Bundle is the Standard growing package. This includes the usage of certified soybean seeds and the adoption of best management practices (early planting, planting in rows, increased seed population, and timely weeding). The Yellow, Blue, Green, and Purple Bundles build off the Red Bundle by adding 1, 2, 3, and 4 additional inputs, respectively. To balance the financial risk of applying new inputs, SIL recommends a stepwise investment in a new technology. This prioritizes the maximum financial returns on the minimum input costs, and allows initial successes to feed into additional future inputs

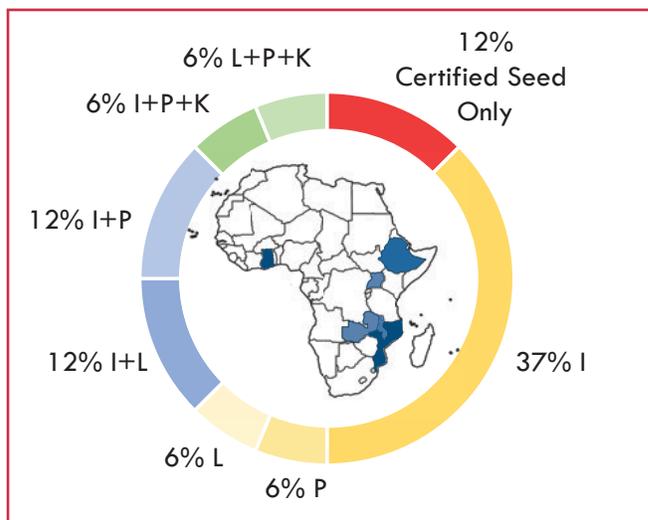
## What Bundle is best for you and your field?



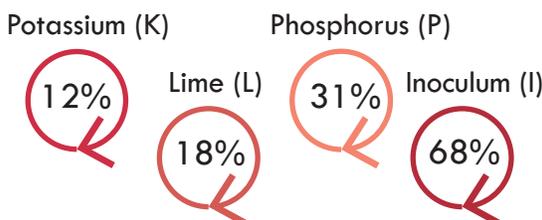
**Figure 1:** Treatment yields (line graph) and gross margins (bar graph) for the 2020 SMART Farm in Domasi, Malawi. Gross margin = Revenue – Variable Costs.

**More is not always better.** Different fields will benefit from different input bundles depending on environment and soil fertility. And while additional inputs may generate higher yields, they will also result in increased costs. Through the SMART Farm input omission trials, agronomic results are coupled with local input and grain prices to best determine which input Bundle is most profitable and productive. In the example shown in **Figure 1** the Blue Bundle, containing inoculum and phosphorus, in addition to proper management and certified seed, is recommended for 2020 Domasi field site in Malawi. For Domasi, the Blue Bundle outperforms other bundle options, even those with more inputs, in terms of yield and profitability.

## What Bundles are being recommended?



## How often was each input included in recommended Bundles?



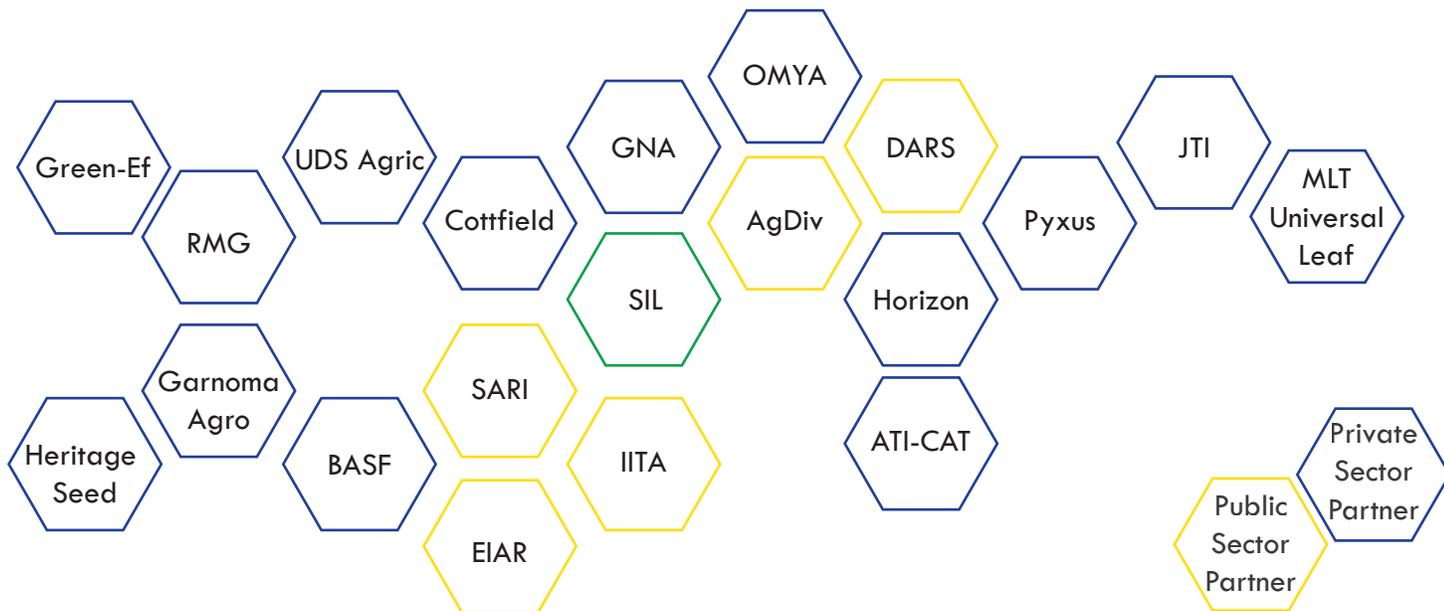
| Season    | Country    | Location  | Public/Private         | Recommended bundle | Yield (MT/ha) | Gross Margin (\$USD) |
|-----------|------------|-----------|------------------------|--------------------|---------------|----------------------|
| -         | -          | -         | Typical Soybean Farmer | -                  | 0.89          | \$ 182               |
| 2019      | Ethiopia   | Dimtu     | Public                 | L                  | 3.02          | \$ 925               |
| 2019      | Ghana      | Nyankpala | Public                 | I+P                | 2.66          | \$ 880               |
| 2019-2020 | Malawi     | Lisungwi  | Private                | L+I                | 2.01          | \$ 535               |
| 2019-2020 | Malawi     | Zomba     | Public                 | Certified Seed     | 2.43          | \$ 755               |
| 2019-2020 | Malawi     | Mpale     | Private                | I                  | 2.66          | \$ 831               |
| 2019-2020 | Malawi     | Kanengo   | Private                | I                  | 3.30          | \$ 1,090             |
| 2019-2020 | Malawi     | Chitedze  | Public                 | I                  | 3.96          | \$ 1,351             |
| 2019-2020 | Mozambique | Angonia   | Public                 | L+P+K              | 1.97          | \$ 363               |
| 2019-2020 | Mozambique | Gurue     | Public                 | L+I                | 2.57          | \$ 759               |
| 2019-2020 | Mozambique | Nkhame    | Private                | I                  | 2.44          | \$ 742               |
| 2019-2020 | Zambia     | Lusaka    | Public                 | I+P+K              | 1.90          | \$ 360               |
| 2019-2020 | Zambia     | Chipata   | Private                | P                  | 2.90          | \$ 831               |
| 2020      | Ethiopia   | Dimtu     | Public                 | Certified Seed     | 1.45          | \$ 362               |
| 2020      | Malawi     | Bwanje    | Public                 | I                  | 2.40          | \$ 728               |
| 2020      | Malawi     | Domasi    | Public                 | I+P                | 3.68          | \$ 1,130             |
| 2020      | Uganda     | Bulangira | Private                | I                  | 1.95          | \$ 465               |

**Table 1:** Recommended input Bundles for the 2019-2020 SMART Farms with accompanying yield and gross margins. Bundle recommendations are given to the input combination that generates the highest economic returns for farmers, not necessarily the highest yields. Public = Public sector sites. Private = Private sector sites.

**The Farmer defines the Bundle.** While SIL has identified lime, inoculum, phosphorus, and potassium as beneficial inputs for farmers to include in their bundles, other agricultural inputs may be just as critical for soybean growth in a given region. As a farmer's needs shift, the SMART Farm template can be adjusted to accommodate additional fertilizers, agronomic practices, or the use of protective or preventative products. Please see the "Next Steps" section below for more information of the SMART Farm planting protocol.

## Networks are the key to success

**No soybean grower can do it alone.** Soybean production relies on a network of farmers, agronomists, agro-processors, input suppliers, private companies, public institutions, and government agencies. Fostering and strengthening the connections within this soybean network is an essential goal of SIL and is critical to the prosperous and sustainable growth of soybean production in Sub-Saharan African. Below are some of the invaluable partners that have made SIL's efforts possible.



### Takeaways

**A little goes a long way!** In most SMART Farm trials, the Red Bundle marks a large improvement (2x yield gains) over typical farming practices. The use of certified seed and good management practices can make the difference between a poor field and a profitable one.

**A bean's best friend!** Rhizobium Inoculum is present in two-thirds of all of SMART Farm recommended Bundles. Its low cost and large contributions to soybean nitrogen availability make these little bacteria an easy addition to any soybean field.

**The problem with pests!** The SMART Farms focus primarily on inputs that directly or indirectly provide more nutrients to growing soybean plants. However, in locations with high plant disease, weed, or insect pressure, a farmer may find more value exploring protective or preventative products to include in their Bundle. If a soybean plant dies before reproductive maturity, the amount of available nutrients won't matter very much.

**Know your soil!** Soil quality and fertility can vary greatly from location to location. Making use of soil tests arms farmers with information on what nutrients their fields may be deficient in, and by extension what fertilizers may benefit soybean production.

### The Next Step

**Interested in learning more about the SMART Farm trials and Bundle recommendations discussed here?** Check out the Tropical Soybean Information Portal (TSIP) where you can access full agronomic reports in addition to valuable resources on soybean variety performance, soybean-based food options, post-harvest threshing, and much more!

[www.tropicalsoybean.com](http://www.tropicalsoybean.com)

**Are you curious about what inputs would be in your soybean Bundle?** Take a look at the SMART Farm Input Calculator found in the "Tools" section of the TSIP Users can enter soil information specific to their own fields, define a starting budget for the purchase of inputs, and control the costs of each input to reflect local prices.

**Would you like to host a SMART Farm input omission trial at your location?** Please contact the SIL SMART Farm Project Manager to learn more.

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Soybean Innovation Lab  
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