Is Soft Red Winter Wheat Production Competitive with a Corn-Soybean Rotation?[1]

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Abstract

Soft red winter wheat (SRWW) production in Illinois as well as the U.S. has been on the decline. Trends in wheat yields have not kept up with corn and soybean yield trends. Price and cost of production for SRWW has not improved relative to corn and soybeans. Despite these disadvantages, SRWW alone or double cropped with soybeans is competitive with a corn-soybean rotation under certain conditions.

Introduction

The trend in U.S.-planted wheat acreage as well as Illinois wheat acreage has been downward since the early 1980s despite year to year fluctuations in planted wheat acreage. Planted wheat acreage for all wheat in the U.S. in 2002 was 70 percent of the 1982 acreage (USDA-NASS n.d.). This decline was especially true for soft red winter wheat (SRWW), the major class of wheat grown in Illinois and the eastern part of the U.S. Planted wheat acreage for U.S. SRWW in 2002 was 48 percent of the 1982 planted acreage (USDA-ERS 2002). In 2002, Illinois planted 43 percent of the wheat acreage planted in 1982 which is primarily SRWW (USDA-NASS n.d.).




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Factors responsible for the decline in Illinois wheat acreage are summarized, and the conditions showing when SRWW is a profitable crop for Illinois producers are presented. The growing season increases from north to south in Illinois which allows for double cropping wheat and soybeans in the southern part of the state as opposed to a single crop in the northern region. Crop yields consistently vary by crop reporting districts in Illinois by more than 30 percent. These factors and conditions are applicable to other areas of the eastern U.S. from Missouri and Arkansas to the west to Pennsylvania and Georgia in the east, or areas having a 165 to 180 day growing season.

Factors Responsible for Decline in SRWWheat Production

The decline in SRWW production in Illinois and elsewhere can be attributed to several factors: (1) lower increases in yields compared to corn and soybeans, (2) increased yield risk, (3) less improvement in the cost of production relative to corn and soybean production, and (4) a weaker price and greater price risk compared to corn and soybean prices.

Yield trends

Comparing yield trend indices of wheat, corn, and soybeans for the U.S. and Illinois from 1980 to1999 reveals that increases in the wheat yield index were below those of corn and soybeans (USDA-NASS n.d.). For the U.S. from 1980 through 1999, the trend in corn yields increased by 37 percent, soybean yields increased by 40 percent, while wheat yields only increased by 15 percent. For Illinois, corn yields increased by 29 percent, soybean yields increased by 28 percent, while wheat yields increased only by 10 percent. These comparative trends were consistent across all crop reporting districts in Illinois.

Yield risk

Yield risk for wheat compared to corn and soybeans increased over the 1980-1999 time period. During the 1980s, the amount of wheat yield variability (detrended) as a percentage of average crop yield was less than corn for all crop reporting districts in Illinois, and was less than soybeans for the southern districts of the state (Table 1). During the 1990s, wheat yield variability increased considerably compared to corn and soybeans. From 1980 through 1999, wheat yield variability was comparable to corn, but more variable than soybean yield. Unfortunately for wheat, this variability increased over the past decade as indicated by comparing the coefficient of variation for the years 1980 to 1989 with the years 1990 to 1999. Disease outbreaks such as head scab and adverse weather events in the 1990s are two possible explanations for the observed increase in yield variation in wheat.

Table 1. Yield Variability for Detrended Yields by Illinois Crop Reporting District, 1980-1999

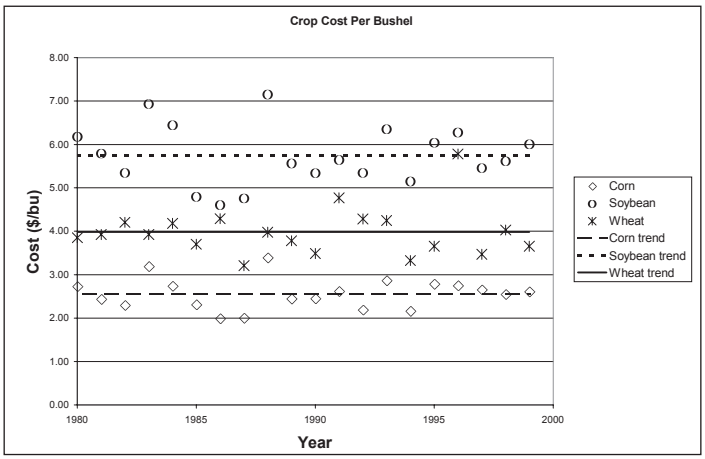
Crop										
	Coefficient of Variation (%) 1980-1999									
Corn	13.8	14.4	16.3	15.9	19.3	14.1	16.3	14.9	16.3	15.6
Soybeans	8.1	10.4	9.1	9.8	13.2	10.5	11.7	11.3	12.5	10.3
Wheat	17.1	17.9	16.9	14.8	15.8	15.6	14.9	15.4	15.7	14.9
	Coefficient of Variation (%) 1980-1989									
Corn	19.7	16.5	24.0	23.3	23.9	20.3	21.6	21.3	20.5	20.7
Soybeans	12.0	12.2	11.9	15.3	17.9	15.1	16.9	14.9	16.1	14.3
Wheat	13.7	13.6	12.5	15.7	14.6	11.3	11.7	10.9	12.7	9.1
	Coefficient of Variation (%) 1990-1999									
Corn	9.7*	14.8	9.4*	10.0*	17.5	9.8*	13.2	11.2*	15.5	11.5*
Soybeans	5.1*	10.5	6.0*	3.5*	10.0*	6.1*	7.5*	7.8*	10.7	5.7*
Wheat	18.9	21.6	19.1	13.7	17.6	18.6*	17.7	19.2*	18.8	17.2*

Source: Calculated from detrended yields using yield data from USDA-NASS n.d. Note: Coefficient of Variation = standard error about trend line divided by average yield for time period. *Variance 1990s yields significantly different from variance 1980s yields at P(F=0.1).

Cost of production

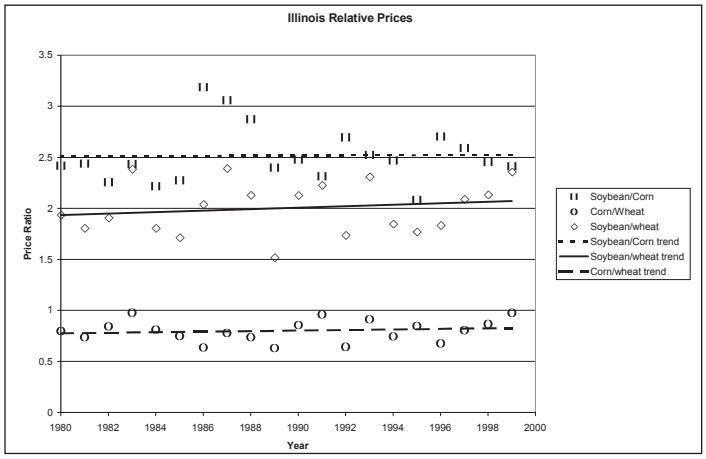
Cost of production comparisons between wheat, corn, and soybeans for the north central states indicates that costs per acre for wheat have not increased as high as those for corn and soybeans. Since 1980, wheat cost per acre has trended upward at a rate of 1.3 percent per year whereas the cost per acre for corn and soybeans has trended upward at an annual rate of 1.6 and 1.4 percent, respectively (USDA-ERS 2002d). Although a comparison of cost per bushel trends for wheat, corn, and soybeans indicates that the costs have been relatively constant for the past twenty years (Figure 1). Soybean cost per bushel shows a slight downward trend, whereas wheat and corn show a slight upward trend in cost per bushel with wheat showing the greater increase in cost per bushel. This again indicates that increases in wheat yield have not kept up with yield increases in corn and soybeans. Note that the above comparison was conducted in nominal prices. An adjustment for the purchasing price of the dollar would reveal that the cost per bushel has declined for all three crops, but wheat would show a slower rate of decline.

Figure 1. Cost Per Bushel for Corn, Soybeans and Wheat in the North Central Region, 1980-1999



Source: Calculated from north central and heartland commodity costs and returns data USDA-ERS 2002d.

Figure 2. Illinois Relative Prices, Soybean/Corn, Soybean/Wheat and Wheat/Corn Price Ratios, 1980 - 1999



Source: Ratios calculated from price data from USDA-NASS n.d.

Relative prices and price risk

Comparisons of the trend in relative prices for wheat, corn, and soybeans for the U.S. and Illinois reveals mixed results. The relative price trend in the soybean-corn price ratio for the U.S. and Illinois remained nearly constant despite the year to year fluctuations (Figure 2). For the U.S., the relative price of soybeans to wheat and corn to wheat show only a slight trend in favor of a stronger wheat price relative to corn and soybean prices (USDA-NASS n.d). For Illinois however, corn and soybean prices improved relative to wheat prices. This apparent contradiction can be explained by the increased difference in price between classes of wheat. SRWW, which makes up less than 20 percent of total U.S. wheat production, is the predominant wheat grown in Illinois and the eastern U.S. A comparison between the annual average Kansas City hard red winter wheat price (ordinary protein) and the annual average St. Louis SRWW price indicates the difference in price has increased over time. Using annual price data from the USDA (2002b), during the 1970s, the average price difference was 7.3 cents per bushel. During the 1980s, the average price difference was 18.1 cents per bushel, and during the 1990s, the average difference was 41.2 cents per bushel. Thus, wheat prices for Illinois and other SRWW producing states weakened relative to corn and soybean prices.

The weakening in the price of SRWW can be explained partially by the emergence of structural changes and quality preferences in the buying patterns in the world market. Vocke (2000) discussed possible threats to the U.S.'s share of world wheat trade. Structural changes are observed in many countries where the government had been in charge of purchasing the grain for domestic use. Soft red wheat, which is used for cookies, crackers, and all purpose flour in the U.S. was purchased by those government buyers for bread making due to its relatively low price and abundant worldwide supply. The movement towards privatization in many smaller importing countries has caused a decline in the demand for soft red wheat in the world market because of the increased attention to the various milling qualities (Vocke 2000, 9). The worldwide soft red wheat market has historically consisted of four key markets: Egypt, China, Russia, and Morocco. Over the past two decades the demand has fallen in each of these four countries (Perkins (1999).

In terms of price risk, soft-red wheat prices show greater variability in the past decade than the previous decade. During the 1980s, price variability as measured by the coefficient of variation (c.v.) of annual Illinois prices from USDA-NASS data was 15 percent for wheat, 20 percent for corn, and 17 percent for soybeans. The decade of the 1990s indicates a reversal with the c.v. exceeding 21 percent for wheat, while for corn the measure drops to less than 16 percent, and for soybeans the measure drops to less than 14 percent.

From 1996 to 2001, another disadvantage for SRWW was the government loan rates. Upper limit on loan rates under 1996 to 2001 legislation was $1.89/bushel for corn, $5.26/bushel for soybeans, and $2.58/bushel for wheat (USDA-ERS 2002c). Farm program loan rates provided incentives for production when market prices were below the loan rate. Program loan price ratios of soybean to corn and soybean to wheat were greater than the historical average price ratios for U.S farmers, indicating the loan prices favored soybean production. The program loan price ratio for soybean to wheat was 2.04 compared to the 1980-1999 average soybean to wheat price ratio of 1.84. The loan price ratio for corn to wheat was equal to the 1980-1999 U.S. historical corn to wheat price ratio. The soybean to corn loan price ratio was 2.78 compared to the 1980-1999 U.S. soybean to corn price ratio of 2.53.

Conditions Favoring SRWW Production in Illinois

Despite the trends explaining declining production of SRWW by Illinois producers, SRWW can be a competitive enterprise under certain conditions. Conditions that favor SRWW as a competitive crop choice are: (1) relative comparative yield advantage along with double cropping, (2) farm bill changes for 2002, (3) risk diversification, (4) availability of a wheat straw markets, (5) timeliness, and (6) marketing wheat as food.

Regional comparative advantages

A comparison of returns over operating costs and returns to management for continuous corn, corn-soybean rotation, wheat, wheat-soybean double crop across the crop reporting districts of Illinois was made to identify regional differences in the comparative advantages of corn, soybeans, and wheat. Across the state there are differences in yields and growing seasons. The longer growing season for the southern crop reporting districts permits wheat-soybean double cropping. Wheat and wheat-soybean double crop are treated as separate enterprises that could be added to a rotation where applicable. Literature suggests there are possible rotational advantages and disadvantages of adding wheat to a rotation. Adding wheat to a corn-soybean rotation could help reduce soybean diseases by keeping soybeans out of production for two years, but corn and wheat are grasses and could be disease vectors for each other. If wheat follows soybeans, it will not receive the full nitrogen credit provided by soybeans because the available nitrogen becomes available beginning in May when the soil temperature has increased; by that time, wheat will be mature and harvested by June. For this analysis, any rotational effects of including wheat in rotation were excluded. Returns were estimated using 1995-1999 crop reporting district average prices and crop yields as reported by Illinois Agricultural Statistics Service (Table 2). Double-crop soybean yield averages for the southern districts were calculated from the Illinois Farm Business Farm Management Service records because Illinois Agricultural Statistics Service did not distinguish between double-crop and full-season soybeans. Production costs were estimated based on recommended practices and average crop yields. This procedure was used because of insufficient survey cost data for wheat in Illinois from either Illinois Agricultural Statistics Service or Illinois Farm Business Farm Management Service records. Fertilizer applications reflect recommended maintenance levels associated with the average yield. Pesticide applications were likely applied materials at recommended rates. Detailed information on other cost estimates are available from the authors.

Table 2. Five-Year Average Prices and Yields, 1995-1999

Crop Reporting District:	NW	NE	W	C	E	WSW	ESE	SW	SE
	Five-Year Average Price, 1995-1999 ($/bushel)								
Corn	2.53	2.53	2.51	2.54	2.54	2.54	2.57	2.51	2.55
Soybeans	6.17	6.15	6.17	6.2	6.22	6.24	6.18	6.13	6.15
Wheat	3.14	3.08	3.02	3.14	3.09	3.17	3.16	3.04	3.04
	Five-Year Average Yield , 1995-1999 (bushel/acre)								
Corn	140	135	137	144	133	134	119	102	104
Soybeans	48	43	45	46	44	41	37	33	33
Wheat	58	61	50	56	64	52	49	51	48
Double-crop Soybeans						23	24	26	27

Source: Illinois Agricultural Statistics Service various years except double-crop soybean yields which are from Illinois Farm Business Farm Management Records.

Returns over operating costs (seed, fertilizer, chemicals, fuel, oil, machinery repairs, crop insurance, labor, etc.) and returns to management (returns over operating costs less capital recovery for machinery and buildings and a land charge) for wheat and wheat-soybean double-crop are compared to a corn-soybean rotation (Table 3). The corn-soybean rotation was selected for comparison purposes because it was more profitable than continuous corn across all crop reporting districts.

The "profit or loss with wheat" column in Table 3 indicates the difference in returns between an acre in wheat production and an acre in a corn-soybean rotation. A loss appears for wheat for

Table 3. Returns Per Acres for Corn-Soybean Rotation, Wheat, and Double-Crop Wheat Soybeans by Crop Reporting District

Crop Reporting District		A Corn-Soybean Rotation ($/acre)	B Wheat ($/acre)	C Double-Crop Wheat-Soybeans ($/acre)	B-A Profit/Loss With Wheat ($/acre)	C-A Profit/Loss Double Crop Wheat-Soybeans ($/acre)
Northwest	Returns Above Operating Costs	174	81		-93	
	Return to Management	-3	-94	*	-91	
Northeast	Returns Above Operating Costs	156	86		-70	
	Return to Management	-28	-96	*	-68	
West	Returns Above Operating Costs	161	52		-109	
	Return to Management	-12	-119	*	-107	
Central	Returns Above Operating Costs	176	75		-101	
	Return to Management	0	-98	*	-99	
East	Returns Above Operating Costs	159	95		-64	
	Return to Management	-29	-91	*	-61	
West SW	Returns Above Operating Costs	152	66	102	-86	-50
	Return to Management	-20	-104	-67	-83	-47
East SE	Returns Above Operating Costs	128	57	100	-71	-28
	Return to Management	-34	-102	-58	-69	-25
Southwest	Returns Above Operating Costs	95	56	107	-40	12
	Return to Management	-34	-71	-19	-37	15
Southeast	Returns Above Operating Costs	101	48	106	-53	5
	Return to Management	-26	-77	-18	-50	9

*Length of growing season not sufficient for wheat-soybean double crop.

all districts. Down the column from the northern districts to the southern districts, the size of the loss declines. Losses for return to management range between $61 to $106 an acre in the north and central part of the state. In the southern part of the state, losses are less, ranging between $37 and $83 an acre. Wheat alone across the state was not competitive with a corn-soybean rotation.

The "profit or loss" column for double-crop wheat and soybeans is the difference in returns between an acre in wheat-soybean double crop and an acre in a corn-soybean rotation. Double cropping wheat and soybeans provided more profit than a corn-soybean rotation for the Southwest (SW) and Southeast (SE) districts. These returns assumed that the grower was successful in planting the soybean crop after wheat. If the grower was unsuccessful then it would be as if wheat was only grown and losses are incurred. For double cropping to be successful in the SW and SE district, growers would have to successfully plant soybeans 70 percent of the time in the SW and 85 percent of the time in the SE.

Table 4. Breakeven Wheat Yield and Percentage Increase from 1995-1999 Average Yield by Illinois Crop Reporting District Using 1995-1999 Average Commodity Prices

	NW	NE	W	C	E	WSW	ESE	SW	SE
	Breakeven Wheat Yield								
Wheat Yield (bushels/acre)	90	85	89	90	86	81	73	65	67
Wheat Yield Increase (%)	55	39	78	61	34	56	50	27	39
	Breakeven Wheat Yield for Double-Crop System								
Wheat Yield (bushels/acre)						69	58	46	46
Wheat Yield Increase (%)						33	20	-9	-3

Note: Breakeven yields are wheat yields necessary to make returns above operating costs equivalent to a corn-soybean rotation. Wheat yield increase is the percentage increase above the 1995-1999 average wheat yield necessary to breakeven.

The losses for wheat grown alone do not imply that wheat is unprofitable for all growers. Individual growers within a district may have wheat yields that are relatively high compared to their corn and soybean yields. Table 4 shows the wheat yields required for an equivalent return to management from a corn-soybean rotation. District wheat yields would need to increase from 27 percent to 78 percent in order to breakeven, or wheat yields would have to range from 65 to 90 bushels per acre. These breakeven yields account for the additional fertilizer and other costs that would increase with higher wheat yields. The breakeven yield for each district was found by using Microsoft Excel™ Solver and allowing the wheat yield for the district wheat enterprise or the wheat-double-crop-soybean enterprise to vary until the return above operating cost was equivalent to the return above operating cost for a corn-soybean rotation. Another way to visualize what is necessary to make wheat competitive with a corn-soybean rotation is to divide the breakeven wheat yields by the average corn yield. Historically, Illinois county wheat yields are correlated with corn yields (Illinois Agronomy Handbook, Ch. 4, p. 44). Across the crop reporting district, wheat yields need to be 60 to 65 percent of the five-year average corn yield in order to breakeven. This requirement is somewhat higher than the "rule of thumb" that wheat yields are about one-half of corn yields with favorable conditions for both crops (Illinois Agronomy Handbook, Ch. 4, p. 44).

For the West-Southwest (WSW) and the East-Southeast (ESE) districts where the wheat-soybean double crop was not as profitable as a corn-soybean rotation, wheat yields in the double-crop system would need to increase 33 percent and 20 percent respectively, or yields of 69 and 58 bushels/acre.

The results reported in Tables 3 and 4 were based on 1995-1999 crop prices which differ from the current government program loan prices. A similar analysis compared wheat and double-crop wheat soybeans to a corn-soybean rotation using loan prices for 2002-2003 as set in the 2002 farm bill. The 2002-2003 loan rates were $1.98/bushel for corn, $5.26/bushel for soybeans, and $2.80/bushel for wheat (USDA-ERS 2002c). The results were similar in that the corn-soybean rotation was still the most profitable except in those regions where previously SRWW with double-cropped soybeans was more profitable. The advantage of the corn-soybean rotation over wheat and wheat with double-cropped soybeans declined because the wheat loan rate price has improved relative to the loan rate price for soybeans. The required increase in wheat yields to breakeven with a corn-soybean rotation would range between 5 to 45 percent, or wheat yields ranging from 53 to 76 bushels per acre. Or, achieving wheat yields which are 51 to 54 percent of corn yields would make wheat competitive to a corn-soybean rotation. Thus, at the program loan rate prices, the breakeven wheat yields as a percent of corn yields would be near the previously stated "rule of thumb" that wheat yields are one-half of corn yields.

Risk diversification

Although wheat yield variability has increased, wheat production offers producers the opportunity to diversify risk. Wheat provides a greater potential to diversify crop yield risk because it matures and is harvested in June. Wheat yields are unaffected by midsummer drought or heat stress whereas corn and soybean yields are affected. Often it is the case that when wheat yields are up, corn and soybean yields are down and vice versa. This relationship is captured in Table 5 showing the correlation coefficients between corn, soybean, and wheat yields. Correlation coefficients range between -1 and +1. Selecting crops that have negative or low correlation coefficient allow for greater diversification of yield risk. Wheat yields have a negative correlation or very low correlation with corn and soybean yields. This implies that historically good wheat yields have offset poor corn and soybean yields and vice versa. Corn and soybean yields show a high positive correlation as expected, which implies when corn yields are poor, soybean yields are likely to be poor also, and vice versa.

Table 5. Yield Correlation of Detrended Crop Yields by Crop Reporting Districts, 1980-1999

Yield Correlation NW	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.83	1	
Wheat	-0	0.08	1

Yield Correlation NE	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.81	1	
Wheat	0.28	0.42	1

Yield Correlation W	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.85	1	
Wheat	-0.2	-0.4	1

Yield Correlation C	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.85	1	
Wheat	0.01	0.18	1

Yield Correlation E	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.86	1	
Wheat	0.14	0.29	1

Yield Correlation WSW	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.89	1	
Wheat	-0.1	-0.2	1

Yield Correlation ESE	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.87	1	
Wheat	0.23	0.12	1

Yield Correlation SW	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.8	1	
Wheat	0.06	-0.1	1

Yield Correlation SE	*Corn*	*Soybeans*	*Wheat*
Corn	1		
Soybeans	0.73	1	
Wheat	0.4	0.11	1

Source: Raw yield data from USDA-NASS n.d.

Wheat straw

Wheat straw can increase returns to the wheat enterprise for growers who have market opportunities for straw. The market for straw in Illinois has declined with the reduction of livestock, but some farmers may still have access to a straw market. If straw is sold for $45 a ton, a grower could add an additional $15 per acre return. This could be even more depending on the market for straw. Additional cost incurred would be for raking, baling, and hauling the straw. Removal of the straw will also require increases in fertilizer cost as phosphorus and potassium are removed with the straw.

Receipts: 1 ton x $45/ton = $45
Costs: rake, bale, and haul = -$22
fertilizer (P2O5, K2O) =-$8
Net return from straw production = $15

Timeliness

Timeliness is another factor that can add to the value of wheat. Growers who plant part of their acreage to wheat are more likely to complete corn and soybean plantings on time and avoid yield losses. If by not planting wheat results in corn plantings after May 10, then yield losses can result at 0.5 bushel per day (Illinois Agronomy Handbook 2001, Ch. 2, p. 20).

Assuming corn is planted between May 10 and May 20, an average yield loss of 2.5 bushels is expected. This loss amounts to $4.95 an acre using the 2002 farm bill loan rates. Further delays would increase the losses to the disadvantage of corn, but increase the advantage to wheat. Having a market for straw and reducing timeliness losses could add $20 an acre. This would make wheat without double-crop soybeans competitive with a corn-soybean rotation in the East (E), SW, and SE crop reporting districts using 2002-2003 loan rates as prices.

Marketing Wheat as Food

Growers that maintain the quality of the wheat through proper growing, harvesting, storing, and handling thus avoiding sprouting, low falling numbers, cracked kernels, and foreign matter are quite likely to receive a premium from millers over the terminal market price. David Marshall, a merchandiser for AgriPride FS, Inc., Nashville, Illinois (2002) indicated that premiums from Illinois wheat millers were $.30 to $.50 more per bushel than river terminals or country elevators. At $.40 over the wheat loan rate, wheat and double-crop soybeans would be profitable in the East-southeast district.

Conclusions

The decline in SRWW production in Illinois has been driven by a number of factors. Increases in wheat yields have not kept up with the increases in yields of corn and soybeans. The SRWW yields have also become more variable over time as compared to corn and soybean yield variability. The cost of production for SRWW has not improved compared to the improvements in cost of production for corn and soybeans. The price of SRWW has weakened relative to the price of corn and soybeans due to changes in the world wheat market and the government program loan rate price for soybeans prior the 2002 farm bill.

Despite these negative factors affecting SRWW production, SRWW should be still considered as a viable crop enterprise under certain conditions. From the comparison across Illinois crop reporting districts, wheat had an advantage to a corn-soybean rotation in the far southern districts. This result is attributed to the ability to double crop wheat and soybeans and the lower corn and soybean yields. These results are likely applicable to other regions that have ability to double crop and have lower corn and soybean yields.

Results suggest that SRWW, to be competitive with a corn-soybean rotation without double-crop soybeans, depends on relative crop prices. If relative crop prices reflected by 2002-2003 government program loan rates exist then breakeven SRWW yields would have to be 51 to 54 percent of corn yield. If relative prices reflected by 1995-1999 average prices exist then SRWW yields would have to be 60 to 65 percent of corn yields. Other factors such as markets for wheat straw, timeliness, risk diversification, and premiums for quality wheat can all add to the competitive advantage of SRWW production.

Endnotes

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References

Bitzer, Morris and James Herbek. 1997. *A Comprehensive Guide to Wheat Management in Kentucky*. University of Kentucky at Lexington, College of Agriculture. Cooperative Extension Service.

Illinois Agronomy Handbook. 2001. Dept. of Crop Sciences, University of Illinois, Urbana-Champaign. Online htttp://web.aces.uiuc.edu/aim/IAH/ (10 October 2002)

Illinois Agricultural Statistics Service. Various years. *Annual Summary*. Illinois Department of Agriculture, U.S. Department of Agriculture-National Agricultural Statistics Service. Online. http://www.agstats.state.il.us/website/reports.htm (26 September 2002).

Illinois Farm Business Farm Management Association. Various years. Farm records for Shawnee and Lincoln Associations, Dept. of Agricultural and Consumer Economics, University of Illinois Urbana-Champaign.

Marshall, David. 2002. "Steps You Can Take to Add $1 to Your Wheat Price." Illinois Wheat Association Newsletter. 8(#2 Spring):7-8.

Perkins, Morgan. 1999. "On the Wheat Export Scene, U.S. Soft Red Winter Almost Disappears." United States Department of Agriculture-Foreign Agricultural Service. Online. http://www.fas.usda.gov/grain/circular/1999/99-02/dtricks.htm#bookmark1 (10 October 2002).

U.S. Department of Agriculture-Economic Research Service. 2002. "Appendix table 6 Wheat classes: Estimated acreage, yield and production, 1982-2002." Online. http://usda.mann.lib.cornell.edu/data-sets/crops/88008/tab06.xls (26 September 2002).

U.S. Department of Agriculture-Economic Research Service. 2002b. "Appendix table 21--Wheat cash prices for leading classes at major markets, 1970/71-2001/02." Online. http://usda.mann.lib.cornell.edu/data-sets/crops/88008/tab21.xls (26 September 2002).

U.S. Department of Agriculture-Economic Research Service. 2002c. "The 2002 Farm Bill: Title I Commodity Programs." Online. http://www.ers.usda.gov/Features/FarmBill/Titles/TitleICommodities.htm (8 October 2002).

U.S. Department of Agriculture-Economic Research Service. 2002d. "Data commodity costs and returns." http://www.ers.usda.gov/data/CostsAndReturns/testpick.htm (26 September 2002).

U.S. Department of Agriculture-National Agricultural Statistics Service. n.d. NASS historical data. Online. http://www.usda.gov/nass (26 September 2002).

Vocke, Gary. 2000. "Forces Shaping the U.S. Wheat Economy." Agricultural Outlook. ERS, U.S. Department of Agriculture.