2013 Purdue Soybean On-Farm Trial – ROW WIDTHS

Shaun Casteel, Extension Soybean Specialist, Purdue Agronomy
scasteel@purdue.edu, 765.494.0895

OVERVIEW

This protocol describes the design and conduct of on-farm, field-scale research trials. The protocol is fairly simple, but a discussion of the logistics is needed to ensure a successful evaluation. Please do not hesitate to contact me with questions.

Objective: To identify the optimal row width for soybean production in Indiana.

Row Widths: Narrow (~7.5 or 15 in) vs. wide (30 in) rows at a minimum. Additional row widths are desirable such as 20-in and twin rows set on 30-in centers.

Replication: Minimum of 3 replicates. Row widths will be randomized within each replicate.

Variety: More than one is acceptable, but land area and complexity of trial increases.

Seed Rate: One target seeding rate will be used for all row widths. The suggested rate will be 150,000 seeds per acre regardless of row width.

Plot Size: Length is typically the field length, which should be a minimum of 350 ft. Plot width depends on drill/planter and combine platform widths. The basic setup would be to plant 1.5 to 2 times as wide as the combine header, so that the center of the plots can be harvested without effects from border plots of different widths.

Planting: Randomization of the row widths strips within each replicate favors those cooperators with split-row planters or drills and wide row planters. Cooperators with auto-steer capability will have an easier time laying out the row width plots. Calibration of planting equipment is highly desirable.

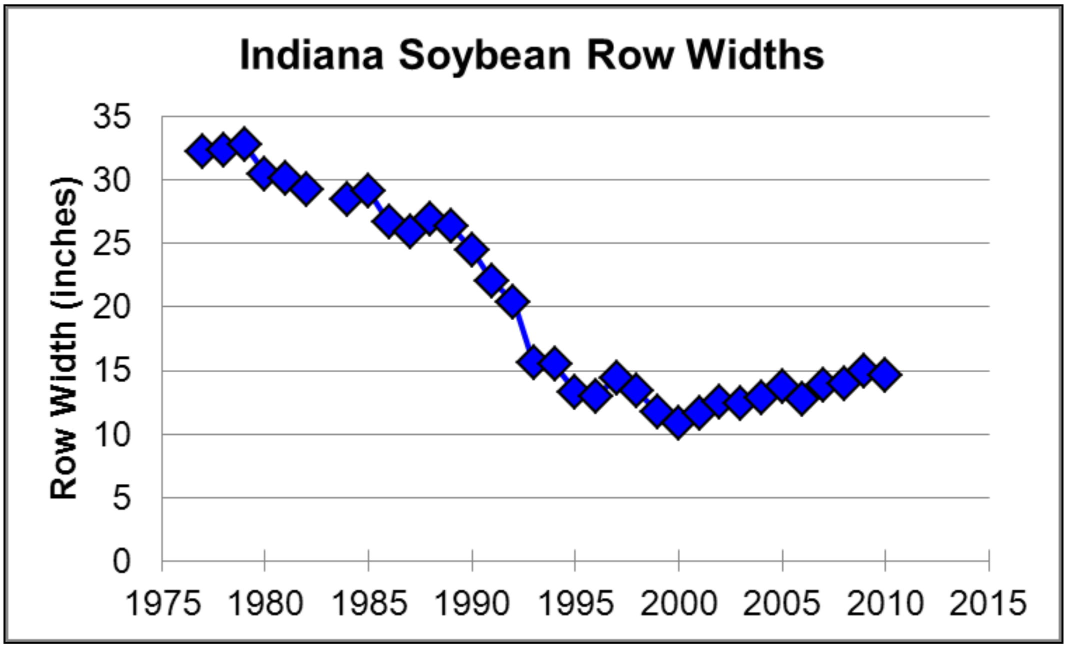
Harvest: Yield monitors equipped with GPS certainly minimize the harvest logistics of this trial. Cooperators with yield monitors must be willing to calibrate the units to the conditions of this trial. Calibration will require access to a grain cart with load cell, weigh wagon, or other weigh scales. A weigh wagon will be needed for those without yield monitors.

Example of Three Row Widths Within One Replication:

Rep 1	Plot 1	**Narrow** (15-in Split-Row Planter)
	Plot 2	**Ultra-Narrow** (7.5-in Drill)
	Plot 3	**Wide** (30-in Row Planter)
		|------- Field Length – minimum of 350 ft -----------|

2013 Purdue Soybean On-Farm Trials – Row Width

Shaun Casteel, Extension Soybean Specialist, Purdue Agronomy
scasteel@purdue.edu, 765.494.0895



Soybean row widths decreased from ~30 inches in the 1980s to ~10 inches in 2000. However, the row widths have increased to nearly 15 inches over the last 12 years within Indiana (USDA-NASS, 2012).

After three years of testing various management strategies to increase soybean yield across 6 states, one of the most striking findings was that simply planting soybeans in narrow rows (15 inches or less) increased yield as much as planting in 30-in rows and managing them intensely (Corn & Soybean Digest, 2012).

We typically see 5 to 10% yield advantage in planting soybeans in narrow rows (15 inches or less) compared to wide rows (30 inches). Yet, a number of growers have switched to planting in wide rows. We would like to build on our small plot research with field-scale trials to confirm the narrow row advantage for the growers of Indiana.

PROTOCOL DETAILS

Objective: This protocol describes the design and conduct of on-farm, field-scale research trials with the objective of identifying optimal row widths for soybean production across Indiana. While the protocol is fairly simple, the actual logistics of conducting the trial often require further discussion, so please do not hesitate to contact me.

Row Widths: This soybean trial will compare narrow (7.5-in, 15-in, etc.) and wide (~30-in) rows at a minimum. Additional row widths are desirable such as 20-in rows and twin rows on 30-in centers. Seeding rates will be the same across all row widths and a suggested rate would be 150,000 seeds per acre. I strongly encourage cooperators to calibrate their seed meters prior to the season to ensure that the targeted seeding rates will actually be the seeding rates that are dropped by the planting equipment. Potential farmer cooperators should recognize that wide rows (30-in) typically yield 5 to 10% less than narrow rows (less than 15 in). Canopy closure and sunlight interception are primary reasons for the yield advantage, which also relate to proper management of weeds, diseases, and/or insects.

Plot Size: Each treatment plot (strip) should be at least 350 feet long. Most of the time, the plot length in an on-farm trial is simply the length of the field. The row width treatments must be replicated at least three times, but preferably four times in the field (Fig. 1). Replication is necessary to enable the mathematical statistical analyses of the plot data.

The width of each plot (strip) should be nearly 1.5 to 2 times the width of the combine header widths to enable harvesting a full header width down the center of each plot yet avoid having to glean partial header widths between plots. Harvesting the center of each treatment plot instead of the entire plot avoids possible border effects caused by adjacent row widths. Table 1 shows examples of compatible plot sizes for different planting swaths and combine header widths. Plot widths may not be exactly the same from row width treatment to the next treatment due to varying planting swaths among the planting equipment. The plot layout will be designed prior to planting to overcome this complexity. The plot widths must be at least 1.5 times the width of the combine header regardless if individual plot are different due to the planting equipment.

Variety: You may want to include more than variety in an on-farm seeding rate trial. A second variety can easily be evaluated if your planter setup allows for splitting the units. For example, variety #1 can be placed in the first half and variety #2 in the second half of the planter. Three planter passes per row width results in two harvested treatment plots provided that two planting passes would be double the width of the combine header (Fig. 2). The difficulty of planting two varieties with a drill or other central hub planters increases, but could be discussed.

Planting Through Harvest: If your tractor/planter is equipped with auto-steer navigation, we can design a planting layout based on the GPS field boundary that will simplify your planting of the plots. Additionally, the travel direction of a sprayer applying herbicides, insecticides, fungicides, etc. should be the opposite direction of the row width plots. This spray pattern will ensure that all row width plots will have equal effects from the tire tracks.

Availability of a combine with GPS-equipped yield monitor greatly simplifies your harvest logistics. To ensure accurate yield estimates, yield monitors should be calibrated to the conditions of the test field (Questions on calibration? Talk to me before harvest). If a yield monitor is not available, a weigh wagon can be used to measure the grain weight harvested from each plot, but the length of each plot must also be known and recorded. Harvest and record data from each treatment plot separately.

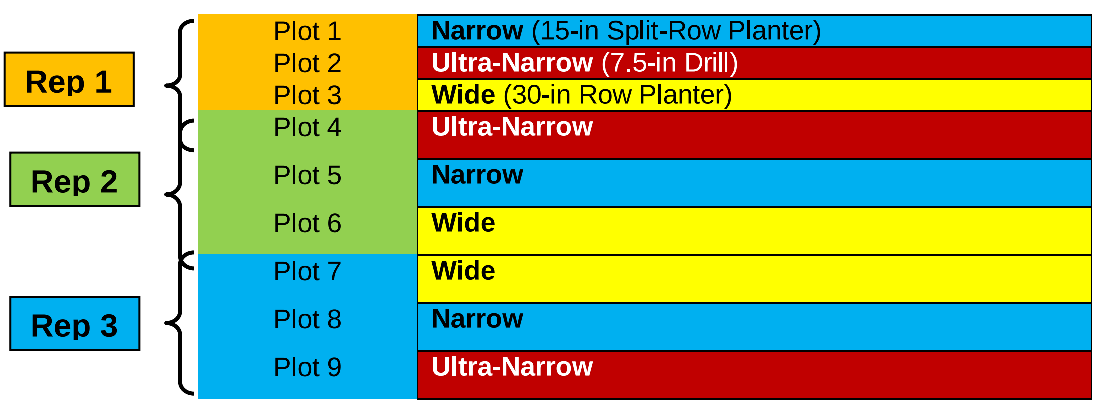
<u>Interests:</u> Regardless of the details of the on-farm trial, contact me if you have any interest in participating in this research. We can discuss the specific details for your field and equipment to help you decide whether you will be comfortable in becoming an on-farm research collaborator.

Table 1. Plot width options for different combinations of planting equipment and combine header widths. Numerous plot orientations are possible, but the basic layout is to plant row width treatment plots twice as wide as the combine header. Some examples are listed below.

Planting Swath	Combine header width	Plot width	Harvest
30-in rows with 12 units (30 ft)	30 ft	60 ft (24 rows)	Center 30 ft
30-in rows with 6 units (15 ft)	15 ft	30 ft (12 rows)	Center 15 ft
Twin rows on 30-in centers (30 ft)	30 ft	60 ft (48 twins)	Center 30 ft
20-in rows with 36 units (60 ft)	30 ft	60 ft (36 rows)	Center 30 ft
15-in rows with 23 units (28.75 ft)	18 ft	57.5 ft (46 rows)	Center 18 ft
7.5-in drilled rows (20 ft)	24 ft	60 ft	Center 24 ft

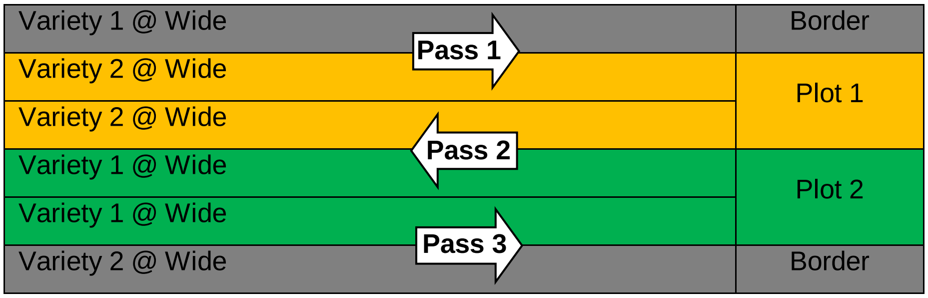
Figure 1. Example of randomized plot layout for 3 row widths, each replicated 3 times for a total of 9 treatment "plots". Each rectangle is equal to a treatment "plot" and would equal a compatible plot size listed in Table 1. The sequence of the treatment plots <u>within</u> each replicate can be changed, but each replicate should contain one and only one plot of each row width treatment. As one might imagine, such a randomized treatment layout is most easily accomplished with the availability of in-cab variable seeding rate controls and GPS-enabled lightbar navigation or true RTK-enabled auto-navigation capability. Questions? Talk to me.

Example of Plot Layout Using One Variety



Total width of the field for this example if 30-ft wide plots are used = 540 ft.

Figure. 2. Illustration of split-planter seeding rate study where three planter passes result in two plots of a single row width; one for each of two varieties.


Variety 1 @ Wide
Variety 2 @ Wide
Variety 2 @ Wide
Variety 1 @ Wide
Variety 1 @ Wide
Variety 2 @ Wide
Pass 1
Pass 2
Pass 3
Border
Plot 1
Plot 2
Border

Use this form to record the requested information about the on-farm trial and return to:
Shaun Casteel, Purdue Univ., Agronomy Dept, 915 W State St, West Lafayette, IN 47907-2054.

Purdue On-Farm Research Trials – Plot Information

Name:							
County:				**Soil series:**			
Tillage [1]:				**Drainage [2]:**			
Most recent soil sample results [3]:	**OM**	**pH**	**P**	**K**	**Ca**	**Mg**	**CEC**
			Lbs per acre or ppm?				
Soil sample date:				**Previous crop:**			
Variety:				**Seed Treatment[4]:**			
Plant date:							
Harvest date:							
Broadcast fertilizer [5]:							
Starter fertilizer [6]:							
Manure application [7]:							
Weed management [8]:							

Rainfall amount: (Inches per month)	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct.**

[1] **Tillage method preceding this crop, such as no-till, strip-till, disc, moldboard plow, etc.**
[2] **Whether tiled or not plus assessment of overall drainage (e.g., poor, good, excellent).**
[3] **A copy of a recent soil sample for the field if it is available or record on sheet. Soil O.M. is a strong interest.**
[4] **Seed treatment: date applied, rate, type (fungicide, insecticide, inoculants, and/or plant growth promoter)**
[5] **Rate, analysis and date of broadcast fertilizer application if any (e.g., DAP).**
[7] **Rate (tons or gallons), date of application(s), application method, and manure analysis (if available).**
[8] **Product and rate. Rate overall weed pressure and control.**

Other comments: