

Using Skip-Rows for Soybean Pest Management Increases Profit

Drs. Beuerlein, Hammond, Dorrance, & Dennis Mills
The Ohio State University

There are several late season soybean insect and disease problems that many Ohio growers must deal with. Most fields are planted in 7.5-inch rows and may be sprayed in late July or in August, well after the soybean canopy has closed which will cause a yield loss due to soybean plants being run down. Fortunately, most commercial sprayers have narrow tires so only two rows may be run down as the sprayer crosses a field. Table 1 shows the loss (bu/acre, \$/acre) when two rows are destroyed during pesticide application in mid to late summer by varying size sprayers. Establishing skip rows while planting will eliminate much of that yield loss.

Table 1: Loss (bu/acre, \$/acre) when two 7.5” soybean rows are destroyed during pesticide application in mid to late summer by varying size sprayers.

Spray boom width (ft)	Rows covered per pass	Yield loss %	Yield loss (bu/acre)	\$/acre loss: (50 bu/ac yield)					
				\$5.00/bu	\$5.50/bu	\$6.00/bu	\$6.50/bu	\$7.00/bu	\$7.50/bu
50	80	2.50	1.25	6.25	6.88	7.50	8.13	8.75	9.38
60	96	2.10	1.05	5.25	5.78	6.30	6.83	7.35	7.88
70	112	1.80	0.90	4.50	4.95	5.40	5.85	6.30	6.75
80	128	1.56	0.78	3.90	4.29	4.68	5.07	5.46	5.85
90	144	1.39	0.70	3.48	3.82	4.17	4.52	4.87	5.21
120	192	1.04	0.52	2.60	2.86	3.12	3.38	3.64	3.90

Following is an example of the calculations we used to determine the cost of establishing skip rows with a drill. In this example we used a 30-foot wide drill, a 60-foot wide sprayer, a seed cost of \$40.00 pre acre and soybean grain worth \$6.50 per bushel, and assumed 15” row yields of 48 bu/ac and 7.5” row yields of 50 bu/ac.

Numerous soybean row spacing studies indicate that for soybeans planted the first three weeks of May, the yield difference between 15-inch and 7.5-inch rows varies from no difference to about two bushels per acre depending on soil type, weather, and the amount of plant growth. By not planting two of the 48 rows (4.2%) on a 30-foot wide drill, and assuming a two bushel per acre yield loss, the yield would be reduced by 2 bu/ac times 4.2%, which is 5.04 pounds of grain per acre which is worth \$0.55/ac. If seed costs \$40.00/ac, the savings for not planting two rows is \$1.68 (4.2% times \$40). Because the four rows next to the two 15-inch middles have lower plant populations than normal for 15-inch rows, there could be a yield loss of up to 5% on those four rows which represent 16.6% of the 15” rows that could be planted in 30 feet. The reduced yield from those four rows will be 0.4 bu/ac worth \$2.59/ac (16.6% x 5% x 48 bu/ac x \$6.50/bu). Therefore, making skip rows with a 30 foot drill will lower income by \$1.46/ac (\$1.68 - \$0.55 - \$2.60 = \$1.46). Based on these calculations, there is almost always less yield and income loss due to the establishment of skip rows than there would be from running down two rows in mid to late summer during the application of pesticides. The results of calculations for other size drills are shown in Table 2. Table 3 indicates the total cost to form skip rows for combinations of drill size, seed cost per acre, and grain value. Table 4 shows the loss in \$/Ac if four rows are run down by different size spraying equipment during each pass across the field. Table 5 shows the cost in \$/Ac when either four or six rows are left unplanted by different size planters to accommodate spraying equipment.

Table 2: Examples of yield and income lost (lbs/ac, \$/ac) when two 7.5-inch soybean rows are left unplanted by various size planters to form skip rows that facilitate pesticide application in mid to late summer.

Planter width (ft)	Possible 7.5" rows	% Rows not planted	Yield lost		Savings in Seed (\$/ac)	Yield lost on 4-15" rows*	Total cost (\$/ac)
			(lbs/ac)	(\$/ac)			
15	24	8.30	10	1.08	3.32	5.18*	2.94
20	32	6.25	7.5	0.82	2.52	3.90*	2.20
30	48	4.20	5.0	0.55	1.68	2.59*	1.46
40	64	3.12	3.75	0.40	1.24	1.95*	1.11

* Many drills have a fluted seed metering system where the seeding rate is changed by exposing more or less of each flute to the seed being metered. Normally each flute can be moved independently of the other metering flutes which allows the operator to increase the seeding rate in the rows next to skip area to eliminate much of loss reported in this column.

Table 3. Total cost to form skip-rows for different combinations of drill size, seed cost per acre, and grain value.

Drill Width	Seed Cost (\$/ac)	Grain Value (\$/bu)					
		5.00	5.50	6.00	6.50	7.00	7.50
15	25	2.74	3.22	3.70	4.18	4.66	4.37
	35	1.91	2.39	2.87	3.35	3.83	4.32
	40	1.49	1.98	2.46	2.94	3.42	3.90
	45	1.08	1.56	2.04	2.52	3.00	3.49
	55	0.25	0.73	1.21	1.69	2.17	2.66
	65	(0.58)	(0.10)	0.38	0.86	1.34	1.83
20	25	2.06	2.42	2.78	3.14	3.51	3.78
	35	1.43	1.79	2.15	2.51	2.88	3.24
	40	1.11	1.47	1.84	2.20	2.56	2.93
	45	0.80	1.16	1.52	1.88	2.25	2.61
	55	0.17	0.53	0.89	1.25	1.62	1.98
	65	(0.47)	(0.10)	0.26	0.62	0.99	1.35
30	25	1.36	1.60	1.84	2.09	2.33	2.57
	35	0.94	1.18	1.42	1.67	1.91	2.15
	40	0.73	0.97	1.21	1.46	1.70	1.94
	45	0.52	0.76	1.00	1.25	1.49	1.73
	55	0.10	0.34	0.58	0.83	1.07	1.31
	65	(0.32)	(0.08)	0.16	0.41	0.65	0.89
40	25	1.04	1.22	1.40	1.58	1.76	1.94
	35	0.73	0.91	1.09	1.27	1.45	1.63
	40	0.57	0.75	0.93	1.11	1.29	1.48
	45	0.42	0.60	0.78	0.96	1.14	1.32
	55	0.11	0.29	0.47	0.65	0.83	1.03
	65	(0.21)	(0.02)	0.16	0.34	0.52	0.70

Commercial sprayers with booms larger than 60 feet typically require larger skip middles to accommodate their larger tires and drive mechanisms. Also, as plant size increases, larger skip middles are needed to avoid damage to soybean plants. A good operator may be able to prevent a 12” tire from damaging small plants at the side of a 15” skip middle, but that task becomes impossible after the plants reach a height of 12” or more. Therefore, where large sprayers will be used, or the plants get very tall, the size of the skip middles must be increased to at least 22” wide, and 30” wide skip middles may be needed when plant height is greater than 30”.

Table 4. Loss (\$/acre) due to running down four or six 7.5” rows while applying pesticides.

Sprayer Width (ft)	Assume 50 bu/acre and \$6.50/bu	
	Yield Loss (\$/ac)	
	4 Rows	6 Rows
50	16.26	24.39
60	13.52	20.28
70	11.70	17.55
80	10.14	15.15
90	9.10	13.65
120	6.76	10.14

Table 5. Loss (\$/acre) when either four or six 7.5” rows are left unplanted to form skip rows.

Planter With (ft)	Assume 50 bu/acre and \$6.50/bu	
	Total Cost (\$/ac)	
	4 Rows*	6 Rows*
15	7.50	16.96
20	5.64	12.08
30	3.70	8.42
40	2.82	6.38

* For many drills and seeders it is possible to move the disk openers one to two inches to increase the width of the skip areas to accommodate larger tires.

For some combinations of soybean row spacing and sprayer tire width it may be economically advantageous to travel perpendicular to the rows when applying pesticides in mid to late summer. Table 6 shows the economic loss due to driving perpendicular to 7.5” soybean rows for several combinations of tire width and sprayer size for a 50 bushel per acre yield with grain valued at \$6.50 per bushel. For 15” rows multiply the values in table 6 by 0.96 to determine the loss.

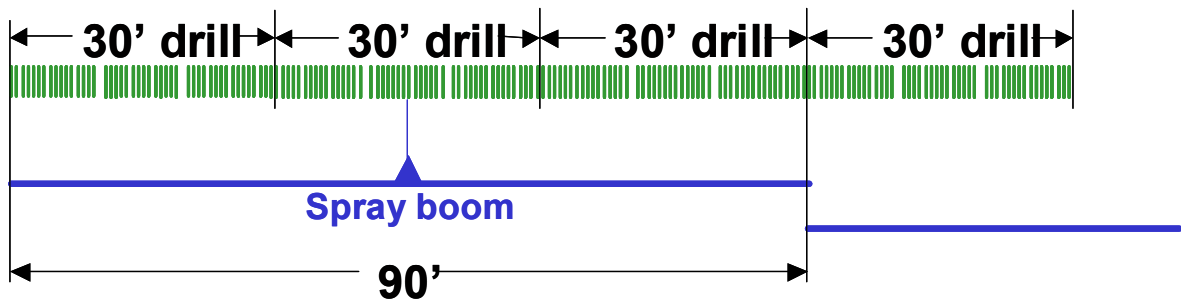
Table 6: Yield loss (\$/ac) when traveling perpendicular to soybean rows for various size sprayers and tire widths for a 50 bu/ac yield and grain valued at \$6.50/bushel.

Tire Width (in)	Yield loss (\$/Ac.)					
	Sprayer width (ft)					
	50	60	70	80	90	120
10	10.83	9.02	7.74	6.76	6.02	4.51
12	13.00	10.83	9.28	8.43	7.22	5.42
15	16.25	13.55	11.61	10.15	9.02	6.77
18	19.50	16.25	13.92	12.19	10.83	8.13
20	21.67	18.06	15.47	13.55	12.04	9.02

When forming skip rows it is important that they be the correct distance apart to accommodate the sprayer that will be used. Many sprayers are adjustable and can accommodate a wheel spacing of eight to twelve feet. The ideal combination of drill and sprayer width is when the sprayer is three times as wide as the drill. With that

combination the sprayer will use the 2nd, 5th, 8th, etc. pass of the drill when making applications. If the sprayer is either two or four times as wide as the drill, the first sprayer pass should be positioned to spray from the edge of the field to the center of a drill pass by disabling nozzles on the end of the sprayer. For the remainder of the field use all the spray boom and the appropriate skip rows. Sprayers that are not full multiple widths of the drill will not be able to use skip row systems unless the sprayer size is either increased or decreased to meet that requirement. The following illustrations show how to use a 60-, 90-, and 120-foot sprayer with a 30-foot drill. These illustrations also serve as guidelines for other combinations of planters and sprayers.

Spraying Skip Rows with a 90' sprayer



Spraying Skip Rows with a 60', and 120' sprayer

