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A SOYBEAN RUST SCENARIO MODEL: 2005 CROP YEAR DECISION MAKING IN ILLINOIS

The 2005 crop will be particularly challenging for Illinois soybean producers. Soybean rust, a fungal disease, has moved up from South American and was found in the Southern US in the fall of 2004. This is the first discovery of the disease in the continental US. The disease is in the form of spores and can spread through airborne pathways over wide geographic areas (Isard et al, 2004[1]). Weather patterns, especially those from the South to North, will be the main factor causing an outbreak in Illinois during the 2005 crop year.

For farm managers the situation in Illinois is very different than for producers in South America, who have been dealing with rust the last three crop seasons. Low latitude regions (closer to the equator) maintain spore populations all year-round. While infection rates may be higher, because the spores are always present, decision making is simpler. A treatment regime of multiple spray treatments is integrated directly into the farm management plan. In high latitude regions where a killing frost is present, annual infection is windborne/weather related. This makes infection timing and infection extent much more uncertain; making farmer decision making uncertain. If the farmer makes the decision that rust is a threat and a response is necessary, a second source of uncertainty arises as to how the farmer should respond?

The purpose of this article and the associated model is to help farmers address these uncertainties.

RESOURCES AND VALUABLE LITERATURE

Though beyond the scope of this article there are numerous articles and websites devoted to rust. In terms of general web sites dedicated to rust several of value are:

http://www.soygrowers.com/rust/default.htm http://www.rma.usda.gov/news/2004/12/soybean-rust.html
http://www.aphis.usda.gov/ppq/ep/soybean_rust/
http://www.agr.state.il.us/regulation/soybeanrustprogram.pdf
http://web.extension.uiuc.edu/champaign/news/news526.html

[1] Isard, S., C. Main, T. Keever, R. Magarey, S. Redlin, and J Russo. (2004) *Weather-Based Assessment of Soybean Rust Threat to North America*. Final Report APHIS. https://netfiles.uiuc.edu/ariatti/www/SBR/Cycle.html

These provide not only information but contact people. The University of Illinois Extension and the Illinois Department of Agriculture, as part of the State's Rust Response Plan, are working closely to provide Illinois farmers with high quality information and services.

For analysis of economic impact, take a look at a recent publication from the USDA, "Economic and Policy Implications of Wind Borne Entry of Asian Soybean Rust into the United States" (http://www.ers.usda.gov/publications/OCS/APR04/OCS04D02/)
Also Goldsmith constructed a rust cost calculator
(http://www.cornandsoybeandigest.com/news/Arrival-of-Soybean-Rust-110804/)
and Schnitkey looked at the costs of adjusting the corn:soybean ratio (see http://www.farmdoc.uiuc.edu/manage/newsletters/fefo04_20/fefo04_20.html). All three economic analyses bring to light the levels of uncertainty involved in decision making about rust.

TACTICAL DECISION MAKING

The current rust environment is a tactical challenge for the upcoming season. Farmers have to respond in some way. Even no decision is a decision for the upcoming cropping season. It is important to note first off that while it is probable that rust will be found in Illinois in 2005, it is not certain. And if it is found, it is unclear how widespread the infection will be across the state. So decision making may take the full range of actions; from doing nothing, to multiple spray treatments, to avoiding soybeans completely. For example, the organic soybean farmers in the state and their customers are particularly challenged because there is no known organic treatment for rust (Leopold Center, 2004[2]).

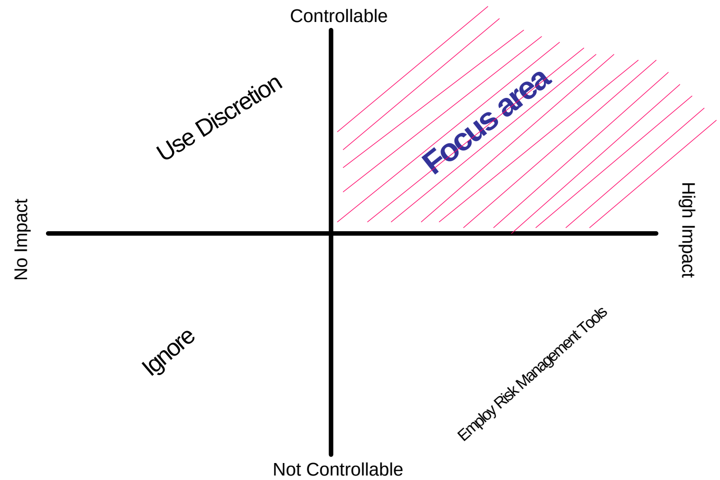
In tactical decision making there are two dimensions to consider, whether a management variable is significant or trivial and if a variable is controllable or not controllable (Figure 1). While a problem may involve many variables, and in a perfect world one would like to address them all, many times this can not be done. Hard choices need to be made to focus on a few key variables. Effective managers focus on the variables that jointly have the highest returns to profitability and on which they have the most control, the upper right-hand quadrant of Figure 1.

The rust problem for Illinois farmers can be cast in such a framework. The uncertainty for managers arises from a variety of sources and can be either experiential or probabilistic. Experientially, soybean producers are unfamiliar with fungicides. Spraying for rust will add managerial, as well as logistical, demands on the State's spraying infrastructure, protocols, and skills. More narrowly, rust is a new disease in the U.S. 2005 will be the first year continental U.S. farmers will experience managing the disease on their farms.

There are also probabilistic uncertainties with respect to infection and rust's impact on markets. Unknown is when rust might arrive during the growing season, how it might be distributed across a particular region or farm, how it might affect a particular field, and what its final impact might be on crop yields and prices.

[2] Leopold Center. (2004). "Science Behind the News: Looking at Asian Soybean Rust." *The Leopold Letter.* Vol.16 (4): p. 5.

Figure 1. Tactical Decision Making Framework



There are 16 main variables that affect profitability within a rust response model (Table 1). In terms of tactical decision making, these variables can be cast in the two-dimensional framework (Figure 2). Each variable in some form has an impact and may or may not be controllable. Impact can be high, medium, or low/none. The same can be true for control; highly controllable, moderately controllable, or not controllable. For effective decision making under such uncertainty the objective is to focus management on those few areas where control and impact in combination would most favorably affect profitability. As an exercise the variables have been set within the tactical decision framework. The placement of the variables within the framework is for illustrative purposes. Each manager should decide on their own where variables should be placed and if variables need to be added or removed.

Figure 2. Tactical Decision Making Framework for Rust

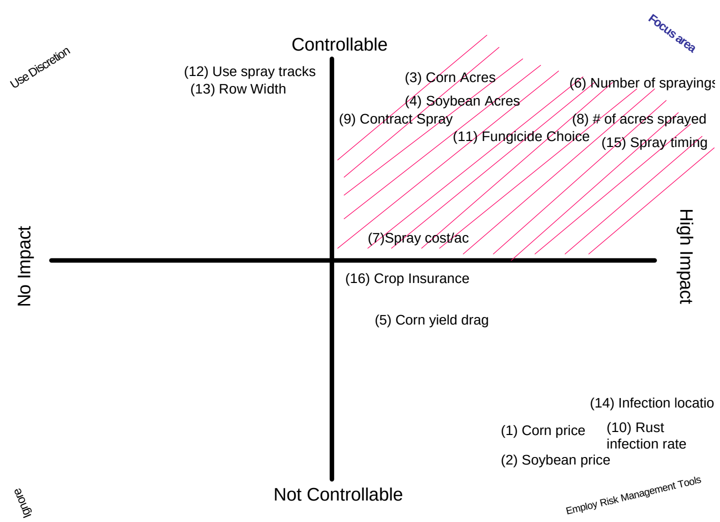


Table 1. Rust Decision Variables

#	Model Variables	Variable Type	Impact High Medium Low/None (HML)	Controllable High Medium Low/None (HML)	Management Priority 1= high 2= medium 3=low
1	Corn price	Probabilistic	H	L	3
2	Soybean price	Probabilistic	H	L	3
3	Corn acres planted		H	H	1
4	Soybean acres planted		H	H	1
5	Corn yield drag (%)	Probabilistic and Experiential	M	M	2
6	# of fungicide sprayings	Experiential	H	H	1
7	Cost per treatment	Probabilistic and Experiential	M	M	2
8	Number of acres sprayed	Experiential	H	H	1
9	Use a spray contractor	Experiential	M	H	2
10	Infection rate	Probabilistic	H	L	3
11	Which fungicides?	Experiential	H	H	1
12	Use spray tracks?	Experiential	M	H	2
13	Row width?	Experiential	L	H	3
14	Infection location	Probabilistic	H	L	3
15	When to spray	Experiential	H	H	1
16	Crop insurance	Probabilistic and Experiential	M	H	2

An immediate conclusion drawn from Figure 2 is that 1st tier managerial activities should focus on scouting, disease management, and spray-related decision making. There is plenty of time before infection and large quantities of high-quality educational materials are available. In this way, rust, as an event, creates an opportunity for generating returns to good management. Those who are prepared will out perform those who are not. So preparation is the key to successfully deal with rust. The prognosis is good that rust's impacts may only be moderate at worst given that: 1) there is time; 2) information is plentiful; and 3) disease management is a high impact/controllable area.

Second tier activities should focus on cropping decisions, spraying equipment, and materials. As the scenario analysis below relates, while having impact the corn:soybean ratio has less impact on profitability than the tier 1 activities associated with good spray management. Spray timing is critical, so delays beyond a few days could be costly. Make sure that spraying equipment and fungicide product will be available when you want and where you want. Currently orders for fungicide are being taken but not fulfilled. This makes preparedness a little more difficult, especially given that it is not certain Illinois will see rust in 2005. Begin now to develop good communication with fungicide sales representatives and spray contractors.

Third tier activities might involve risk management (e.g., crop insurance) and special approaches to managing rust (e.g., use of spray tracks and adjusting row widths.) While employing these activities is highly controllable, their impact is generally thought to be more moderate with respect to rust.

For example, if crop insurance coverage levels were maximized at 85% and allowed for 15% losses before payout, this may be less than the expected losses from rust. A producer needs to ask: what is the probability of rust on my farm and what will be the damage levels when best management practices are employed[3]? If a farmer believed that the probability was, say 25% that rust would be on his/her farm in 2005 and with losses of 10% with good management practices, the expected loss is [25% x 10%], or 2.5%, much less than the 15% threshold for crop insurance. Alternatively, because of one's location or because of potential difficulties securing timely treatment for rust, expected probability of losses may be high enough to warrant crop insurance. Such an analysis needs to be conducted by the individual producer.

Finally, there are the high impact variables that are uncontrollable, such as grain prices and rust infection rate and location. These variables need to be factored in and analyzed but they can not be directly managed. Use of risk management tools such as insurance, contracts, and pricing options may prove helpful to address the associated risks.

RUST SCENARIO MODEL

A Rust Scenario Model[4] was constructed to better understand the impacts of these uncertainties.

For simplicity assume a 1,000 acre farm. This farm produces only corn and soybeans. In 2004 it produced 500 acres of corn and 500 acres of soybeans (Table 2). In 2005 two overall decisions have to be made, the number of corn acres planted versus soybean acres and how to treat the soybeans, if planted, for rust. In 2006 assume there are no threat or impacts from rust[5]. A partial budget focusing only on variable costs is developed using 2004 FBFM[6] cost of production averages for central Illinois grain farms having highly productive farmland. Most central Illinois farms plant about 50% of their acres in corn and 50% in soybeans, suggesting that these cost estimates are appropriate. Following Schnitkey and Lattz (2004) the model assumes a 10% yield drag and a $10/acre additional nitrogen cost for corn following corn. Prices and yields are the last five year average for central Illinois; 173 bu/ac for corn and 49 bu/ac for soybeans. Corn prices are $2.25/bu and soybean prices are $5.20.

Table 2. Model Variable Settings

#	Model Variables	**Variable Setting**	Impact High Medium Low/None (HML)	Controllable High Medium Low/None (HML)	Management Priority 1= high 2= medium 3=low
1	Corn price	**$2.20**	H	L	3
2	Soybean price	**$5.20**	H	L	3
3	Corn acres planted	**500-1000**	H	H	1
4	Soybean acres planted	**0-500**	H	H	1
5	Corn yield drag	**10%**	M	M	2
	Corn Yield (bu/ac)	**173**			
	Soybean Yield (bu/ac)	**49**			

[3] See http://www.rma.usda.gov/news/2004/07/715soybeanrust.html for a discussion of crop insurance coverage.
[4] A decision tool utilizing the model will soon be available to for use on www.farmdoc.uiuc.edu
[5] Assuming no rust threat in 2006 is highly unrealistic. The analysis though is simpler and no insights are lost.
[6] Farm Business Farm Management Association http://fbfm.ace.uiuc.edu/

6	# of fungicide sprayings	**2**	H	H	1
7	Cost per treatment	**$20.00**	M	M	2
8	Number of acres sprayed	**0-500**	H	H	1
9	Use a spray contractor	**NA***	M	H	2
10	Infection rate	**NA**	H	L	3
	Crop losses	**5%**			
	Addit. Cost of N	**$10.00**			
11	Which fungicides?	**NA**	H	H	1
12	Use spray tracks?	**NA**	M	H	2
13	Row width?	**NA**	L	H	3
14	Infection location	**NA**	H	L	3
15	When to spray	**NA**	H	H	1
16	Crop insurance	**NA**	M	H	2

*Not applied in the model

With respect to costs associated with rust, several costs and yield impacts are important. Following Goldsmith (2004), cost per spray is assumed to be $20. As a starting point assume all soybeans are sprayed. Planting fewer soybeans will result in fewer acres that will require spraying. Losses are assumed to be 5% under a two-spray regime.[7]

As noted above, the model farm planted 500 acres of corn and 500 acres of soybeans) in 2004, which is a ratio of 50% corn and 50% soybeans. In this crop year (2005) the farm can plant 50:50 again, 75:25, or 100:0 (all corn and no soybeans). In 2006 it is assumed that the ratio will return to 50:50, 500 acres of corn and 500 acres of soybeans. These three scenarios are compared across the three-year period 2004-2006.

RUST SCENARIO MODEL RESULTS

Three scenarios are compared, 50:50, 75:25 and 100:0 over the three year period 2004-2006.

Revenue 2004

This is the base year. There are no impacts from rust and there are 500 acres of corn and 500 acres of soybeans planted. Total revenue for the 1,000 acres is $322,025.

Table 3. Total Revenue for 2004 (Base Year)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
% of Farm	50	50	
Price/Bushel	2.25	5.2	
Yield	173	49	
Yield Loss	0	0	
Final Yield	173	49	
Harvest (bu)	86,500	24,500	
Revenue	$194,625	$127,400	$322,025

[7] For a 1-spray regime 20% losses are expected if 100% of the soybeans are infected and 2% losses are expected for losses under a 3-spray regime. All loss percentages are based on personal communication with Drs. Monte Miles (University of Illinois) and Glen Hartman (USDA).

Revenue 2005

In 2005, the farmer must decide how much corn to plant and how many soybeans to plant. Under the 50-50 scenario total revenue is $315,655, falling 2% ($6,370) from the base year (Appendix1a). Revenue falls because of a 5% yield loss on the 500 acres of soybeans. Yields are reduced from 49 bu/ac to 46.55 bu/ac.

Under the 75:25 scenario total revenue increases almost 9% over the 50:50 scenario, to $342,721 (Appendix1b). Rust affects on yield are reduced because 50% (250 ac) fewer soybeans are planted. Revenue gains from reduced soybean acres though are mitigated in part by the yield drag occurring on part of corn acres. Because 750 acres of corn are planted in 2005 in this scenario, 250 acres will need to be planted on 2004 corn ground. Coming out of the 2004 crop year there was only 500 acres of soybean ground available for rotation. So there will be a yield drag of 10 bu/ac on 250 of the 750 corn acres planted in 2005. Effective yield on those 250 acres falls to 155.7 bu/acre.

Under the final scenario where no soybeans are planted, revenues increase 17% over the 50:50 plan to $369,788 (Appendix 1c). Now rust has no impact because no soybeans are planted. Yield drag affects occur on half (500) the planted acres.

Variable Costs 2004

In the base year total variable costs per acre are $192 and $111 respectively for corn and soybeans (Table 4) and $151,500 in total for the entire farm (Table 5).

Table 4. Variable Costs/Acre for 2004 (Base Year)

	Corn	Soybeans
Crop Year	2004	2004
Fertilizer ($/ac)	$65	$24
Pesticide ($/ac)	$40	$25
Fungicide ($/ac)	$0	$0
Seed ($/ac)	$38	$29
Drying ($/ac)	$16	$5
Machinery Operation and Repair ($/ac)	$33	$28
Total Variable Costs ($/ac)	$192	$111

Table 5. Total Variable Costs for 2004 (Base Year)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1000
Fertilizer	$32,500	$12,000	$44,500
Pesticide	$20,000	$12,500	$32,500
Fungicide	$0	$0	$0
Seed	$19,000	$14,500	$33,500
Drying	$8,000	$2,500	$10,500
Machinery Operation and Repair	$16,500	$14,000	$30,500
Variable Costs	$96,000	$55,500	$151,500

Variable Costs 2005

Under the 50:50 scenario variable costs for corn are $96,000 and $75,500 for soybeans, for a total of $171,500 (Appendix 2a). This would be an increase of 13% over the base year. The only extraordinary cost for soybeans is an additional charge of $20,000 for spraying fungicide two times (@$20 per) on all 500 acres of soybeans.

Under the 75:25 scenario, there the additional fungicide cost, but it is only applied on 250 acres. There is also an additional cost ($10/ac) of supplemental nitrogen for the 250 corn:corn acres. Total variable costs rise to $184,250 (19%) over the base year (Appendix 2b).

Under the 100:0 scenario, there is no additional cost from the fungicide but supplemental nitrogen is now needed on 500 acres of corn:corn ground. Variable costs per acre rise 27% over the base year to $197,000 (Appendix 2c). This is due in part to increased usage of nitrogen but also because variable costs per acre are higher for corn than soybeans.

Net Revenue 2004

Net revenue, revenue minus variable costs, in the base year is $170,525 or 171/ac (Table 6).

Table 6. Net Revenue for 2004 (Base Year)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
Revenue	$194,625	$127,400	$322,025
Variable Costs	$96,000	$55,500	$151,500
Net Revenue over Variable Costs	$98,625	$71,900	$170,525
Net Revenue over Variable Costs/Acre	$197.25	$143.80	$170.53

Net Revenue 2005

Net Revenue under the 50:50 plan falls 15% to $144,155 reflecting both the revenue and cost impacts from rust (Appendix 3a). Under the 75:25 and 100:0 scenarios the differences with the base year are reduced (Appendices 3b and 3c). Net revenue for 2005 for the two plans is $158,471 (-7%) and $172,788 (+1%), respectively; both superior in 2005 to the 50:50 plan.

Revenue 2006

As described above, changing the corn:soybean ratio is not simply a static problem but is dynamic, with carry-over implications for the following crop year. Assume that the farmer returns in 2006 to a 50:50 ratio and there is no threat of rust.

Under the 1st scenario, 50:50 in 2005, there is neither a yield drag penalty, nor a soybean yield loss due to rust in 2006. Total revenues would rise to $322,025, the same as in 2004 (Appendix 4a).

In Scenario 2 that employed a 75:25 plan in 2005, revenues would fall almost $10,000 (3%) compared to the 50:50 plan, to $312,294 (Appendix 4b). In this scenario, 250 acres of corn would be two-year continuous corn so would suffer a 10% yield drag.

Finally, the third scenario where in the previous year (2005) no soybeans were planted, all 500 acres of corn would suffer a yield drag. Half of the 500 acres of corn would be two years of continuous corn and the other half would be three years of continuous corn. Yield drag losses were assumed to the same for both[8]. Revenue would decline almost $20,000 (6%), compared to the 50:50 plan, to $302,563 (Appendix 4c).

Variable Costs 2006

Under the 1st Scenario, 50:50 in 2005, costs return to the 2004 levels and total $151,500 (Appendix 5a). Since the 50:50 rotation remains intact no supplemental nitrogen is needed. Also since rust is not an issue in 2006 (by assumption) there are no additional costs for fungicides.

In Scenario 2 that employed a 75:25 plan in 2005, costs would rise in 2006 $2,500 above the base year to $154,000 (Appendix 5b) This reflects the additional costs of added nitrogen on 250 of corn:corn acres.

In Scenario 3, all corn in 2005, would require significant supplemental nitrogen. Variable costs would be $156,500, rising $5,000 (3%) over the base year (Appendix 5c).

Net Revenue 2006

Net Revenue in 2006 for the three plans would be $170,525, 158,294, and 146,063, respectively, for the 50:50, 75:25, and 100:0 plans (Appendices 6a-6c). The 50:50 plan's variable costs for 2006 would be exactly the same as the base year (2004). The 75:25 plan's costs would be 7% higher and the 100:0 plan's costs would be 14% higher due to the effects on revenue from the yield drag and the effects on costs from the higher nitrogen rates.

Net Revenue 2004-2006

When all three years are combined all three scenarios are quite comparable, within $4,170 of each other (Table 7). The highest net revenue, $489,375, occurs by using the 100:0 plan. It is .86% or $1.39/ac/yr greater than the 50:50 plan. Net revenues are $487,290 (+.43%) and $485,205, respectively for the 75:25 and 50:50 plans..

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[8] No data exists on the yield drag of three-year continuous corn versus two-year. So to be conservative the same 10% loss compared to rated corn was used.

Table 7. Summary Table for the Three Scenarios, 50:50, 75:25, 100:0 (2004-2006)

Scenario		2004			2005			2006			Total
	Acres	**Corn 500**	**Soybean 500**	**All 1000**	**Corn 500**	**Soybean 500**	**All 1000**	**Corn 500**	**Soybean 500**	**All 1000**	**All**
50:50	Revenue	$194,625	$127,400	$322,025	$194,625	$121,030	$315,655	$194,625	$127,400	$322,025	
	V Costs	$96,000	$55,500	$151,500	$96,000	$75,500	$171,500	$96,000	$55,500	$151,500	
	Net Revenue	$98,625	$71,900	$170,525	$98,625	$45,530	$144,155	$98,625	$71,900	$170,525	**$485,205**
	Acres	**500**	**500**	**1000**	**750**	**250**	**1000**	**500**	**500**	**1000**	
75:25	Revenue	$194,625	$127,400	$322,025	$282,206	$60,515	$342,721	$184,894	$127,400	$312,294	
	V Costs	$96,000	$55,500	$151,500	$146,500	$37,750	$184,250	$98,500	$55,500	$154,000	
	Net Revenue	$98,625	$71,900	$170,525	$135,706	$22,765	$158,471	$86,394	$71,900	$158,294	**$487,290 (+.43%)**
	Acres	**500**	**500**	**1000**	**1000**	**0**	**1000**	**500**	**500**	**1000**	
100:0	Revenue	$194,625	$127,400	$322,025	$369,788	$0	$369,788	$175,163	$127,400	$302,563	
	V Costs	$96,000	$55,500	$151,500	$197,000	$0	$197,000	$101,000	$55,500	$156,500	
	Net Revenue	$98,625	$71,900	$170,525	$172,788	$0	$172,788	$74,163	$71,900	$146,063	**$489,375 (+.86%)**

ANALYSIS AND CONCLUSIONS

Though it would appear then the three plans are quite comparable. In fact they may not be when alternative analyses are conducted using different assumptions. The above analysis was just one application of a model than can be significantly altered depending on the user's assumptions. The model will be posted on www.farmdoc.uiuc.edu to allow for more in-depth analyses.

Several key assumptions might be quite different under a more complete exercising of the model. For example:

The above results assume prices are static; that there is no supply effect. Just a 10% price response in 2005 in soybeans from $5.20 to $5.72, makes the 50:50 plan preferred by $12,000 (1.6%), over the 2004-2006 time period, when compared to the 100:0 plan. Correspondingly what might be assumed about corn prices?

Using an alternative line of reasoning, risks from rust are eliminated by going to all corn. So when increased risks from rust are incorporated into the comparison, the 100:0 plan may in fact be preferred. For example, the above results assumed rust losses to be 5%. Just by assuming losses to 10% reduces the net revenue of the 50:50 plan by $7,000 over the three year horizon, countering the impacts of a positive soybean price response.

Alternatively, while a 100:0 crop mix removes certain uncertainties, it adds new uncertainties as well. All benefits from crop diversification are lost. Risk is increased simply by concentrating all activities in corn rather than spreading risk across the two crops. There are also uncertainties and associated with producing continuous corn. The model assumed a 10% yield drag, but is that correct? What if 2005 was a drought year? Or the model does not capture the out years of 2007 and beyond. For example, just increasing the yield drag to 15% and keeping nitrogen costs the same would reduce the 3-year net revenue of the 100:0 plan almost $19,000 or $6.49/acre/year. Also the model assumed that the only additional costs from continuous corn were the application of higher rates of nitrogen. Continuous corn might even require other increases inputs, i.e., insecticides or be more vulnerable to input price inflation.

Finally, an additional significant risk is being poorly positioned in the market if rust doesn't impact the U.S. or if there is a supply response positively affecting the soybean corn price ratio. For example, some farms or regions may not be affected, allowing those producers who choose the plant soybeans to take advantage of a positive soybean price response. Similarly some producers may be more effective managing the affects of rust. They too would be able to take advantage of a positive price response.

In conclusion, many rust management experts are confident that good managers will manage any outbreak of rust effectively. While Illinois soybean producers certainly face a new threat, there is a real opportunity for good management to mitigate many of the risks posed by rust. In a commodity business, farm profitability is not simply a case of managing well, but managing differentially well. This has certainly been the case in Brazil where superior rust managers have garnered superior returns.

The model shows that exchanging one known, rust, for another unknown, continuous corn, may not be warranted. Each farmer will need to study their own situation, use their own assumptions and conduct their own analyses for their particular situation. The key is to focus on the high impact controllable variables and prepare. What that means with respect to rust is learn about the disease, how to scout it, and how to treat it. Then put in place a rust management plan, ready to deploy in event rust does come to Illinois in 2005.

Issued by: Peter Goldsmith and Gary Schnitkey, Department of Agricultural and Consumer Economics

Appendix 1a. Total Revenue for 2005 (50:50)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
% of Farm	50	50	
Price/Bushel	2.25	5.2	
Yield	173	49	
Yield Loss	0	5%	
Final Yield	173	46.55	
Harvest (bu)	86,500	23,275	
Revenue	$194,625	$121,030	$315,655

Appendix 1b. Total Revenue for 2005 (75:25)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2005	2005	2005	2005
Acres	500	250	250	1,000
% of Farm	50	25	25	
Price/Bushel	2.25	2.25	5.20	
Yield	173	173	49	
Yield Loss	0	10%	5%	
Final Yield	173	155.7	46.55	
Harvest (bu)	86,500	38,925	11,638	
Revenue	$194,625	$87,581	$60,515	$342,721

Appendix 1c. Total Revenue for 2005 (100:0)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2005	2005	2005	2005
Acres	500	500	0	1,000
% of Farm	50	25	25	
Price/Bushel	2.25	2.25	5.20	
Yield	173	173	49	
Yield Loss	0	10%	0	
Final Yield	173	155.7	0	
Harvest (bu)	86,500	77,850	0	
Revenue	$194,625	$175,163	0	$369,788

Appendix 2a. Total Variable Costs for 2005 (50:50)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1000
Fertilizer	$32,500	$12,000	
Pesticide	$20,000	$12,500	
Fungicide	$0	$20,000	
Seed	$19,000	$14,500	
Drying	$8,000	$2,500	
Machinery Operation and Repair	$16,500	$14,000	
Variable Costs	$96,000	$75,500	$171,500

Appendix 2b. Total Variable Costs for 2005 (75:25)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	500	250	250	1000
Fertilizer	$32,500	$18,750	$6,000	
Pesticide	$20,000	$10,000	$6,250	
Fungicide	$0	$0	$10,000	
Seed	$19,000	$9,500	$7,250	
Drying	$8,000	$4,000	$1,250	
Machinery Operation and Repair	$16,500	$8,250	$7,000	
Variable Costs	$96,000	$50,500	$37,750	$184,250

Appendix 2c. Total Variable Costs for 2005 (100:0)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	500	500	0	1000
Fertilizer	$32,500	$37,500	$0	
Pesticide	$20,000	$20,000	$0	
Fungicide	$0	$0	$0	
Seed	$19,000	$19,000	$0	
Drying	$8,000	$8,000	$0	
Machinery Operation and Repair	$16,500	$16,500	$0	
Variable Costs	$96,000	$101,000	$0	$197,000

Appendix 3a. Net Revenue for 2005 (50:50)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
Revenue	$194,625	$121,030	$315,655
Variable Costs	$96,000	$75,500	$171,500
Net Revenue over Variable Costs	$98,625	$45,530	$144,155

Appendix 3b. Net Revenue for 2005 (75:25)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	500	250	250	1,000
Revenue	$194,625	$87,581	$60,515	
Variable Costs	$96,000	$50,500	$37,750	
Net Revenue over Variable Costs	$98,625	$37,081	$22,765	$158,471

Appendix 3c. Net Revenue for 2005 (100:0)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	500	500	0	1,000
Revenue	$194,625	$175,163	$0	
Variable Costs	$96,000	$101,000	$0	
Net Revenue over Variable Costs	$98,625	$74,163	$0	$172,788

Appendix 4a. Total Revenue for 2006 (50:50) (50:50 in 2005)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
% of Farm	50	50	
Price/Bushel	2.25	5.2	
Yield	173	49	
Yield Loss	0	0	
Final Yield	173	49	
Harvest (bu)	86,500	24,500	
Revenue	$194,625	$127,400	$322,025

Appendix 4b. Total Revenue for 2006 (50:50) (75:25 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2005	2005	2005	2005
Acres	250	250	500	1,000
% of Farm	25	25	50	
Price/Bushel	2.25	2.25	5.20	
Yield	173	173	49	
Yield Loss	0	10%	0	
Final Yield	173	155.7	49	
Harvest (bu)	43,250	38,925	24,500	
Revenue	$97,313	$87,581	$127,400	$312,294

Appendix 4c. Total Revenue for 2006 (50:50) (100:0 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2005	2005	2005	2005
Acres	250	250	500	1,000
% of Farm	25	25	50	
Price/Bushel	2.25	2.25	5.20	
Yield	173	173	49	
Yield Loss	10%	10%	0	
Final Yield	155.7	155.7	49	
Harvest (bu)	38,925	38,925	24,500	
Revenue	$87,581	$87,581	$127,400	$302,563

Appendix 5a. Total Variable Costs for 2005 (50:50) (50:50 in 2005)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1000
Fertilizer	$32,500	$12,000	
Pesticide	$20,000	$12,500	
Fungicide	$0	$0	
Seed	$19,000	$14,500	
Drying	$8,000	$2,500	
Machinery Operation and Repair	$16,500	$14,000	
Variable Costs	$96,000	$55,500	$151,500

Appendix 5b. Total Variable Costs for 2005 (50:50) (75:25 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	500	250	500	1000
Fertilizer	$16,250	$18,750	$12,000	
Pesticide	$10,000	$10,000	$12,500	
Fungicide	$0	$0	$0	
Seed	$9,500	$9,500	$14,500	
Drying	$4,000	$4,000	$2,500	
Machinery Operation and Repair	$8,250	$8,250	$14,000	
Variable Costs	$48,000	$50,500	$55,500	$154,000

Appendix 5c. Total Variable Costs for 2005 50:50 (100:0 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	250	250	500	1000
Fertilizer	$18,750	$18,750	$12,000	
Pesticide	$10,000	$10,000	$12,500	
Fungicide	$0	$0	$0	
Seed	$9,500	$9,500	$14,500	
Drying	$4,000	$4,000	$2,500	
Machinery Operation and Repair	$8,250	$8,250	$14,000	
Variable Costs	$50,500	$50,500	$55,500	$156,500

Appendix 6a. Net Revenue for 2006 (50:50) (50:50 in 2005)

	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004
Acres	500	500	1,000
Revenue	$194,625	$127,400	$322,025
Variable Costs	$96,000	$55,500	$151,500
Net Revenue over Variable Costs	$98,625	$71,900	$170,525

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Appendix 6b. Net Revenue for 2006 (50:50) (75:25 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	250	250	500	1,000
Revenue	$97,313	$87,581	$127,400	$312,294
Variable Costs	$48,000	$50,500	$55,500	$154,000
Net Revenue over Variable Costs	$49,313	$37,081	$71,900	$158,294

Appendix 6c. Net Revenue for 2006 (50:50) (100:0 in 2005)

	Corn	Corn	Soybeans	Farm Totals
Crop Year	2004	2004	2004	2004
Acres	250	250	500	1,000
Revenue	$87,581	$87,581	$127,400	$302,562
Variable Costs	$50,500	$50,500	$55,500	$156,500
Net Revenue over Variable Costs	$37,081	$37,081	$71,900	$146,062

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