

Optimizing returns and decreasing production risks by managing maturity groups and planting dates for specific locations in the Midsouth

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Soybean Breeders Workshop

13 February 2017





Soybean Agronomists and
Physiologists?
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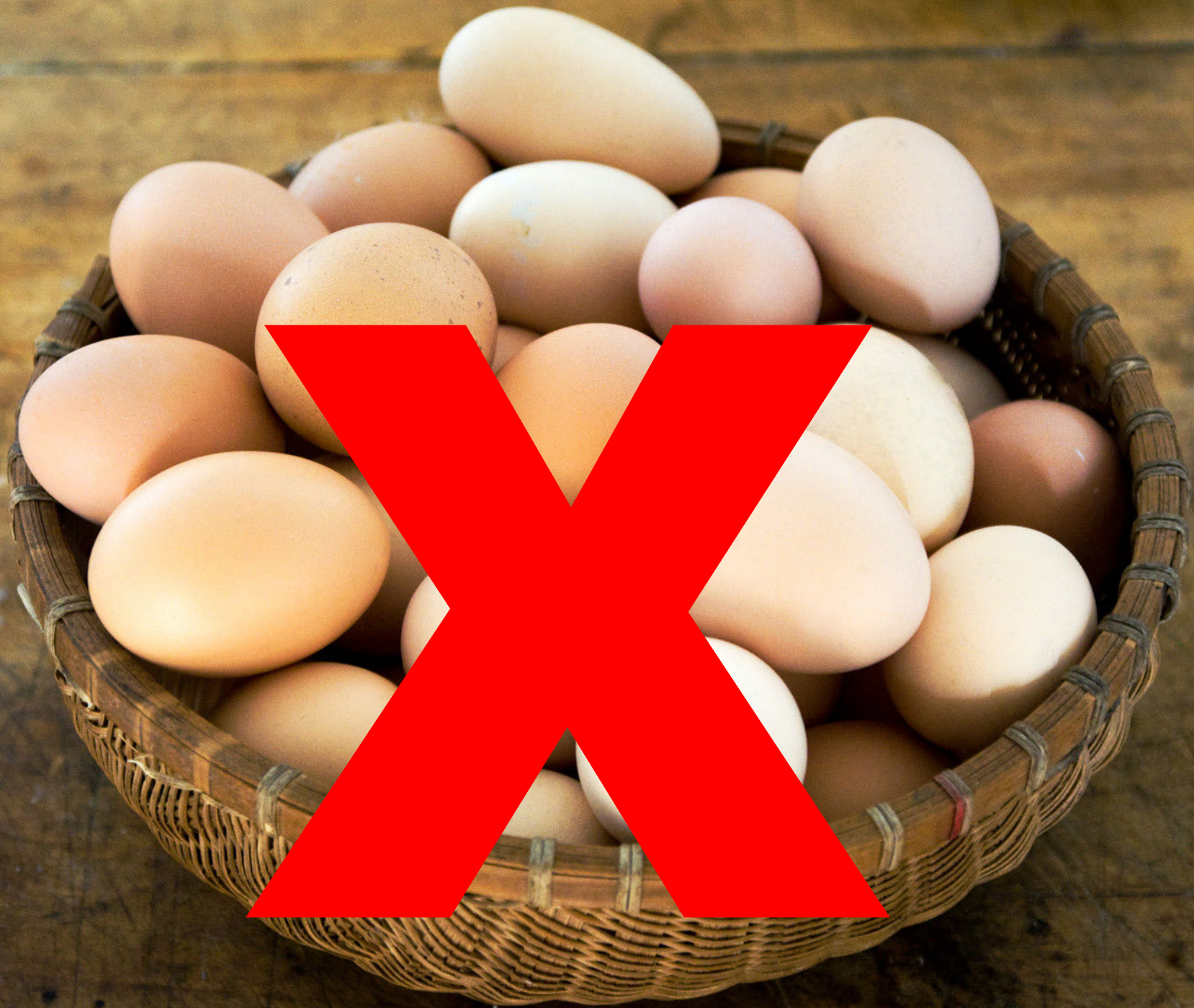
Soybean Breeding and Genetics, Univ or Arkansas



- Tenure track
- 90% Research, 10% teaching
- Well funded, state supported
- Excellent & experienced staff
- Located on main campus, Fayetteville
- Screening begins 3/1/17



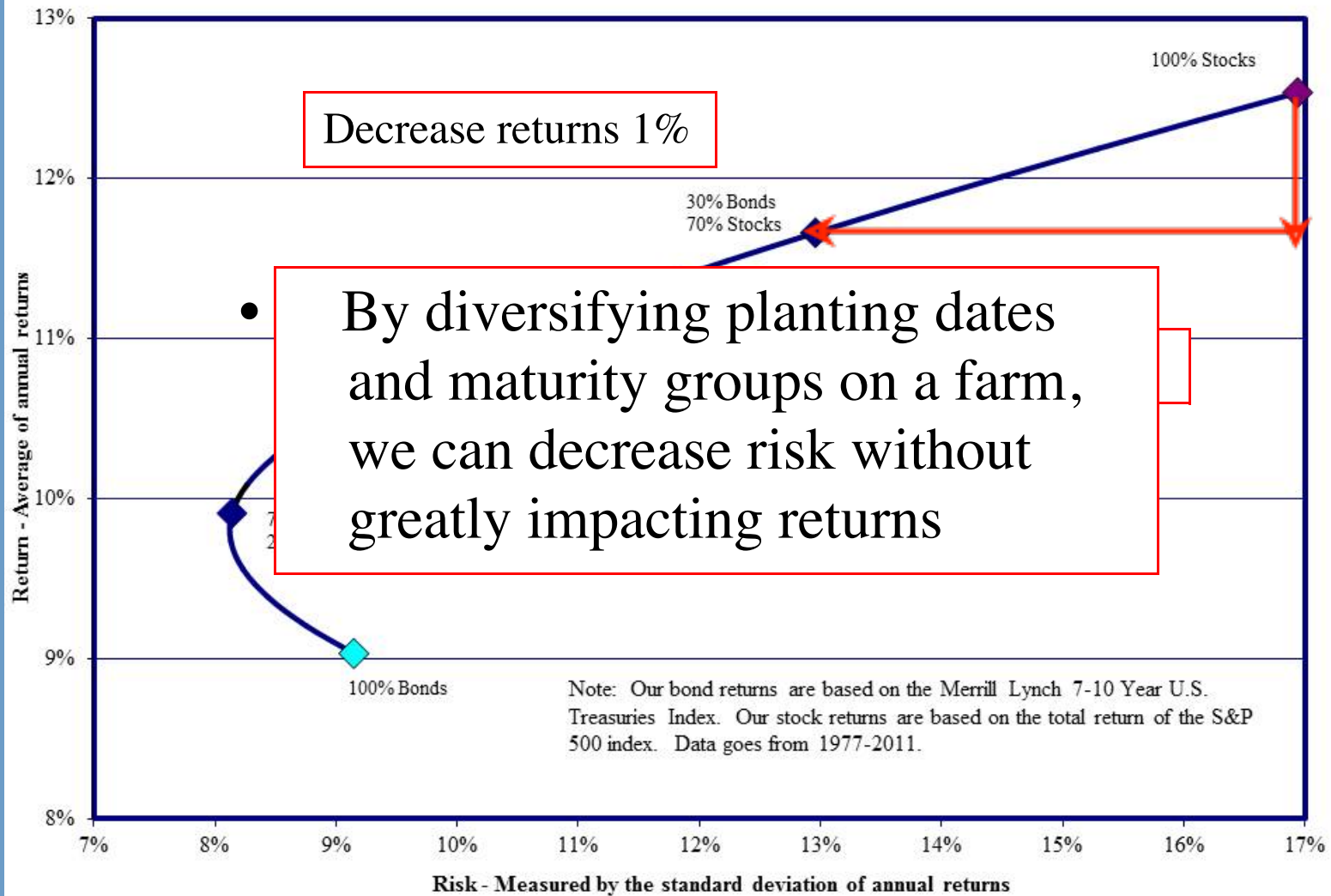
- Background on diversification
- Brief description of regional experiment and model
- Decision support tool - SoyRISK





An Efficient Frontier

The Power of Diversification



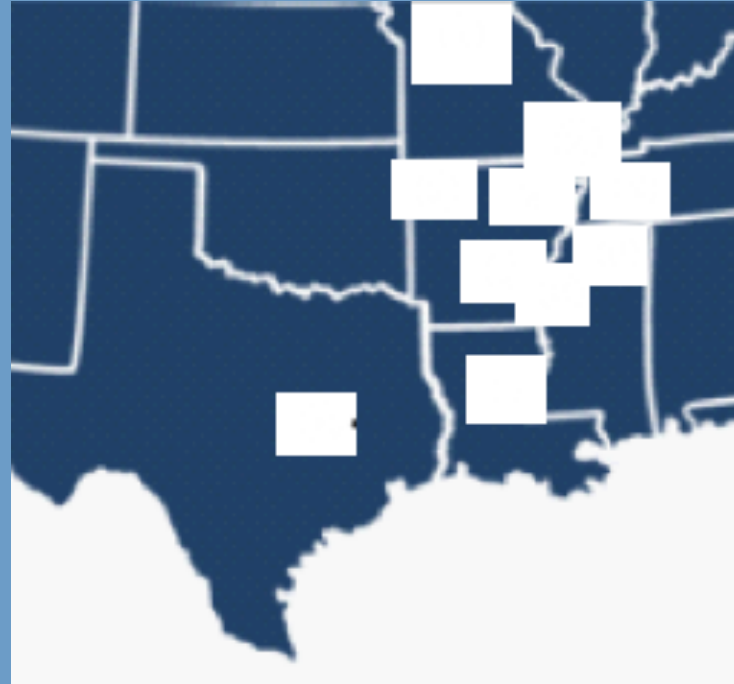
<http://www.youngresearch.com/>



- Background on diversification
- **Brief description of regional experiment and model**
- Decision support tool - SoyRISK

Project Description

- 3-year study (2012-14)
- 10 locations
- Irrigated
- **4 planting dates (PD)**
- **MG 3 to 6 soybeans**
(16 cultivars)
- (> 6000 plots)



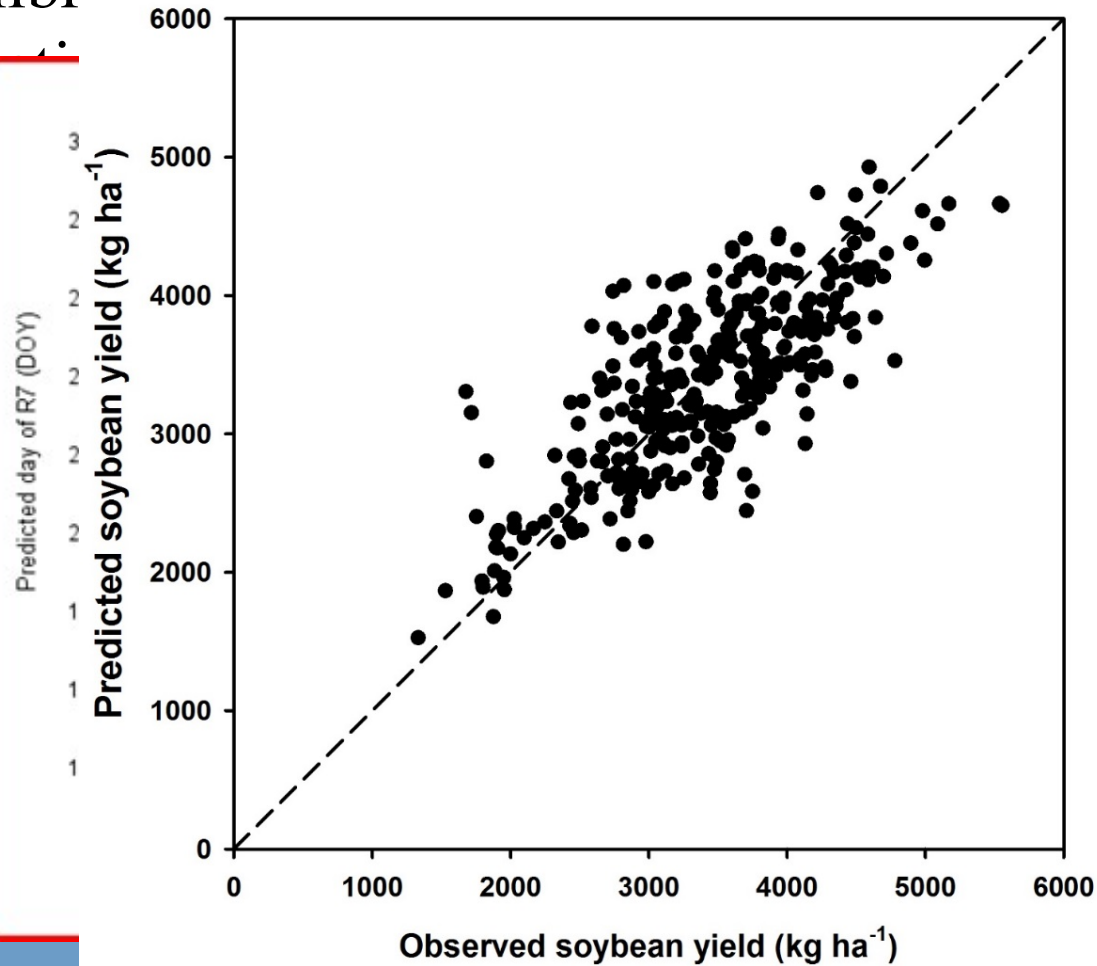
- ① Columbia, MO
- ② Portageville, MO
- ③ Fayetteville, AR
- ④ Keiser, AR
- ⑤ Milan, TN
- ⑥ Verona, MS
- ⑦ Rohwer, AR
- ⑧ Stoneville, MS
- ⑨ St. Joseph, LA
- ⑩ College Station, TX

Participants: ① Felix Fritschi, Bill Wiebold; ② Earl Vories, Grover Shannon; ③ Larry Purcell, Montse Salmeron, Ed Gbur; ④ Fred Bourland; ⑤ David Verbree, Angela McClure; ⑥ Normie Buehring; ⑦ Larry Earnest; ⑧ Bobby Golden; ⑨ Josh Lofton; ⑩ Travis Miller, Clark Neely, Daniel Hathcoat



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- Background on diversification
- Brief description of regional experiment and model
- **Decision support tool - SoyRISK**

Decision Support Tool Development



- Collect daily weather data from 30 years from 13 locations
- Run model simulations for:
 - MGs 3 through 6 in half-MG intervals
 - Weekly planting dates (March 15 to June 30, 16 weeks)
 - 30 years and 13 locations
 - Silt loam and clay soils
 - 99,840 simulations; 3328 scenarios
 - For each scenario, determine average returns and 95% confidence interval
- Interface in Excel that allows user to query return/risk tradeoffs

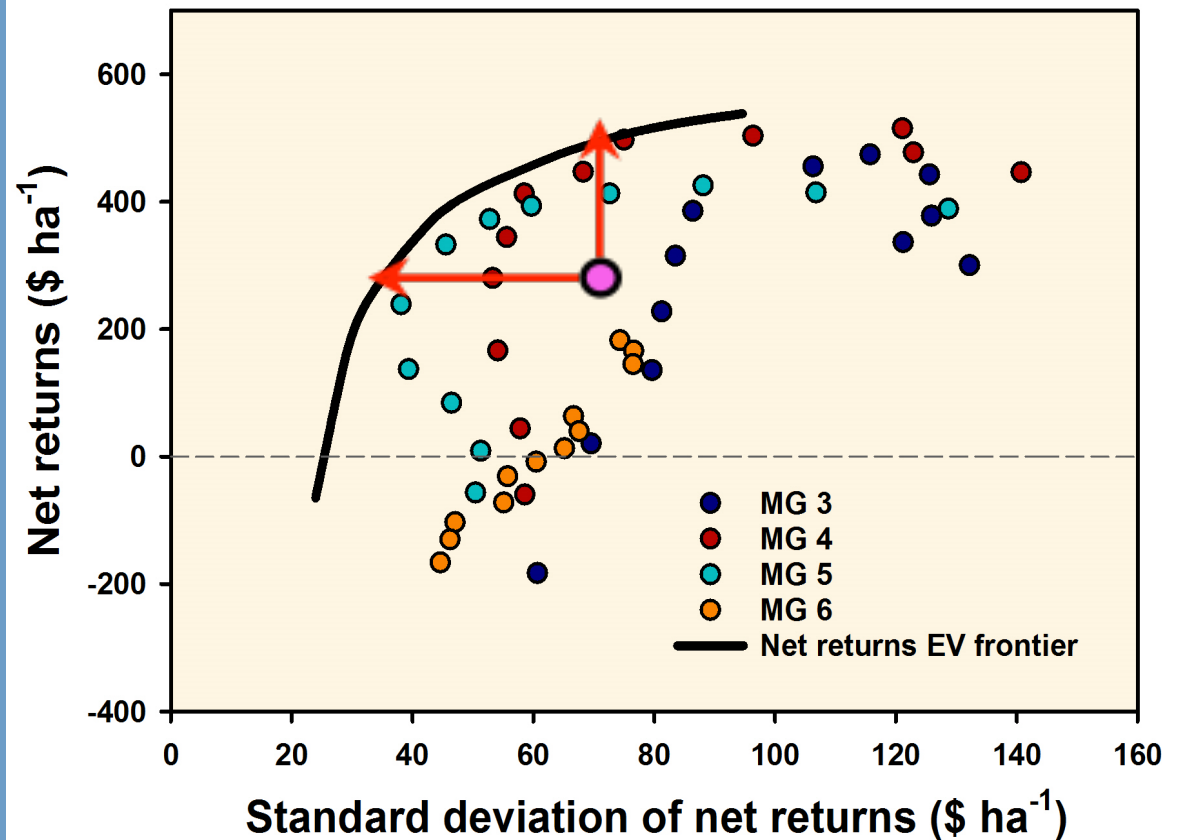
Different combinations of MG and planting date can be mixed, much like investing in a portfolio of stocks by estimating an EV frontier.

Maximize profit given a level of risk AND/OR

Minimize risk given a particular level of profit

Meet an irrigation threshold

Simulated yields and irrigation water by MG and planting date at **Marianna, AR**. Data averaged across 30-yr.





User Information: Location, soil texture, and planting options

Location nearest your fields: **Carbondale, IL** Lat. 37° 44' N Long. 89° 13' W

Soil Texture: **Silt Loam**

Highest Yielding MG -- PD Combination

MG 3.5-3.9 April 15-22



Planting Options

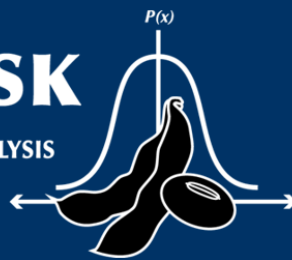
(Choose % of acreage planted to different MG by planting week)

% of Acres	MG	Planting Week
30%	MG 3.5-3.9	May 15-22
30%	MG 4.0-4.4	May 23-31
20%	MG 5.0-5.4	May 23-31
20%	MG 5.5-5.9	June 8-14
0%	Please Select	Please Select
0%	Please Select	Please Select
0%	Please Select	Please Select
0%	Please Select	Please Select



SOYRISK

SOYBEAN RISK ANALYSIS





Specification of cost of production for Carbondale, IL on Silt Loam soils

Producer Choices

Please choose an irrigation cost that most closely represents your **cash costs per acre-inch** applied (i.e. fuel/electric, depth to water, irrigation type and energy cost can be selected to see a suggested amount. Enter your own to reflect other charges/savings that apply to your farm)

150 ft well
 Electric
 7 ¢/kWh
 Furrow/Flood

\$1.79

\$3.00

Please choose an amount that most closely reflects per acre costs **other** than irrigation costs just specified above ...

\$ 425/acre

(e.g. seed, fertilizer, chemicals, fuel, labor, equipment, and rent or land charges)

Expected Soybean Price (\$/bu)

... please enter an annual average net of hauling and check off you expect...

\$10.50

Please choose the max. amount of irrigation. Your current choice uses 16.07 acre-inches.

Least Possible
11.38

15.0

Adjust soybean prices for seasonality and soybean seed quality premiums or discounts?

Yes

\$/effective acre-inch

\$6.00

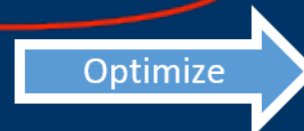
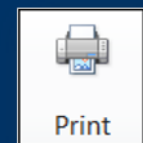


User-Selected Optimization Goals

Max. Profit @ No More Than User Risk

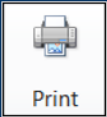
User-Selected Planting Window

May-June





Comparison of Planting Portfolios for Carbondale, IL on Silt Loam Soils



	<u>Exp. Returns</u> (\$/acre)	<u>Risk</u> (95% Conf. Int. in \$/acre)	<u>Irr. Applied</u> (acre-inch adj. for efficiency)	<u>Exp. Yield</u> (bu/acre)	<u>Seas. Adj.</u> Price (\$/bu)	<u>Oil/Protein Prem.</u> or Disc. (\$/bu)
Optimized for Maximum Returns	\$313	\$50.25	15.78	77.8	\$10.10	-\$0.28
Initial User Choice	\$164	\$50.25	16.07	68.0	\$9.33	-\$0.47
Yield Maximizing	\$335	\$65.64	15.58	80.0	\$10.08	-\$0.29

MG 3.5-3.9 April 23-30

User Parameters

Irrigation Cost

\$3.00 per acre-inch applied

Costs other than irrigation

\$425.00 per acre

Expected Soybean Price

\$10.50 per bushel

Initial User Choice		
<u>% Acres</u>	<u>MG</u>	<u>Planting Week</u>
30%	MG 3.5-3.9	May 15-22
30%	MG 4.0-4.4	May 23-31
20%	MG 5.0-5.4	May 23-31
20%	MG 5.5-5.9	June 8-14

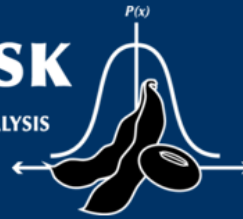
Optimized for Maximum Returns planted May-June on 100% of acreage		
<u>% Acres</u>	<u>MG</u>	<u>Planting Week</u>
30%	MG 3.0-3.4	May 1-7
36%	MG 3.5-3.9	May 1-7
24%	MG 4.0-4.4	May 1-7
9%	MG 4.5-4.9	May 1-7





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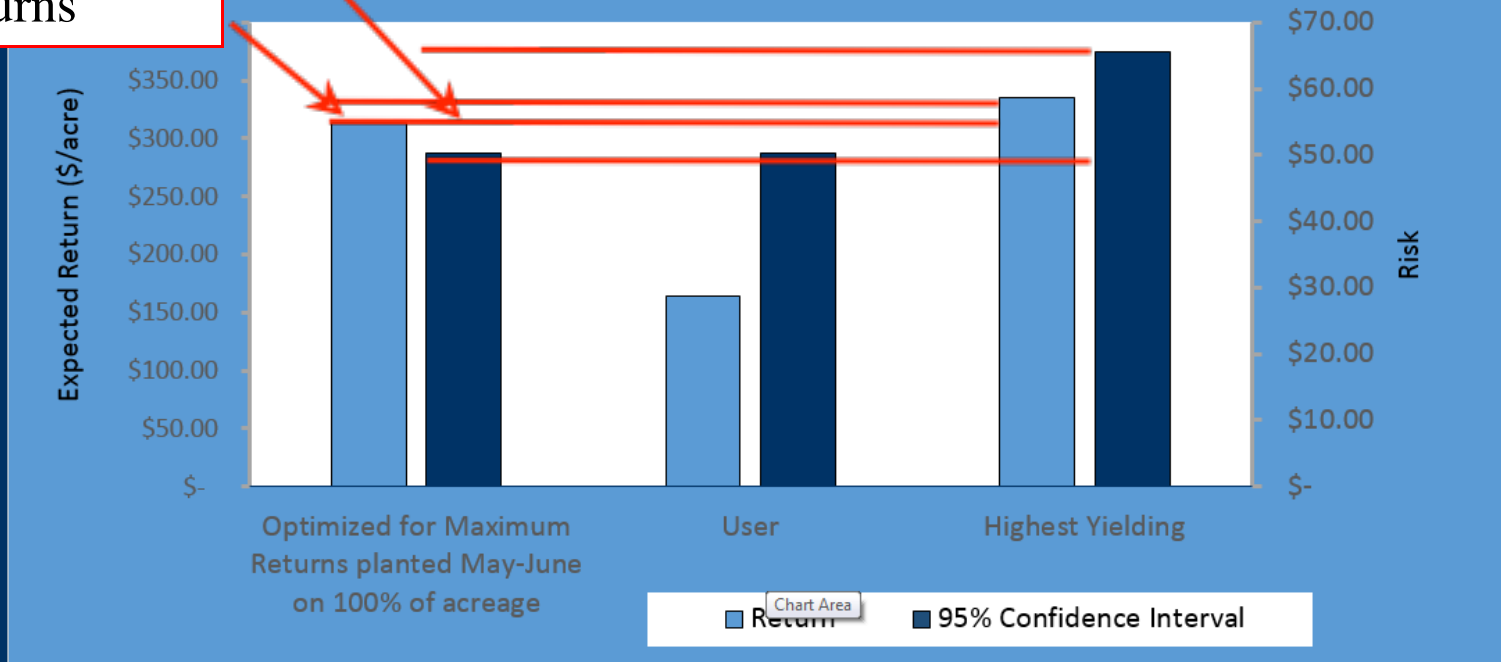
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7% decrease returns

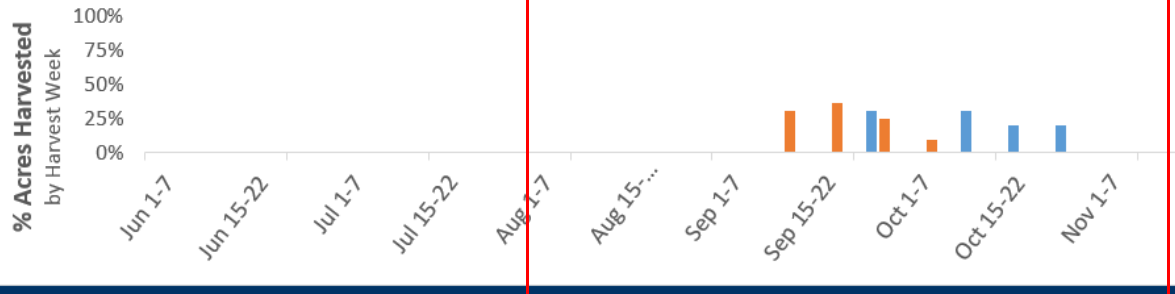
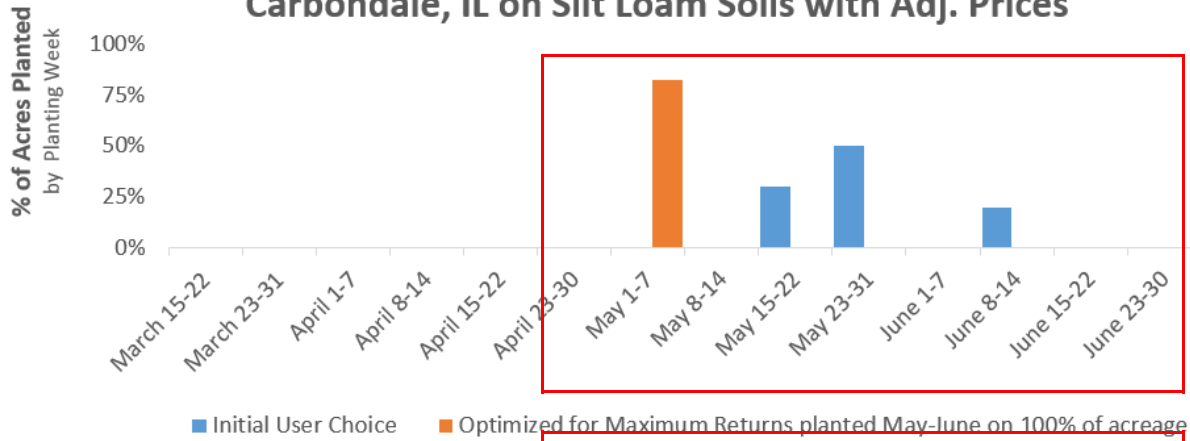
24% decrease risk

Optimized for Maximum Returns planted May-June on 100% of acreage





Carbondale, IL on Silt Loam Soils with Adj. Prices



Optimized for Maximum Returns planted May-June on 100% of acreage

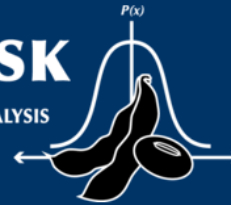
- MG 3.0-3.4
- MG 3.5-3.9
- MG 4.0-4.4
- MG 4.5-4.9
- MG 5.0-5.4
- MG 5.5-5.9
- MG 6.0-6.4
- MG 6.5-6.9



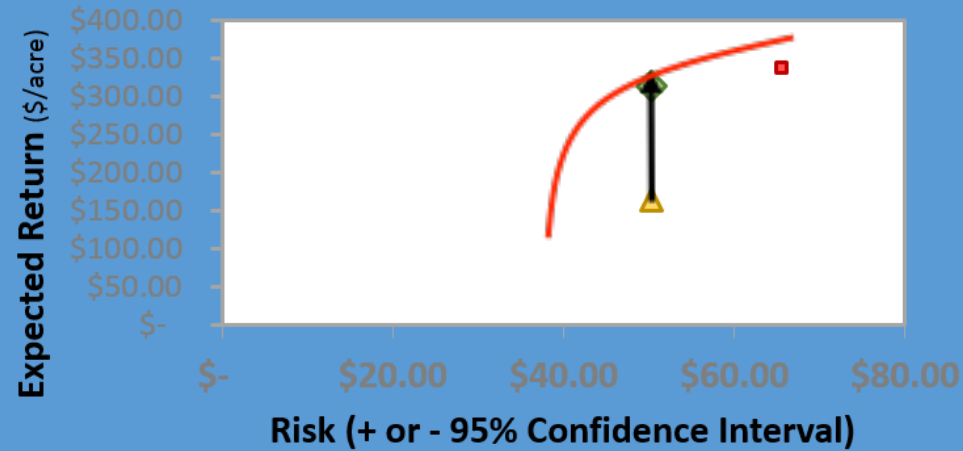


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Carbondale, IL on Silt Loam Soils with Adj. Prices



◆ Optimized for Maximum Returns planted May-June on 100% of acreage ▲ User ■ Highest Yielding





Specification of cost of production for Carbondale, IL on Silt Loam soils



Producer Choices		
Please choose an irrigation cost that most closely represents your cash costs per acre-inch applied (i.e. fuel/electric, depth to water, irrigation type and energy cost can be selected to see a suggested amount. Enter your own to reflect other charges/savings that apply to your farm)	150 ft well Electric 7 ¢/kWh Furrow/Flood	\$1.79 \$3.00
Please choose an amount that most closely reflects per acre costs other than irrigation costs just specified above ...	\$ 425/acre (e.g. seed, fertilizer, chemicals, fuel, labor, equipment, and rent or land charges)	\$6.00
Expected Soybean Price (\$/bu) ... please enter an annual average net of hauling and check off you expect...		\$10.50
Please choose the max. amount of irrigation. Your current choice uses 16.07 acre-inches.	Least Possible 11.38	15.0
Adjust soybean prices for seasonality and soybean seed quality premiums or discounts?		Yes

\$/effective acre-inch
\$6.00

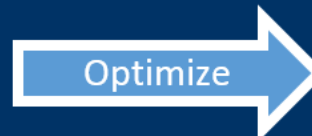
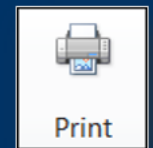


User-Selected Optimization Goals

Min. Risk & Max. Profit

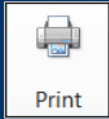
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May-June





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Initial User Choice	\$164	\$50.25	16.07	68.0	\$9.33	-\$0.47
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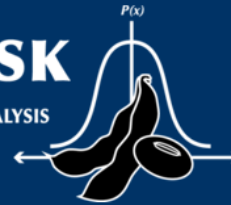
Optimized for Minimum Risk planted May-June on 100% of acreage		
<u>% Acres</u>	<u>MG</u>	<u>Planting Week</u>
20%	MG 3.0-3.4	May 1-7
14%	MG 3.5-3.9	May 1-7
24%	MG 4.5-4.9	May 1-7
8%	MG 6.0-6.4	May 1-7
12%	MG 6.5-6.9	May 1-7
7%	MG 5.0-5.4	June 8-14
16%	MG 3.0-3.4	June 23-30



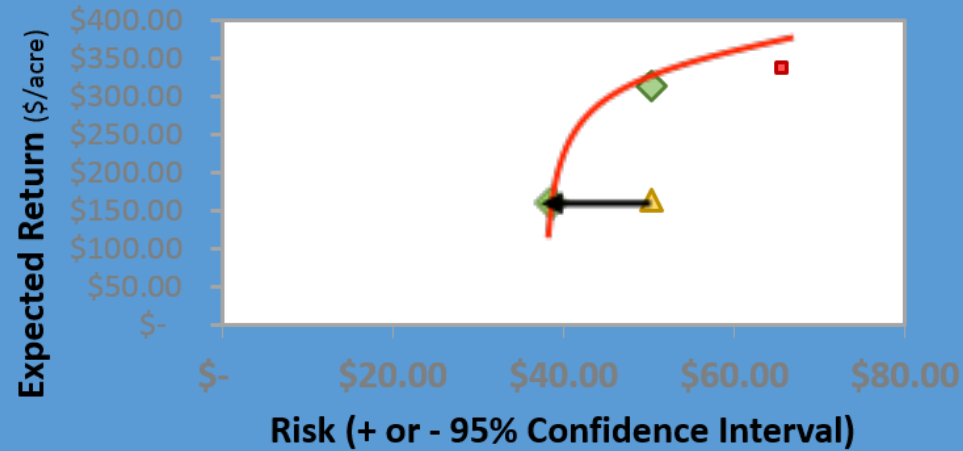


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Carbondale, IL on Silt Loam Soils with Adj. Prices

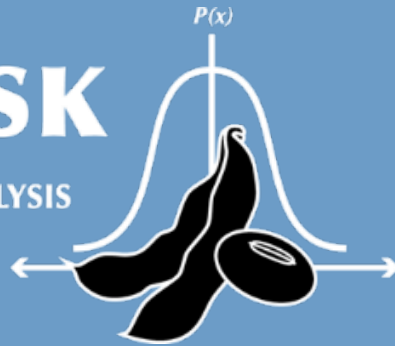


◆ Optimized for Maximum Returns planted May-June on 100% of acreage ▲ User ■ Highest Yielding



SOYRISK

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- Free download from <http://agribusiness.uark.edu/decision-support-software.php#SOYRISK>
- Excel spreadsheet tool with macros and Solver addin. Set up your own production practice by specifying:
 - as many as 8 different rMG soybean (rMG 3.0-3.4 to rMG 6.5-6.9) over
 - 16 planting weeks (March 15-22 to June 23-30)
 - with weather data any of 13 locations (Baton Rouge, LA to Columbia, MO)
 - and two soil textures (clay vs. silt loam)

Final Thoughts



- Don't put all your eggs in the same basket
- Risk can be decreased and returns maintained by combinations of PD and MG
- Highest returns are not always associated with highest yields