

Crop Rotation Tool

With this program, the user can evaluate the economic returns of changing corn and soybean crop rotations.

The Crop Rotation Tool uses corn and soybean revenues and variable costs to compare the per-acre returns for three crop rotations: 1/2 corn - 1/2 soybeans, 2/3 corn - 1/3 soybeans, and continuous corn. Furthermore, the program examines whether crop rotations should change because of soybean rust.

Inputs

The below graphic shows the input section of the tool. Entries are made in cells where the numbers are in blue font. The program asks for per-acre revenues and variable costs for corn where the proceeding crop was soybeans (corn-after-soybeans), corn where the proceeding crop was corn (corn-after-corn), and soybeans.

Budget Input	Corn- After- Soybeans	Corn- After- Corn	Soybeans
Average yields (bu. per acre)	173	156	49
Market price	2.25	2.25	5.20
Effective LDP ²	0.00	0.00	0.00
Effective price (per bu.)	\$2.25	\$2.25	5.20
Revenue per acre	\$389	\$351	\$255
Variable costs per acre			
Fertilizer and lime	\$65	\$75	\$24
Pesticides	40	40	25
Seed	38	38	29
Drying and storage	16	16	5
Machinery repair, fuel, hire	33	33	28
Other	0	0	0
Total variable costs	\$192	\$202	\$111
Revenue less variable costs	\$197	\$149	\$144

If not all inputs are known, clicking [Budget Defaults](#) on the upper right corner of the screen allows the user to enter a default budget for the three crop scenarios. A box appears where the user can select the appropriate Illinois region for the analysis. This data is collected from farmers enrolled in the Farm Business Farm Management Association. After default data has been inserted, the user can change specific entries if necessary.



The bottom line of the input screen calculates revenue minus variable costs for the three crop scenarios. The remaining portion of this document explains the results produced by the tool.

Rotation Returns

The program computes per-acre returns (revenue less variable costs) for three different crop rotations for a single planting season: 1/2 corn - 1/2 soybeans, 2/3 corn - 1/3 soybeans, and continuous corn (corn-after-corn). As seen in the graphic to the right, a 50-50 crop rotation yields a return of \$171 per acre, which is based on the revenue and cost information entered in the input section. Furthermore, a 2/3 - 1/3 corn and soybean rotation results in a \$163 per acre return, while corn-after-corn returns \$149 per acre.

Rotation Returns	
Rotation	Return
1/2 corn - 1/2 soybeans	\$171
2/3 corn - 1/3 soybeans	\$163
Continuous corn	\$149

Long-Run Breakeven Levels

This portion of the results section, shown below, estimates the breakeven per-acre revenue and costs needed to economically justify increasing corn acres from a 50-50 rotation. Factors examined include production costs, yield, and price.

Long-Run Break-Even Levels -- shows break-even levels when rotations with more corn than a 1/2 corn - 1/2 soybean rotation will have higher profits in the long run. Directions are indicated next to variable. All break-even levels are calculated holding other levels in "Budget Input" constant.		
Corn-after-soybeans costs	\$235	(higher levels favor more corn), \$43 increase from budget
Corn-after-corn costs	\$181	(lower levels favor more corn), \$22 decrease from budget
Soybean costs	\$154	(higher levels favor more corn), \$43 increase from budget
Corn-after-soybeans yield	154	(lower levels favor more corn), 19 bu. decrease from budget
Corn-after-corn yield	166	(higher levels favor more corn), 10 bu. increase from budget
Soybean yield	41	(lower levels favor more corn), 8 bu. increase from budget
Effective corn price	\$2.56	(higher levels favor more corn), \$0.31 increase from budget
Soybean price	\$4.32	(lower levels favor more corn), \$0.88 decrease from budget

Cost of Production Factors

According to the "Corn-after-soybeans costs" line in the above example, total per-acre variable costs for farmland put into corn after soybeans must be above \$235 before putting more than half of tillable acres into corn is economically warranted. This is a \$43 increase from budget variable costs of \$192 per acre. Thus, the result for this line reads "(higher levels favor more corn), \$43 increase from budget", which means that as costs associated with planting corn after soybeans increase, it becomes more reasonable to plant more corn acres than soybean acres.

In continuing with this illustration, the per-acre costs of planting corn-after-corn must decrease from \$202 to \$181 before one should consider increasing corn acres. Furthermore, the costs of producing soybeans must increase from \$111 to \$154 per acre to justify putting more than half of total tillable acres into corn.

Yield Factors

The program provides further analysis by examining the yield levels needed to motivate planting more corn. The example on the previous page concludes that the yields for corn-after-soybeans acres must decrease from 173 to 154 bushels (a 19-bushel drop) to validate more corn acres. As yields decline under this rotation, increasing corn acres becomes more favorable. When assessing acres put into continuous corn (corn-after-corn), 166 bushels per acre (an increase of 10 bushels) must be raised to economically justify planting more corn. Finally, soybean yields must fall from 49 to 41 bushels before it becomes financially viable to increase corn acres from a 50-50 corn and soybeans rotation.

Price Factors

Prices received for corn and soybeans also play a role in the decision to put more acres into corn. In the case examined on the previous page, the effective corn price (market price plus LDP) must increase from \$2.25 to \$2.56 per bushel to warrant more corn ground. As the price received for corn increases, planting additional corn acres becomes more favorable. The opposite price direction is true for soybeans. A soybean price of \$4.32 per bushel (a \$.88 decrease from the effective price of \$5.20) is required to validate reducing soybean acres and planting more corn acres.

Breakeven Costs for Different Corn-After-Corn Yield Drags

The final output of the tool, shown below, examines different corn-after-corn yield drags. This section was specifically designed to evaluate the decreases in soybean returns needed to warrant planting more corn. The below table assesses corn-after-corn yield drag from 0 to 14% yield reductions. For each 2% incremental decline in corn yields, the model computes the soybean return decrease (either through yield loss or cost increases) that must occur before planting additional corn acres is economically feasible. For example, if acres planted corn-after-corn result in an 8% yield reduction compared to a corn-after-soybeans rotation, soybean returns must fall at least \$29 per acre before one would be inclined to increase the number of corn acres. Looking at this analysis from the perspective of soybean rust, at an 8% yield drag, a farm operator can spend \$29 per acre on chemicals to fight rust infection before it is financially justified to plant more corn than soybeans in a 50-50 rotation.

Break-Even Costs for Different Corn-After-Corn Yield Drags			
The table was designed to evaluate whether rotations should change because of soybean rust. The table shows break-even soybean return decreases, whether from yield decreases and/or cost increases, that cause it to be profitable to add corn-after-corn to a 1/2 corn - 1/2 soybeans rotation.	Corn-After-Corn Yield Drag	Soybean Returns Decrease	Interpretation: If corn-after-corn yields are 10% below corn-after-soybean yields, soybean returns can decrease by \$44 per acre before corn-after-corn enters the rotation. Break-evens are after a farm has reached a stable rotation.
	0%	-\$34	
	2%	-\$18	
	4%	-\$2	
	6%	\$13	
	8%	\$29	
	10%	\$44	
	12%	\$60	
	14%	\$75	